

1973

**TURF CONFERENCE
PROCEEDINGS**

Sponsored by the

MIDWEST REGIONAL TURF FOUNDATION

and

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PROCEEDINGS OF THE
1973
MIDWEST REGIONAL TURF FOUNDATION

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The 37 talks included in these Proceedings are condensations of talks by speakers before sections and divisions of the 1973 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 1962, 1963, 1964 and 1965 Proceedings are available at \$ 1.00 per copy. Copies of 1969, 1970, 1971 and 1972 are \$ 2.00 each.

A copy of these Proceedings were mailed to:

The 753 attending the 1973 Midwest Turf Conference

One person of each member organization within the Midwest Regional

Turf Foundation not represented at the Conference

List of those in educational activities

Additional copies are available at \$ 2.00 each from:

W. H. Daniel, Executive Secretary
Midwest Regional Turf Foundation
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W. Lafayette, Indiana. 47907

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PRESIDENT'S REPORT

Paul Morgan, Supt. Brown's Run Country Club
Middletown, Ohio

The Midwest Regional Turf Foundation continues to provide a steady area of research and education. The services of Kaye House, Bob Seager and Dr. Bill Daniel have made the program on-going.

It has been a pleasure to have served as President, to work with the Board of Directors, and to better understand the impact of the Purdue program on the turf interests of this area.

To the Board of Directors a special vote of thanks for they have contributed not only to chairmaning our programs during the Conference, but in discussing the development of programs and the maintaining of contact in their areas.

It is an honor to be selected as President, and a privilege to have joined you in the Midwest Regional Turf Foundation. I would encourage all those attending this Conference to consider new memberships, and to seek them out during the Conference and throughout the year. The Foundation is our way of maintaining strong contact.

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EXECUTIVE SECRETARY'S REPORT

William H. Daniel
Purdue University

Each year seems to be busier with more diversity of activity than the past.

The increased student load at Purdue should be mentioned. Our program started in 1952 and expanded gradually until the 60's. We used to consider 18 turf majors a normal load - now we have over 36. During 1973 there will be ten graduates - none are going to the military. As of this time eight of the ten have been placed, with interviews during this Conference for the others. I am pleased with the caliber of young men coming to us for training. Remember, they come to us. Often you help send them by your early employment and your enthusiasm for the business. Incidentally, only about one-third of our graduates are active golf course superintendents. Others are in sales, sod, research and other phases - the field constantly expands.

The PURR-WICK green concept is continuing to expand. Some entire golf courses are putting in new greens this way. It offers moisture and nutrient conservation, but more important the freedom of use and ease of management. We consider it as routine education now.

The PAT (Prescription Athletic Turf) System has received much time and effort since its inception in late December, 1970. The progress has been to file patent claim on the system of moisture control; to evolve specifications available for contractors and architects. We are currently working with a national licensee application who then would have sub-licensees in numerous locations throughout the U.S.

During '72 two fields were installed. These models have performed very effectively in generating interest. There is much to be done, but the research and practices have meshed very encouragingly to this date. There will be monies coming from

the patenting and licensing to support part of our Turf Research program. This, your Executive Secretary felt was a "must" that had to be handled.

A special thanks to all the Board members and others whose enthusiasm has made travel and visits in local areas so enjoyable. Your contribution greatly augments our program financially, and obviously increases the efficiency of the contacts in your area.

There has been much travel for the Executive Secretary. During 1972, 65 trips were made involving over 100 days (this is one-third of the working time). Always such trips generate more work when back at the office, and usually about the time the office is straightened up another trip is due. It has been your Executive Secretary's policy to always accept speaking and travel requests unless committed prior. Such demands have been rewarding, although at times confusing.

To those numerous clubs and individuals who continue to maintain strong support for Midwest Turf, the entire organization say a heartfelt "thanks." It is a pleasure to work in the Midwest Turf program. Its continuation since 1945 without major problems illustrates your enthusiasm.

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THE METRIC SYSTEM - FUTURE

Walter Wilkie, March Irrigation & Supply Company
Muskegon, Mich.

The Great Metric Controversy began here in America. At that time one of the greatest proponents for conversion to it was John Quincy Adams, where I am reminded of what he once said: "Weights and measures may be ranked among the necessities of life to every individual of human society. They enter into the economical arrangements and daily concerns of every family. They are necessary to every occupation of human industry; to the distribution and security of every species of property; to every transaction of trade and commerce; to the labors of mankind; to the studies of the philosopher; to the navigation of the mariner, and the marches of the soldier; to all the exchanges of peace, and all the operations of war." Why, then, the controversy? Simply because there are two systems of measurement in the world, and whenever two systems of any kind occur there is always some kind of debate as to which one should succeed.

The metric debate has been a strange one. Measurements may not seem like an emotional issue, yet few of the participants have managed to keep their tempers, and on both sides the arguments have been loud and inflammatory, and well laced with personal attacks. Advocates have claimed that the United States could convert to the metric system in a few weeks, and that the cost of the change would be recovered in a few months. The cost would be tens of billions of dollars, opponents have replied, and it could never be recovered. Thousands of businesses would fail, and millions would be unemployed. Almost everyone would welcome it, its advocates say. On the contrary, opponents retort. It could never be enforced and the jails would bulge with violators.

Some very distinguished men have asserted that the metric system would save two to three years of time in the education of a child. Equally distinguished men have branded this as utter nonsense, for if there were any savings it would be less than a week. According to its critics, the metric system violates the laws of

nature and the needs of man. They cite that it drove American engineers mad during World War I and II, and made cripples of customs inspectors -- the reason, I'm sure that a forgotten pamphleteer once wrote:

"Modern science, disguise it as we may, is not merely out at sea upon the waves of doubt, but is essentially an atheistic school, that ^{has} no God, which has long since closed its doors against the written word. Our representatives have no more right to force the metric system upon us than they have to make our babies beg for bread in foreign idioms...Even the permissive use of the metric system is a blot upon our statute books. If men want to use an evil system, they will do it anyway."

As if God and Christianity were not enough, then, some anti-metricists claim paganism and superstition as allies. They wrote involved dissertations on ancient symbols as guides to cosmic truths, and professed to find in the mystic numerical ratios of these symbols the foundations of the English system of measurement.

The metric system has had many famous men as advocates, but in general these can be defined as scientists and educators. The opposition, however, has not been quite so sharply defined. Some industrial groups have favored it. Others, chiefly the metal working industries, textile companies, shoe companies, and machine tool fabricators have opposed it. In tests of strength, the opposition has always won.

For a number of years the issue of whether or not to convert has seemed almost dead in the United States, and the organizations set up to promote metric legislation have virtually disbanded. But, this is cold comfort for advocates of English measurement. The metric system has become the sole official system in nation after nation, sweeping around the world, becoming the first international language of measurement. Of all rival systems, only the English and American have withstood it, and even they have lost ground. There's not the slightest chance today that our system should or could become a world system, for if the world is ever to have a single system of measurement it will, in my opinion, be the metric system.

Why, then, all the fuss? The controversy began with man's natural endowment, the manner in which nature shaped his body. He had ten fingers. He counted on his fingers and he measured with them too. But, there was no relationship at first between counting and measuring. Nor did man in those days compute. He counted. He did not add or subtract, multiply or divide.

The units of linear measure - foot, nail, cubit, span - were not chosen because they were related to each other in simple ratios. Nor did man begin counting on his fingers because he had ten. The ratios were discovered later, and by then decimal counting was well established. The early refinements of measurements were very simple, more in the nature of mechanical operations than of number-work. As craftsmen gained skill, they required more precise units of measure. To obtain a smaller unit of measure than a foot, for example, it was better to sub-divide the foot than resort to another kind of unit.

Suppose you wish to sub-divide a pie, or lump of clay, or a strip of paper, into an equal number of parts, using no measuring instruments. You can easily divide the whole into halves, and the halves into quarters, and you can verify your accuracy by comparing the pieces. With somewhat less ease, but with fair accuracy, you can sub-divide into thirds. But, if you should attempt to sub-divide into fifths or tenths, your margin of error would be considerably larger.

From these beginnings came the structure of present-day English measure: the 12-inch foot, the 3-foot yard, the 6-foot fathom, and so on. From the craftsman's

sub-divisions came the divisions of the inch into halves, quarters, eighths and sixteenths; and similar sub-divisions of the gallon, quart, mile, ton and pound.

Further, as the need arose for extremely small units, decimal division was sometimes adopted in place of halving. In the United States, for example, machinists worked in fractions of an inch down to a sixty-fourth. Beyond that point, however, fractions became unwieldy, and so they now divide the inch decimally into thousandths.

Measuring and counting existed side by side for many years, but until Arabic numerals replaced Roman Numerals in the Middle Ages, computation was a real difficulty. Thus, when science and commerce began to use computation, the conflict began. Not only was there awkwardness in applying decimal arithmetic to measurement, there was an even greater problem in making conversions. Moving from one kind of unit to another.

The most persuasive demonstration of this is the almost universal illiteracy of English-speaking people with respect to their own system of measurement. For example, how many of these questions can you answer without consulting a reference book?

How many cubic inches are there in a bushel? A dry quart? A liquid quart?
What is the relationship, in capacity, between a dry quart and a liquid quart?
How many square feet in an acre?
How many acres in a square mile?
How many quarts in a barrel?
How many pounds of water will a barrel hold?
If a pint of a certain liquid weighs $1\frac{1}{4}$ lbs., how much will a cubic foot of it weigh?
How many cubic inches in a cubic foot? In a cubic yard?

In metric countries, using metric units, any schoolboy can rattle off the answers to such questions without thinking twice. All of his units are decimal units, all related in ratios of ten, and the system is consistent throughout. Here, then, are the roots of the Great Metric Controversy. Measurement and computation had, at last collided. For persons whose work consisted largely of computation, metric measure was obviously far more convenient. For others, such as carpenters and stonemasons, the simple fractions of English measure were better.

Our English system today is far simpler and far more consistent than in Saxon times. And yet, can you set up conversion tables in our own system of measure in which appear the scruple, carat, pica, grain, dram? Can you state the difference between the apothecaries' ounce, the Troy ounce, and the liquid ounce? Can you state the size of a cranberry barrel?

Such questions would offer not the slightest difficulty to anybody in a metric country. There is one word for length, one for weight or mass, and one for capacity. There are standard prefixes for multiples and sub-divisions, but they're all decimal. This was one of the tremendous appeals of the metric system to people throughout the world - they could understand it.

The metric system is so logical and reasonable that most people in England or America, who consider it for the first time, are baffled. Why on earth didn't we adopt it long ago? Why do we adhere to our jumbled system of unrelated units which almost no one can remember, and which require time-consuming and cumbersome calculations?

Perhaps, then, this is the reason the following article appeared on the editorial page of the October 27, 1972, issue of the Detroit Free Press:

"We are about to be subverted. Our familiar world of measurement deals in such units as inches, feet, yard, and miles, gallons, bushels and Farenheit degrees. But the outer world, even including the eccentric British, is either on the metric system, which deals in multiples of 10, or is committed to going there."

Your could say, "so what?" but the infiltrators are already within our gates. The millimeter is creeping upon the inch. Photographic film comes in metric measurements. The pharmaceutical industry has abandoned old-fashioned drams and grains in favor of milligrams and grams. Swimming pools are now being built to international metric-distance specifications. Automobile mechanics are being forced to add metric tools to their toolboxes, for imported cars have metric parts. Whether it comes in years or decades, we are on our way to a momentous change.

I am sure I won't like it, but then, I had a predominantly literary education. I like to savor Robert Frost's lines about having "promises to keep and miles to go before I sleep," and would hate to have my poetry footnoted to include kilometer readings.

Seriously, though, the opponents of the metric system will have to recognize that they are fighting a rear-guard action. Once upon a time the island and the peninsula peoples of the world (the British, with their dominions and colonies, the U. S. as an offshoot of Britain, the Greeks, the Boers, and the Japanese) disdained counting everything in units of 10. The metric system was the child of the continental masses. Where Englishmen stuck to gallons, stones, ounces and pounds, Talleyrand put the full authority of the French Revolution behind a logical system that related everything to everything else by decimal ratios. The system took hold from the English Channel to the China Sea.

The triumph of the metric system has been coincidental with the disappearance of the British Empire. With Britain and Canada signifying their intention of going over to metric standards, Britain's old African colonies have taken the same course. So has India. The nations of the European Common Market have been ironing out their remaining national differences in engineering standards.

Our big multinational corporations, which assemble computers, automobiles and complicated factory machinery from components made in several countries, have all been going metric. This means that smaller companies, which hope to sell to big companies, must go metric too. In Britain, U. S. subsidiaries account for 14 percent of the total economy. Thus, as Britain goes metric, U. S. multinational companies in the United Kingdom must conform or die.

It took a decade for Sen. Pell and Griffin, and Rep. Miller to get Congress to pass a Metric Study Act. The study has now been completed. Meanwhile, the British have passed the midpoint of their metric changeover, and the Australians and Canadians are beginning theirs. The forehanded Japanese finished their conversion 10 years ago. The U. S. alone remains on the freight train. It is one more example of the isolation we have permitted to creep up on us unawares, but does this mean we can ignore it? I don't think we can.

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EXPANSION IN TURF USAGE

W. B. Gilbert, Turfgrass Research and Teaching
North Carolina State University,
Raleigh, N. C.

With the present trend toward a shorter work week, plus population increase, turf facilities are becoming more crowded. The extent of new turf areas is difficult to document, with the exception of golf courses.

As of October, 1971, the National Golf Foundation reports that there were 10,494 golf facilities in the United States. The term facility as used denotes a single geographical area that contains one or more golf courses under one management. This number is over a 50% increase in the past ten years, with a 30% increase from 1961 to 1966, and 20% from 1966-1971. It would seem reasonable to expect the rate of growth to hold this downward trend and level off at $\pm 15\%$ for the next five year period.

In some areas the growth has been more pronounced. In the past ten years, the South has shown an increase in golf facilities of 93%, with Kentucky increasing by 115%, and Florida, N.C., S.C., and Tennessee being over 100%. The figures for Indiana show 77% for the same period, with Illinois having a 50% increase.

This increase in the number of golf facilities is not entirely due to more leisure time and more people. Golf itself has become more popular. The Professional Golf Association tour has had a decided effect on the popularity of golf. The increased prize money and television coverage has stimulated the interest and increased the use of golf facilities.

In 1973, North Carolina will be the richest layover for the play-for-pay pilgrims. Five tournaments will put up \$ 1,160,000 in prize money. Florida, currently scheduled to host seven tour stops, ranks second in prize cash with \$1,060,000, and California with six tournaments has a \$ 995,000 total.

With the anticipated increase in golf participation and facility construction, we had better be prepared for an increase in the problems associated with traffic so that turf conferences and trained personnel become more and more important.

Other turf facilities and uses have been expanding, some with the same magnitude as golf courses. However, it is more difficult to obtain facts and figures for the national growth of these facilities.

Highway construction is estimated to expose over a half million acres of roadsides to possible erosion until stabilized by permanent turfgrass vegetation. With the new federal limits of area exposed at any given time, the use of temporary grasses and other methods of stabilization are going to increase.

The construction of new homes and apartments barely keeps pace with the population explosion, and these new lawns, as well as the turfed areas of the shopping centers and industrial sites to serve the new sub-divisions of cities, cause more demands on the turf industry. The population growth increases the need for more schools, with the lawns, playgrounds and athletic fields contributing to the expansion of turf.

New Uses

Turf expansion is not limited to the old concepts. Along with our increased population comes the added problem of the possibility (or probability) of polluting

ourselves out of existence. Many rivers, lakes, and even oceans, are becoming unfit for use by various sources of pollution. One of the coming additives to turf expansion is the absorption and de-toxification of sewage in particular by golf courses or other turfed areas. This can help alleviate the water deficit faced by many installations, as well as solve the problems of disposing of our by-products.

Another expanding area is the stabilization of our coastal dunes and beaches by the use of adapted grasses.. The increased use of turf in these areas will not only protect from storms and high tides, but render them more enjoyable to the inhabitants.

This expansion in turf usage has created a demand for more and better trained personnel. Many universities, including North Carolina State University, have responded with both two and four-year programs in Turf Management for training of students in this area. These schools, supplemented with the many fine turf conferences, will meet the challenge of this expansion.

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THE MODERN TURF WORLD

Richard Nelson, Int. Sales, Jacobsen Mfg. Company
Racine, Wis.

Totally there are about 5000 golf courses outside the U.S.A.

I. Europe

Quantities of golf courses on continent (500+)
U. K. and Ireland - golf courses (1,800)
Sweden (120) - rapid growth of golf
Norway (12) - lack of arable land
Denmark - much growth of golf

Preference to U.S.A. machinery

Germany (70)
Eastern Europe - starting again
U. K. equipment sales 20% is golf, and 80% on athletic areas
Spain - rapid golf growth and tourist encouragement
need for more machinery import

II. Middle East

Israel - Use of water; special irrigation
50,000 acres of grass to mow

III. Far East

Japan - 700 plus 70 courses under construction
Hilly condition (500 ft. elevation change within course)
Businessmen play golf during working hours (not done in Europe)
Interest in golf Overseas trips of Japanese to Hawaii
All buying sets of clubs
Preference for imported machinery

Taiwan - 12. 50% of tourists will be Japanese

Philippines - 50 golf courses, of which maybe 12 are of champion quality
President Marcos plays golf
Import license difficulties

Hong Kong - 4 clubs and more in development

Thailand - Golf courses for Thai Army, Air Force and Navy

Malaysia & -

Singapore - 72 holes of golf (watershed water problem - no chemicals)
Prime Minister plays golf

Southeast Asia will become a tremendous playground for tourists -
mostly Japanese in the years ahead, and golf is very important
to the Japanese.

Australia &

New Zealand - About 1,000 golf courses reported

Tahiti - First beautiful course - lacking players.

IV. Latin America - (grass problems, athletic fields)

Dominican Republic - 2 new courses

Puerto Rico

Jamaica

Trinidad - new course

Mexico - 40 courses

Central America

Panama - new course

Columbia

Venezuela

Ecuador - 22 men hand-cutting grass

Peru

Chile

Argentine - 55 courses - 1 municipal)

Brazil - 35 courses

V. Conclusion of a wonderful world of golf. There will be more courses in a
diverse increase.

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EMPLOYEE MOTIVATION--IS THE \$\$ ENOUGH?

Donald C. Zick, Mgr. Employee Training
University of Missouri, Columbia

Motivation, as a name, might turn some of us off. This is a big subject,
and an important subject. We think the only thing that motivates is a kick in the
seat of the pants - sometimes. Well, there's much more to it than that. A lot of
us really are missing the mark on motivation in a practical sense. What really
does motivate your people?

Participate in this, as practically as you can, of one word that you think motivates your people more than anything else. One thing! that you think really, truthfully does motivate your employees. The reason I say one word is that if you want to get it down to some real specifics long phrases and statements many times don't come out with the main idea. So keep in mind - think of what really motivates your people more than anything else. Just think about what really and honestly motivates you, because that will probably be the same thing that motivates your employees. If there is too big a gap between you and your employees, then it's not necessarily true, but I think generally you'll find that whatever motivates you really motivates your employees too.

While you are thinking about this one word, let me ask you this question. "Who motivates the motivator?" In other words, who motivates you so that you can motivate people? If nothing else, you can forget everything else that comes after this statement. If you are not a motivated person, you won't motivate anybody else. We've got some situations where I see people who are trying to motivate other people and they're not motivated at all. It won't work!

Sometimes the very fruits of our early labors lull us into the false illusion that we no longer need to push and motivate ourselves. We lay aside the real tools of our achievement and we lose momentum, humility, and the human touch. In other words, if you were promoted to supervisor three weeks ago I bet you're still charging. I bet you're really trying to prove to somebody that you're a damn good supervisor. If you were promoted to supervisor three years ago, the same might not be the case. You might be slackening off and beginning to settle back and trying to take it a little bit easy. I think that is a pressure that is upon all of us, if you lay back and start taking it easy and expect the person you hire tomorrow to be motivated while you are kinda taking it easy and are not really too enthusiastic, and are not really trying too hard, you're going to have a hard time trying to motivate those people who work for you.

We can even get more basic than this. I think there are periods in a person's life that he should be aware of that influences this very subject. If you remember back--some of you might not have to remember too far--to the age 18-25, I think that's a period you'll find that most people have a tendency to be idealistic. In other words, they can change this world; the world will be changed, and they are the ones who are going to change it. These ages obviously are not magical, and I don't mean them to be as specific as I give them, but somewhere in that age of 18-25 people are very idealistic. Between the age of 25 and 30 they think they can't change the world, but they can still change the organization they work for, and do a little bit of improvement on that organization in the area in which they work. Between the ages of 30-35, after you have butting your head against the wall for quite a few years and things haven't changed much, you begin to wonder and say, "Well, I'm still going to stick with it."

Then we get to the age 35-40. A study done by the University looked into the different ages of men and how they felt. They came out with a statistic that 85% of the people between the ages of 35-40 become very disillusioned or disappointed. Now, that's a tragic thing if it's really true! You can think about the age you're coming to--35 to 40--or the age you've been through, or the age you're in, and decide for yourself.

Well, if that has happened to you, you've hurt yourself more than you've hurt anybody else. If you begin to settle back and say - "To heck with it," then you're not motivated, you are not an enthusiastic person, and you're not going to motivate anybody. The people who work for you will feel this very definitely, and it will have application on their life so you will be hurt in that aspect. Another aspect where you will be hurt is that your life will not be interesting. If you

look around, the people who are happiest are not the people that have settled back and retired from life. In other words, you find a 70-year old person who is really charging around and is really enthusiastic and you have found a happy person. You've found a person who is far better off than the man who is sitting in a chair somewhere.

Now, what really does motivate people and how you can use it. Not, let's list the ones you think is the most significant one, and what this group of people think is really the best thing to motivate your people. (At this point, the audience suggested) -

<u>Words</u>	<u>Percent</u>	
Pride	27	Challenge
Recognition	26	Fear
Communication	8	Honesty
Responsibility	6	Leadership
Cash	5	Personal Evaluation
Self-fulfillment	5	Personal interest
Enthusiasm	4	Profit
Appreciation	4	Progress
Praise	4	
Good equipment	4	
Profit-sharing	3	
Respect	2	
Security	2	

In my view these are key words:

Appreciation	Enthusiasm	Cash
Praise	Pride	Profit
Recognition	Progress	Security
Responsibility	Self-fulfillment	Profit-sharing

Okay, these are the things that you as a group think motivates people more than anything else in a very practical way. Pride and recognition are the ones you picked as No. 1 and No. 2. I would vote for success, but we'll use the words achievement or accomplishment. A lot of these words are similar - accomplishment, success, and progress are pretty close - We think it is The most important. Not only do we think it's most important and first in sequence, but we think it's one that you can work with more than you can work with others.

For instance, consider pride. You've got 17 guys working for you.' They've got pride or they've not got pride. You try to instill pride into me and you're going to have a tough time. That's like changing my basic personality. You try and change my basic personality and it's going to be rough. Pride might motivate you more than anything because you've got it. That's because of your heredity - or you just found that you can accomplish and you've got pride. So, again we lean back toward accomplishment. If you try to use this you're going to put in a lot of effort for the small amount of good you'll get when you try to instill pride.

Recognition - that's a very big one on the motivation list, but again if you were going to give somebody recognition, what are you going to give it to them for? Well, because he accomplished something! Because he's a success. Because he achieved something! If you give me some recognition for working hard and I didn't - you're not going to motivate me because I'll wonder about you! If you want to motivate somebody think first about accomplishment (or success).

What comes first? First comes accomplishment before enthusiasm. What's he got to be enthusiastic about if he hasn't accomplished anything? Before pride - I'm proud of my accomplishments. I'm not proud of things I've failed at. If I get recognition, it should be for something I've accomplished. If I get praised it should be for accomplishing something. The guys you give more responsibility to are the guys who give you results - not those who didn't accomplish.

Self-fulfillment? the only reason I feel a sense of fulfillment is because of what I have accomplished, and if I don't have a feeling of self-fulfillment it's because I'm not accomplishing anything, but all these things are tied back to accomplishment.

Well, O.K. - what do you want to do with it? How can you get a person to accomplish, to succeed, to achieve so that then you can use these other words - so that he can get some pride, so that he can get cash, so he can get some more responsibility? How do you get him to accomplish? The most significant way to get people to accomplish is to get the roadblocks out of their way. "I want to do a good job, but look at the junk I have to use!" "I want to do a good job, but I show up at 8:00 and the other people show up at 8:15. So, why should I continue to show up at 8:00? It's a roadblock, something that is in my way. All you say is plant the tree, but you never show me how. So the roadblock for me to do a good job is that I don't know how to do a good job." Think about the problems that are in a person's way.

Can you spend just a little bit more time showing this guy his work assignment that will give him a better feeling about how he is really supposed to do his job? How many times have you received a work assignment where the guy says, "I want you to do this, that, or the other and I'll be back at 10:00"-- then he leaves and you think, "Man I've got so many questions!" How long do you think it will take a guy who has received a poor work assignment to waste nine minutes. He says later - "He never told me where the ladder is. How big a ladder do I need?"

So, one of the things you can do to get people to accomplish is to train them better, give them better tools, and more than anything else, get things out of their way. You can show a real interest also in the fact that you want to help them accomplish. That's worth an awful lot. My wife says, "I'd rather have you say nice things to me than do nice things for me." I'd rather have people do nice things for me than say nice things to me. Still both of them are very important. If you don't do and say good things to them once in a while, you aren't going to motivate them and they are not going to accomplish.

What about coffee breaks? I think your point could be a very significant one and that is if you just drive a guy and never give him a chance to stop and think and so forth, you're missing the boat on that too.

Let's take cash for instance, and it's one that is always interesting to talk about anyway. I would say that cash is not a motivator. Money and cash is one of the most important things you have in this field, but it's not a motivator. Since this might even confuse you more, let me try to clear it up. What I mean, it's exactly like health - if you are not healthy, you are not happy. You are not happy because you're healthy. If you are healthy you are then allowed to be happy. The things that happen to you, your kids, having fun, etc., then can make you happy, something else can make you happy if you are healthy. But, if you are unhealthy you're unhappy! So, it's very important. Money is like that. If you're not paid a decent amount you're demotivated. If you're paid a decent amount you're not necessarily motivated - you're just ready to be motivated.

A lot of people are making mistakes on this subject, I think. They are giving benefits, they are giving cash, etc., and they are trying to get motivation with it. It doesn't do the job! If I gave you all a \$100-a-month pay increase

starting today, and I checked a month from now on your production, how much more production would I get out of you for that \$100? Not much. How much more production did you give for the last pay increase you got? You know, this is what really happens.

So, look at it the correct way. Don't say it's unimportant when someone says to you money doesn't motivate. These are not the things that motivate, yet they are very important. If I'm paid much less than I should be paid you're going to have a heck of a time motivating me because I'm really demotivated. I'll be looking around for some place else to go, and while I'm looking around I'm not going to be producing too much for you. So, it's very important, but it really doesn't motivate. I shouldn't say it doesn't ever motivate because it does. For instance, if I got a pay increase today I might think, "By golly that's great," and go out and spend the afternoon working like a dog. But then I come in tomorrow, and I'm back in my same old way. So, it does motivate, but we're talking about important motivators. I'm just saying that money is not one of the important motivators.

How about security? Well how about insecurity? I wouldn't say look only at success or accomplishment, or at recognition, but I'm saying when you do look at a lot of people who work for you there are things that emerge as the main motivators. These things that I'm trying to talk about have emerged as the main motivators. One of the significant points about motivation is you have got to look at the person.

Praise is much more important to women than it is to men! The secretaries I've had working for me - I can say a nice word to them like, "Boy, that was really a good typing job," and they can live for months on that! You say that to a man and he can live for minutes on it! The point is the main things that motivate most people are usually true about you and me. Maybe I am much more sensitive in self-fulfillment or honesty because of the type of person I am. You've got to know your people to motivate them correctly.

Fear is not a good motivator, and you'd say, "I can remember some times when I was afraid and I really started humping." If you are talking about short-range motivation, Fear may be the best one. But, if this guy is going to work for you for awhile, then you'd better think long-range. But, if you're not there to watch me, from then on you've hurt my motivation a little bit because I'm angry with you. Also, I'm upset - plenty upset - that you act the way you just did to me to instill fear in me. So fear is good in short-term - it's pretty lousy in long-term, because I'm going to have plenty of recourses of action if you use fear against me. As time goes on, employees are getting more and more recourses of action. In other words, there is more they can do about it. Fifty years ago if you used fear, there wasn't too much a guy could do about it. Now he can go to the union steward. Now he can get a job somewhere else, but it used to be a lot harder fifty years ago to just quit a job and go to work somewhere else. He can do a lot of things - he can sandbag. So, fear doesn't work out that well in my opinion in long-term.

Security can be overdone. It's like money, in a sense. A bit of security can really be motivated because I'll be spending all my time thinking about whether I'll be able to keep my job or not instead of doing a good job and thinking about quality. But, you can overdo security. If I told all of you no matter what you do, I don't care what it is, you're not going to be fired - that's really security. But that's not going to motivate you. You'll say, "Oh, by golly, I'll just come to work at 9:30 tomorrow." If you are going to motivate people well, then you want to give them just the right amount of security. There should be some insecurity there so they don't feel like, "Well, you can't get rid of me, I don't have to do what you say." You never want to leave that feeling in them.

Think about the sequence of things - "What comes first? Should I praise the guy? Well, has he accomplished anything?" Maybe the answer is yes. Praise is now

the thing to do and you don't have to worry about accomplishment. But, if he hasn't accomplished anything you've got to get that going first. So, what we would say is to think about the things that don't really motivate too much. Don't use them so much as motivators, but use them so you can motivate a person. Like security and money - they get you to a point where you can motivate a person. Then think about accomplishment and how you can get accomplishment. Again, I say the best way, is to get rid of the roadblocks. Get the things out of the guy's way so he can get some accomplishment.

When he gets a little accomplishment, pat him on the back. Give him some praise. When he gets a little more accomplishment, give him some recognition. Say to yourself, "I've been praising John, but I want to give him a little bit more recognition now. Call him in in front of the guy who owns the whole organization and tell him, "I want you to know that this guy is really a good worker." You'd be surprised what you get out of it. And, if you want to give him more, give him some responsibility. Let him grow in his vocation. These things build on each other. But, you've got to start with first things first. You've got to be practical.

Some of the things like challenge and communication are very important. We have a whole course at the university on one subject called "Communication." If you honestly believe that you don't know everything there is to know about motivating people, you've made one big step right there.

There is one other motivator that we haven't even discussed that I would put way up on the list and that's expectation. There's a new philosophy going around that is called the "self-fulfilling prophecy." I subscribe to it about 110%. What it says, basically, is that whatever you think about yourself, and whatever you think about the people that work for you, whatever you expect from yourself, and whatever you expect from the people you have working for you has a way of coming into existence.

There have been some tests. For example, two teachers and two groups of students about as equal as they could get them. They said to the one teacher - "you've got a bunch of dumbbells. Don't expect too much from them. You'll have to work long and hard to get anything done." Then they told the other teacher, "You're really lucky this year because you've got a class of mighty bright kids, enthusiastic kids, intelligent kids - topnotch. They'll really accomplish a lot."

Well, the people who were in the class who were supposed to accomplish a lot, accomplished a heck of a lot. The class where the people were supposedly dumbbells didn't accomplish much at all. And, they brought it all down in this study to the teacher and what the teacher expected of these students. Now the teacher didn't know the students were as equal as they could possibly get them. All the teacher knew was, "I've got dumbbells," or "I've got bright students." The students didn't know anything about any of this - just the teachers knew.

So, the self-fulfilling prophecy has a lot of truth to it. If you think by looking at him that I'm not going to get anything out of him - you've made a mistake because you'll get more out of him by not looking at him. True, he might be the kind of guy that you're not going to get much out of. But again I say, you'll get less out of him than if you will say to yourself, "I'm going to expect some good stuff out of this guy." If you have the right expectations from them you'll get more out of them than if you look down on them in your expectation.

If you look at the people who work for you and think about this, that should help you motivate them a little bit. If a guy fails, don't look at him with that look of "I know you're going to fail again because I know you failed." Look at him and give him a pat on the back and say, --you've got to be honest about it -- "I know you can do it, and I know that first time was just a mistake. I know you can

do a good job the second time." You'll help him a lot more than if you walked by him and say, "Now the next time you'd better do good because I know you did lousy the first time." Man, he's up against it if you say that to him!

Well, my whole point here is I can take any of these words and make a big deal out of them. I'm not trying to play them down. Self-fulfilling prophecy - it's really important, and there is a lot to know about just that one thing. Communication I've already mentioned that one of the longest courses we've had under our direction is just on that one word. Recognition - growth - any of these. There's much to be said about a lot of these.

To make this even more practical, Dr. Hertberg wanted to find a company that had people who really were motivated. He found one - a real company. He asked them if he could go in and find out why the people were motivated and the company said, "Sure you can, we'd like to know as much about this subject as we can ourselves." So, they interviewed every employee and asked them this question - "Think about the last time you were motivated. Tell us about it and tell us why." Well, out of 1,753 interviews they came out with Achievement, Recognition, the Work itself, Responsibility, Advancement, and Growth as THE motivators.

In other words, people said specific things like: "About two weeks ago I wire-welded more transistors than anyone ever had done - 2,109 in an hour. My foreman complimented me. I still feel good. Self-satisfaction and peace of mind to know that I'm doing a good job for them."

If you want to motivate people, set a good example. Set a good example by being a motivated supervisor and arrange your employees' work, and work around him so he can obtain a feeling of achievement, responsibility, growth and recognition. Now, that's something most supervisors can do something about.

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TURFGRASS PROGRAMS IN NORTH CAROLINA

W. B. Gilbert, North Carolina State University

The climate of North Carolina has more variation than any other state in the United States, ranging from the climate of Mid-New England to that of North Florida. This variation means that all cool-season turfgrasses are used in North Carolina, including Kentucky bluegrass, red and tall fescue, ryegrass and bentgrass for permanent turf plantings, or as overseeded winter turf, primarily on bermudagrass golf courses and lawns

The permanent warm-season grasses used include: centipedegrass, St. Augustinegrass, carpetgrass, bahiagrass, zoysia, and many varieties of bermudagrass.

The large number of grasses used in the state presents many opportunities for research. At the present time, the turf research program is divided into grasses for golf and other intensive uses, home and industrial lawns, and highway roadsides.

The current program for golf course turf is on both cool- and warm-season grasses, with an emphasis on bentgrass as follows:

- A. Fertilization - the source, amount and timing of applications of both nitrogen and potassium for growth response, seasonal color, heat tolerance, and incidence of disease and insect damage. The following recommendations have evolved for nitrogen: Rate: 4-8 lbs./1,000 sq.ft. Timing: Fall (S, O, N) 40%; Winter (D, J, F) 30%; Spring (M, A, M) 20%; and Summer (J, Jy, A) 10%. Applications of 4 ozs./M² chelated iron in combination with Winter N fertilization increased resistance to dessication, while summer applications of 2 ozs. iron and 8 ozs. K₂O per 1,000 sq.ft. showed promise for summer use.
- B. Greens construction - A graduate student study in "Soil Physical Factors on Bentgrass Growth" indicated the soil mix should be so the hydraulic conductivity would be in the range of 4 - 5 inches/hour. Another graduate student is studying the "Effects of Manganese Levels on Bentgrass Growth" due to the high Mn content of river terrace soils and sands used in construction of greens. This project is partially supported by a grant from the United States Golf Association.
- C. Variety evaluation - the use of bentgrass in the Upper South has greatly increased during the past 10 years. Many named varieties have been studied, and at present, 3 numbered strains show considerable promise for disease resistance and less thatch development.

THE RESEARCH PROGRAM ON BERMUDAGRASS GREENS INCLUDES:

- A. Fertilization - 24 nitrogen variables and 16 different rates/sources of potassium are being studied. Growth response, color retention in fall, cold tolerance, weed invasion, and effects on overseeded grasses are noted. Emphasis on mineral K nutrition will continue since it plays such an important part in prevention of winter kill of bermudagrass. In an experiment on fertility ratios for cold tolerance, a 4-1-2 and a 4-1-5 ratio fertilizer produced grass that was much more tolerant of cold temperatures than ratios lower in K.
- B. Overseeding - Studies are continuing on golf greens and fairway bermudagrasses as to various methods of preparation, seeding mixtures, and rates. Many golf courses depend on overseeded grasses for 8 months of the year, and the new perennial ryegrasses have improved the quality of the winter greens. Winter protection of bermudagrass through proper fertilization, use of mulches or other covers are being studied. A combination of cultural practices (aerification, verticutting, spiking, fertilization and water management are included in a study on the spring transition from overseeded grasses to bermudagrass.

RESEARCH ON GRASSES FOR LAWN USE.

With the many new varieties of grasses becoming available, considerable time and effort is needed to properly evaluate them as to their usefulness. With a larger portion of North Carolina being in the "transition zone" for grasses - too hot in the summer for cool-season species, and too cold in winter for warm-season grasses, a major effort is being made to obtain an adapted lawn grass. North Carolina, as a member of the Southern Regional Turf Research Group (13 Southern states) has a regional variety test on Kentucky bluegrass, tall fescue, and red fescue. In addition, over 100 other selections of cool-season grasses and 85 bermudagrass strains are being evaluated.

Research is also being done on winter kill of centipedegrass, variety selection of bahiagrass and centipede, and on a local selection of a cold-tolerant St. Augustinegrass. Screening programs for fungicides, herbicides and insecticides are also being carried out.

HIGHWAY RESEARCH PROGRAM

A study on the "Utilization of Wood Residues for Highway Slope Stabilization in North Carolina" was initiated in August, 1972. The use of shredded hardwood bark and pine cambium for erosion control as a mulch for turf establishment is being investigated. North Carolina produces over 2.5 million cu. yds. of bark annually, with only 12% presently being utilized for purposes other than roadside mulching.. An additional 20% could be used on the 15,000 acres of disturbed roadside surfaces during each year of highway construction in the state.

TEACHING PROGRAM

A two-year program in Turfgrass Management was started in 1969. It consists of 4 semesters of instruction in the identification, establishment and maintenance of turf; basic plant and soil sciences; shrub and plant identification; landscape and equipment maintenance, and pest control in weeds, diseases, and insects affecting turf. Courses in written and spoken communication and business records prepare the students for positions of responsibility. In addition, the summer months between the second and third semesters provide on-the-job training.

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WATER - GOOD AND BAD

Donald Clemans, Supt., Wabeek Country Club
Birmingham, Mich.

As each day begins, water, condensed as dew and fog, begins to be reabsorbed into the atmosphere. Water is one of the most unusual natural resources. It expands as it cools and becomes ice, causes landslides, heaves soil and plants by frost action, causes organic matter to accumulate by eliminating aerobic bacterial action (peat bogs and thatch), and causes soil to crack open (drying of clay).

We build dams and ponds to hold water in reserve so it will be available when we need to irrigate our turf, and we drain excess water from our turf with tile drainage systems.

In the July, 1926 issue of "The National Greenskeeper," John Morley, then President of the National Association of Greenskeepers of America, wrote an article entitled "Is Poa annua Good or Bad?" In his article he made reference to the water-soil-air relationship: "I am of the opinion, especially during extreme hot weather, that air in the soil is more important than water. For if deprived of water in hot weather for a long period, the roots of old grass will frequently survive, although the leaves and stems in a drought may turn completely brown, but if deprived of air and immersed in water in hot weather they will die in a few days."

Let us take a closer look at the soil. Soil is basically composed of sand (large particles), silt (medium sized particles), and clay (small particles). When water is added to a soil, three of the possible conditions produced are:

1. Saturated soil (too much water)
2. Field capacity soil (desirable balance of soil particles, air spaces, water)
3. Wilting point (soil with too little water which is held too tightly to the soil particles to be available to plants).

The condition of the soil that is being wet affects this relationship. That is, granular soil has good movement of soil, water and air, while compacted or platy soil has poor movement of water and air.

The micro-climate (the climate near the ground) is also a factor in determining whether the water that falls or runs on to a turf area is "good or bad" for that turf. Consider:

1. A hillside
2. A hilltop
3. The flat at the bottom of the hill
4. Which way does the slope face -
 North
 South
 East
 West
5. Is the area shaded?
 In the morning?
 In the afternoon?

Many golf courses are forty or fifty years old, and through the years they have all had the height of the grass shortened, water added through irrigation, 1000 pound golf cars run over them, and the golf traffic doubled and doubled again. Now, in the 70's we hear "turf failure" - "It's too hot or too wet to grow grass here," - "Can't stand the traffic," - "Poa annua has invaded and the turf fails every year".....

We have all become product oriented through advertising. When we see weeds invade the turf we know, from advertising, that the solution is applying a selective herbicide. If disease attacks the turf, we know the solution is the application of a specific or a broad spectrum fungicide. I suggest that turf managers need the herbicides and fungicides as tools, and I sincerely believe that most of the herbicide and fungicide manufacturers do not promote their products as "cure-alls."

Now, recall the "crazy" ostrich that sticks its head in the ground to "escape" by hiding from its enemies. I remember when:

Dr. Jim Beard (Michigan State University) stuck his head in a root box in the putting green to study roots.

Dr. Bill Daniel telling us to worry about the top inch of soil.

O. J. Noer (Milwaukee Sewage Commission) saying, "More quality turf has been watered out of a golf course than watered in with irrigation."

We are accustomed to hearing about Labor Budgets, Capital Improvement Budgets and Maintenance Budgets. How many turf managers use "Water Budgets?" Do you anticipate that 3 inch rain? Plan to have excess water run directly into surface drops and not soak into the soil. Have you left room in the rootzone for a one and a half inch rain to be absorbed and not saturate the soil?

I agree with John Morley that air in the soil is more important than water during hot weather; with Dr. Daniel that the condition of the top inch is critical to successful turf growth; with O. J. Noer that a mismanged water budget causes turf failure, and with Dr. Beard for he was looking in the right place for the answer to successful turf growth. If you can't grow roots, you won't grow grass.

The water and air relationship in the rootzone is probably the most important relationship to understand in successful Turf Managment.

A SECOND REPORT ON THE "BINAR" AUTOMATIC
IRRIGATION PROGRAMMER AT OAKLAND HILLS

Theodore Woehrle, Oakland Hills C. C.,
Birmingham, Mich.

Upon my arrival at Oakland Hills Country Club, Birmingham, Michigan, in March, 1968, I was faced with the construction of a new golf course, and the installation of a new Automatic Irrigation system. It was an entirely new concept in automation called BINAR. I reported the new idea to you here at Purdue in 1970.

Here is what was said at that time about Binar. It is a two-wire, electrically controlled hydraulic system. We were using back to back FEBCO clocks to control 24 stations within a given zone. There were 8 zones to control all the tees, greens and fairway heads throughout the entire course. The reason for the two clocks back-to-back was to give us the needed flexibility. We were able to place two separate programs on these clocks which both controlled the same zone.

Next, I explained how we were able to use hydraulic heads with the BINAR controllers. The two wires would leave the controller and proceed to the first head in the zone, and there we would connect them to one of the decoders, which are located at each valve, and we would also splice in a 3-way ASCO valve which in turn controlled the hydraulic valve in the valve in head TORO sprinkler. Then, the 2 wires would continue on to the next head, and so on throughout the entire zone.

Each station on the clock could be controlled from 0 to 60 minutes. This meant that we could skip a head if we wanted, and/or we could set individual times for each sprinkler. We had a manifold type control for the tees and greens where two or more sprinklers could be controlled with one valve. This allowed us to free several spots on the clock for a recycling on several valves if we so desired.

Along with this flexibility we also made provisions to operate the individual heads manually. This was especially needed in the tees and greens. I don't care how good your system is, it is always wise to build in backup emergency controls. We are able to go to a box in the rough near each tee and green and operate the sprinklers manually from this box. This is also a good feature to have if you are fertilizing these areas. It means that you don't have to run to the field controller, or back to the central controller, to turn on the sprinklers on the green to water in the fertilizer, or for any other reason.

We begin watering our course in the evening about 7:00 PM, and it is completely watered by 7:00 AM the next morning. Our original BINAR system is still functioning five years later and doing an excellent job. One of the limiting factors about the old system was the fact that you had to water the system in the sequence that the wire was laid out. If the first valve was on the fairway, you would have to run through all stations down the fairway before you could get to a green or tee. This added a few minutes to your watering time, but it more than adequate.

The BINAR concept was so well thought of by its users that we were able to convince the manufacturer to upgrade some of the features in the equipment for future production, and as a result the entire concept was purchased by Johns-Manville Irrigation Corporation, and it now appears on the market under their name. We also thought an awful lot about the new equipment, and installed the new Model CP-2 central programmer on our old Championship Course.

The BINAR is a natural for converting a manual system to automatic. We simply dug up the old quick-coupling valve and replaced it with a 2-speed hydraulic valve-in-head sprinkler, and hooked it up to the 3-way solenoid valve and BINAR decoder. A crew of four men can install a fairway per day, including the pulling of the wire.

The new equipment is far superior to the old because they have added more flexibility. Here are a few items that they have added:

1. It offers 2 separate watering programs capable of operating 40 stations each. These can be used separately or alternately.
2. The sequence of watering can be controlled on a Station-Valve assignment Board by simply moving wires on the board to the desired sequence.
3. The entire board can be divided into 4 quadrants of 10 stations each, and you can make selections of any one of these quadrants, or all of the quadrants, and only these sprinklers will operate. A handy way of dividing the assignments into tees, greens, or a combination of tees and greens, and any combination of fairway valves that you desire.
4. A Syringe cycle button that can operate the individual quadrants or the entire board. The time for syringing can be varied from $2\frac{1}{2}$ minutes to 10 minutes.
5. A station light is installed so you can look at the controller and see which station assignment is operating at any time.
6. A Time multiplier is also added. The time multiplier switch eliminates the necessity of resetting 150 to 250 individual station timers necessary with standard automatic systems. You can increase the entire time schedule on the programmer, or decrease the time by simply turning a lever.
7. You can completely reprogram an entire watering program in minutes. After the initial BINAR watering schedule has been carefully programmed, and changes become necessary because of increased course demands, or course redesign, or perhaps you wish to add an entirely new station or valve, you can make the changes in minutes, and in the case of the addition you simply have to splice in two wires into the existing one out on the course instead of running the wires all the way back to the controller.
8. They have added a remote manual field controller which can be plugged into any zone out on the course to operate the sprinklers where you can see them operating instead of running back to the central programmer.

We find that our BINAR system allowed us to reduce maintenance and installation cost of the system because of fewer wires and field controllers. We have all of our ten programmers back at the maintenance building where they are out of danger from vandalism. You may wonder how ten programmers can do all the watering in twelve hours.

We begin right behind the last players of the evening and follow them around the course. The syringe cycle and the last few valves are operating in the early morning when we arrive. We send out four men to mow greens - to greens #1, 2, 3, and 10. These greens have been syringed before mowing, and then the assignments follow the same order that the men are going to mow. The remaining regular water schedule is also finishing up on holes #9 and 18. These are the last holes that the golfers will be playing regardless of which 9 they tee off on.

Because we water in the fashion we do, we learned one thing - you can reduce the pipe sizes in the original installation because the gpms required are far less than a system where you try to water all greens at one time, or all tees at one time. You also need smaller pumping equipment. Less wire and fewer controllers to do the same or better job of watering - these are all big savings. With the new ideas in BINAR, coupled with the 2-speed sprinklers in our center row fairway system, and the 2-speed sprinklers on the tees and greens, I have the best water distribution and control of any system in the country, and for a lot less money.

Several other features available are - a rain omit switch, telephone control with the new touch tone equipment to control the central programmer. Outside sensing devices, such as moisture sensors, infra red cameras, evaporation reading equipment, information stored in a computer regarding past weather conditions comparable to the present weather, and a host of other things that we as Superintendents may want to add from time to time.

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IMPROVING GOOD TURF

James M. Latham, Jr., Chief Field Agronomist
Milwaukee Sewage Commission, Wis.

Not long ago the program committee for the Wisconsin Golf Turf Symposium met to discuss the 1973 arrangements. The subject will be on thatch and its control. During the discussion one of our group mentioned one important problem he had -- lack of adequate thatch. It seems that his golfers want very fast, close-cut greens, and this prevented his being able to raise the height-of-cut, or - literally - grow a little soil protection. His greens were hard and difficult to manage. This raises the question - "What is good turf, and who is the judge?"

In our zeal to achieve perfection in turf quality, we sometimes go overboard on certain facets of management that actually works against us. At this year's Penn State Conference the remark was made that most people want to get rid of Poa annua when it is healthy, vigorous and in bloom. When it gets sickly and begins to die, however, no stone is left unturned to save it. This is another paradox in turf management and our definitions of "good turf."

Today we have available excellent tools with which to work - - good grass varieties, good fertilizers, good chemicals, and good machinery. Why is it so difficult to put it all together? Probably because we are difficult to satisfy and continually raise our sights to more lofty goals. In so doing we often forget the many interactions in turf management, and overdo one phase to the detriment of others.

Several years ago the trend was to raise the fertility level of soils to produce greener, more vigorous grass. In Florida some greens were receiving 1 lb. N/1,000 sq.ft. 52 weeks a year. In Oklahoma fairways were subjected to 10 to 12# N/1,000 sq.ft. per year. In the North, 6 to 8# N for fairways were not uncommon, and 8 to 10# were put on some greens. This heavy growth caused thatch formation, increased incidence of hard to control diseases, high mowing requirements, and poor golfing conditions.

Then came automated irrigation that was to cure all ills. Few people really understood it, and most overused it. The result was increased compaction,

increased Poa annua, and soggy conditions after an unexpected rain.

The super herbicides arrived about this time to take care of all undesired plant species. The only problem was the deterioration of the desired plants also. Weakened root systems, chemical uptake by trees and shrubs, irrigation water contamination, etc., became other trouble zones.

Today, too much faith is being put into systemic fungicides. They are great materials, but research is already showing that some fungi rapidly become immune to their action when used continually.

Historically, Americans have thrived on inventions, and the latest thing had to be the best thing. As we continually raise turfgrass quality and playing conditions, improvement comes in smaller and smaller increments. Panaceas are harder to come by. Remember when Merion was such a "good" grass? Tests underway indicate that the newer bluegrasses will also have limited resistance to certain diseases as their stands mature.

From a management standpoint, improvement of good turf lies in perfection of our techniques, and the careful utilization of beneficial materials and machinery, both new and old. There is an Eastern Tennessee saying, "You don't trade a sure thing for an I don't know." This is certainly applicable today. Some points to be considered in improvement are:

Will new turfgrass varieties be better than what I have now?

Will different soil mixtures be the answer to better greens?

Can I improve planning to better use the materials now available?

Certainly the last item deserves much more thought by all of us. The following suggestions may help guide our thoughts on evaluation:

1. Develop realistic goals and determine the turf quality attainable.
2. Determine optimum fertility rate and ratio to provide the growth desired. Bear in mind that quality, not quantity production is the basic aim. Remember that there is a difference among golf course soils and whether clippings are removed or not.
3. Re-examine the timing of all operations to see if better arrangements can be made. This is especially true of aeration vs. herbicide applications. Fertilization timing is probably equally important.
4. Bear in mind that most, if not all herbicides have an effect on desirable as well as undesirable plants. Try to find out the effect before use.
5. Adequate irrigation is often easier to provide than adequate drainage. Get a long-range drainage plan set up, determine a priority program and carry it out.
6. Improve your mechanical knowledge and upgrade preventive equipment maintenance to minimize down time.
7. Begin in-service training programs, even on a small scale. Your employees need to know why some operations are necessary, as well as to know how to do them. As golf course maintenance becomes more sophisticated, more individual finesse is required by the entire staff.

This approach will utilize new materials and machinery as well as helping us to make more efficient use of familiar things. It will also encourage more productive effort from the major budget item - labor. Good turf can be improved, through better management of all the resources now available to golf superintendents, through coordination of effort, and cooperation among the people involved.

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IMPROVING TURF EXAMPLES AND EXPERIENCES

Holman M. Griffin, Director, USGA Green Section
Mid-Atlantic Region, Charlottesville, Virginia

One is hard pressed to know where to begin on such a broad topic as improving turf because there are so many ways the task can be accomplished. At the "grassroots" of the problem is improving the plant itself through production of new varieties.

To the best of my knowledge, there are only two full-time turf breeders in the United States, Dr. Funk at Rutgers on cool-season turf, and Dr. Dudek in Florida working on warm-season grasses. Of course, there are other Stations and people involved in turf breeding to one extent or another, but these are the only full-time men.

In the past few years we have seen a great many turf varieites come on the market advertised as a superior grass. Almost all of these strains or varieties are superior in certain particular attributes, but may or may not be as good in others. To be very blunt about the matter, some of the advertisements are ridiculous. You, as I, have probably seen the ad that says minimum maintenance required by infrequent mowing, grows in the hottest weather - yet tolerates below zero temperatures, no insect problems, never needs fertilizer or water. Such was the way Zoysia was described a few years ago.

In reality, we do have a number of improved new turf varieties now on the market and more on the way, but just remember that the best turf variety ever produced is little or no better when poorly maintained than the common varieties when properly maintained.

In the future we will probably be able to select a particular variety for a particular usage much the same as we now select between warm- and cool-season grasses, or bents, bluegrass and fescue for example. We select turf for a particular purpose and the way we manage it from there largely determines its success or failure.

To carry the point further, I doubt anyone in Indiana has a fescut putting green. It would be foolish in Indiana, but under different climatic conditions and different management in Europe, and in the South for overseeding bermuda, fescue is used extensively for putting greens.

What I am saying is, a great deal of turf improvement can be made by selecting the proper variety or improved varieties, but let's not be hasty in changing grasses unless the improvement made is really worthwhile, and perhaps economically practical. Consider what a little more resistance to "jungle rot" or some other specific turf disease is really worth to you, especially if "jungle rot" diseases are not serious in your area. For everything you do you should have a definite

purpose in mind, and weigh the cost against the probable benefits.

Realistically, before you can improve turf, there has to be something wrong with it - something more to be desired from the turf you are growing. You can't solve a problem until you understand it, and even before that you must recognize the problem. A large part of my work as Agronomist for the Green Section, U.S.G.A. is diagnosing and explaining what to do about problems. Drawing on more than eleven years of experience looking at turf, the problems are organized into three categories:

PHYSICAL CONDITIONS AFFECTING TURF

- A. Soil -
 - 1. Water content
 - 2. Air content
 - 3. Water drainage
 - 4. Layering
- B. Temperature
 - 1. Soil
 - 2. Air
- C. Humidity
- D. Light
- E. Circulation
- F. Divots and malicious damage
- G. Surface drainage
- H. Grass blade damage
 - 1. Mowers
 - 2. Traffic
 - 3. Ball pits, etc.

CHEMICAL CONDITIONS AFFECTING TURF

- A. Soil
 - 1. Fertility - level and balance
 - a. Major elements
 - b. Minor elements
 - 2. pH or soil reaction
 - 3. Salt content
- B. Chemical burns or reactions
 - 1. Fertilizer
 - 2. Pesticides
 - 3. Animal excreta
 - 4. Equipment fuels and lubricants

BIOLOGICAL CONDITIONS AFFECTING TURF

- A. Pests
 - 1. Weeds
 - 2. Diseases
 - 3. Insects
 - 4. Nematodes
- B. Cultural and Climatic limitations
 - 1. Seasonal & geographical limits
 - 2. Day length or photoperiod
 - 3. Mowing heights
 - 4. Traffic tolerance
- C. Presence of mat or thatch

CHANGING GOLF GREENS

Holman M. Griffin

Like all sciences, we have made more progress in changing golf greens for the better in the last few years than in all the years since the world began. Golf greens, as golf itself, is a "Johnny Come Lately" by comparison to other scientific projects, but when you consider that playing golf interfered with archery practice in the 1400's, you can't call it new. Most of our progress in changing golf greens has been made in the last ten or twelve years, with some concentrated scientific observations and study of the subject for about twice as long, or say in the last 25 years.

In 1960, the U.S.G.A. published a method for scientifically constructing golf greens, which was a first in the annals of turf history. Since then has come the PURR-WICK System from Purdue, and a similar method from Europe called the CELL SYSTEM. Now, in 1973, the U.S.G.A. is preparing some revisions on their original specifications prepared in 1960 by virtue of studies carried on at Texas A&M University, and Mississippi State University. Penn State and VPI have done extensive research on soil particle movement, as well as moisture retention, and their findings have been most helpful toward putting together an overall picture of how to construct a good putting green.

Unfortunately, there are still a lot of people around in our business that belittle scientific research as a lot of "hog wash." They lend credence to scientific information only when it helps to prove a point they wish to make. They are not encumbered with facts about particle size and hydraulic conductivity, and will expound profusely about their great conquests in building greens by the 1/3, 1/3, 1/3 method, the mud pie method, and the eyeball and feel of the soil texture method, for example. It is surprising how many people will still buy the products of a good medicine show that is here today and gone tomorrow.

The U.S.G.A. and the PURR-WICK methods are not far out scientific prescriptions for golf greens. They are practical, workable procedures.

Since I am more familiar with how the U.S.G.A. Specifications came about, let me tell you that almost all of the principles used in this technique were obtained from golf course superintendents such as yourself. These ideas were then demonstrated and proven to be more or less constant factors by scientific studies, and then assimilated in a logical order for publication of a method as opposed to the method for building greens.

Our concern, "our" meaning the Green Section and men such as Dr. Daniel, - how you build your greens is based on the purest and most objective motives possible. You see our mutual concern is better golf courses, and it doesn't add one penny to our income if you build greens the way we suggest.

Actually, we probably make more of our income trying to help keep turf on greens built by experts who are not bothered by all the scientific "hog wash." (Slide es were shown).

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PURR-WICK GREEN SINCE 1969

William Story, Carmi Country Club
Carmi, Illinois

On August 13, 1969, we started construction on a 4,000 sq.ft. PURR-WICK green, using only our own labor at spare time.

The grade consisted of 4 tiers, each about 18' wide, and each was 6" lower than the above to allow about 3% slope in the surface of the green from back to front. A 4" steel pipe was installed across the edge of each tier to serve as an internal barrier to form a low pool of water. A 1-1/2" slitted plastic drain pipe was installed in each tier with a riser to hold the depth of water at 4".

The sand was then hauled in and dumped at the edge of the green, and spread with a crawler tractor. Sand was spread to a depth of 18" maximum and 12" minimum. We raked in 2 tons of calcined clay and 1 ton of peatmoss into the top 2", compacted and seeded with Penncross bent. We then mulched with wheat straw.

The planting was done on September 4, 1969, and was watered two times each day.

After 8 days we had good coverage and removed the straw. We mowed this green the first time on September 16, and opened it for play on October 10. After three years of play on this green, it seems to perform well. It holds the ball well on well-hit shots.

We feel the PURR-WICK green is better in our area (Southern Illinois) because of less danger of over-water from rains in hot humid weather, less wilt and less disease because of the better drainage.

Anyone building a PURR-WICK green should follow these rules:

1. Keep sand depth as recommended.
2. Use no more than 500 lbs. of peatmoss per 1,000 sq.ft. on surface.
3. Mulch and keep straw damp until after you have good germination.

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GROWTH REGULATORS - FACT OR FANCY

James A. McAfee, Graduate Student
Purdue University

The purpose of this talk is to review the subject of growth regulators in turfgrass. I would like to discuss such topics as uses of growth regulators, problems related to growth regulators, and finally - does great enough a demand exist to warrant the continued research and development of new chemicals to be used as growth regulators in turf.

First, uses of growth regulators in turfgrass. Maleic hydrazide and morphactins used alone, or in combination, can be used to:

1. Retard growth of grasses
2. Control growth of woody vines, shrubs and small trees
3. Some broadleaf weed control, and
4. Inhibit seedhead formation

Morphactin in asphalt solution can be used as a wound dressing for treating cuts or shiners in trees trimmed for shaping or branch removal. Also, Po-San, a combination of maleic hydrazide, plus morphactin, can be used to selectively remove Poa annua from desired grasses. The newer chemicals (growth regulators) being developed are designed to do the same job with greater activity and more safety.

Next, I would like to discuss some of the problems related to growth regulators. Maleic hydrazide most effectively controls growth by killing tips of shoots, which results in unsightliness when viewed closer than 25 ft. Lighter rates can help to reduce the amount of browning. Morphactins usually cause a yellowing of plant tissues (especially grasses). However, the discoloration only lasts for a short period of time. Inhibiting new growth would lead to increase in disease severity. However, more work needs to be conducted to actually determine the relationship between disease and growth inhibitors.

There is some evidence that these inhibitors reduce root growth as well as top growth. This could weaken the plant considerably. Finally, one of the biggest problems of these compounds is improper use. Proper dosages and proper timing are very important in obtaining the desired results. Too many people use the wrong rates and/or apply too early or too late. Either one of these factors will prevent the chemicals from giving the desired results.

Finally, is there really great enough demand to warrant the continued investigation of growth regulators? In all phases of turf management, the trend is to develop products which will reduce maintenance costs, especially labor. Evidence of this trend is the development of riding greens mowers, slow release fertilizers, and herbicidal combinations designed to cut down on number of applications needed to get effective weed control.

In California it has been shown that pruning trees, shrubs, or vines with Maleic Hydrazide in replacing hand-pruning can reduce costs by as much as 80%. Thus, it can be seen that growth regulators properly used offer another tool to aid turf managers in reducing their maintenance costs. Growth regulators offer a means of:

1. Controlling accelerating costs of vegetation maintenance
2. Extending the workload to more conveniently fit labor and machinery available, and
3. To maintain larger volumes of woody ornamental ground cover and shrubs with the same work force.

On turf, even a 50% reduction in clippings for 6 weeks may be adequate. We, in experiments, have repeatedly achieved this.

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FINALLY SEED IN THE BAG

Richard H. Bailey, Turf-Seed, Inc.
Hubbard, Oregon

The comments made are based upon observations made in the seed production area of the Willamette Valley, west of the Cascade Mountains in Oregon. These ideas and concepts have been developed through the years by the astute seed growers in conjunction with researchers from the Oregon State University, U. S. Department of Agriculture, and turf quality conscious seed companies in this unique growing area.

Seed production in the Willamette Valley evolves around the climatic conditions which exists there, mainly that of mild, moist winters and springs, moderately cool early summer temperatures, combined with a unique and dependable weather pattern which is almost always void of measureable rainfall from June through September. This combination allows the development of many grass seed species under ideal conditions, and the natural drying of the mature seed at harvest time. At the present time there are about 200,000 acres of grass seed production in the Willamette Valley, consisting of Colonial bentgrasses, such as Exeter, Astoria and Highland, plus Penncross and Seaside creeping bentgrass. Almost all of the United States' production of ryegrasses have been grown in the Willamette Valley from the common annual, perennials, and more recently the elite new turf-type perennial ryegrass, as well as the tetraploid forage varieties.

Most of the United States' supply of chewings and creeping red fescue is also grown in the Willamette Valley. A significant amount of Kentucky bluegrass has been produced, although the area near Madras and La Grande, also produce a considerable amount of Kentucky bluegrass. The largest concentrated area of Kentucky bluegrass production now, however, probably is the Eastern Washington area from the Snake River through the Palouse country, almost to the Canadian border.

New Developments in Seedbed Preparation

The U.S.D.A. researchers at Oregon State University have done a great deal in developing a method called the "Chemical Fallow System" of chemically cleaning up a seed field prior to planting.

The fields are worked to a finished seedbed in the fall of the year, and chemical, such as Chloro IPC can be applied to virtually kill all germinating seedlings through the winter. In the spring when the soil is dry enough, the growers can then seed elite new varieties in the undisturbed soil by following the drill row with an exacting band of activated charcoal.

After seeding has been completed, once again the entire field is sprayed with a pre-emergent herbicide called Diuron or Karmex, which insures the elimination of all new germinating seedlings from the spring, except in the row that is protected by the charcoal band. This establishes a field which is virtually free of all contamination.

After establishment, the fields are never again cultivated, and all elimination of contamination is done with spring and fall applied chemicals. The results from this method of crop establishment have been phenomenal. The quality of the seed is virtually free of contamination. During the spring and summer the seed fields can be sprayed with an appropriate herbicide, insecticide and fungicide to control any additional unwanted pests. The bluegrasses, for instance, are treated with rust preventative compounds which aid in the harvest of good yields. The

late maturing turf-type perennial ryegrasses are also treated for rust invasion. Irrigation is also necessary on late maturing varieties of bluegrass, bentgrass and perennial ryegrass.

New innovations in harvesting methods have been developed to aid in the speedy harvest of the Willamette Valley seed crops. In all, there are more than 200 individual seed cleaning plants that specialize in grass seed.

After Harvest Sanitation Problems

In the Willamette Valley, under the high moisture conditions which exist from October to June, various plant diseases can raise havoc with seed production. One primary problem is ergot, and another is blind seed disease. If left unchecked, these two diseases alone can limit seed production in the area.

Field burning has been a useful tool to break the life cycles of these two bothersome diseases, as well as eliminate other diseases and insects, as well as weedy grass problems.

Because of the emphasis on air pollution and the modern thinking of far-sighted environmentalists, the Willamette Valley is faced with losing the open field burning sanitation method as we now know it today. A great deal of time, effort and money has been spent by such organizations as the Oregon Seed Council, to develop alternate methods of field sanitation. The primary approach hereon will be to remove the residue after harvest and sanitize the remaining stubble with controlled field burners, which will combine air and auxiliary fuel in such a way as to eliminate the remaining crop residue in an efficient method, emitting a minimal amount of polluting smoke, and yet more scientifically controlling the solid temperatures so as to eliminate the disease organisms and bothersome insects which must be controlled if the Willamette growers are to continue in the seed business.

Plant stimulation is another benefit from field burning which insures a maximum yield the following year. The question then arises as to what should be done or could be done with the remaining crop residue prior to field burning with a field sanitizer.

Great potential exists today which did not exist three years ago for this crop residue. One is the use of the straw for animal feed in the form of briquets, pellets and cubes. Another is the manufacturing of paper, and the third is the development of extruded or pressed items like wallboard, molding, etc. High quality corrugated cardboard can be made from grass straw residue also. New industries are now developing in Oregon and the Northwest through the utilization of this once incinerated agriculture by-product. Ten years from now thousands of Oregonians will derive a livelihood from this new potential industry.

New Varieties on the Horizon

Turf breeders from Europe and the consumption areas of the United States are busy developing exciting new turf varieties which are specifically adapted for their general areas of consumption. Examples of this new change in seed production are Kentucky bluegrass varieties like Sodco, from Dr. Bill Daniel at Purdue University; Bonnie Blue, Galaxy and many other new varieties from Dr. C. Reed Funk at Rutgers; and Pennstar from Dr. Duich of Penn State. The University of Rhode Island and Virginia Polytechnic Institute are also releasing bluegrass varieties, as well. The commercial efforts from companies like O. M. Scotts, with their new Victa Kentucky bluegrass, Vaughan-Jacklin Corporation's Fylking, Loft Seed Company's Baron, and Seaboard's Sydsport, are all now working their respective ways into the expanding specialized bluegrass markets.

The horizon is well dotted with exciting new varieties from every direction, many of which will find a market, and many others will probably fade into the blue because of promotion problems, or production problems, or unforeseen disease problems which will undoubtedly separate the wheat from the chaff.

Now, and in the very near future, seed customers like golf course architects and superintendents, sod growers, parks and recreation turf managers, will be able to pick and choose specific varieties and species which will do most everything from a desirable turf utilization standpoint. Golf courses, for instance, will now be able to utilize various color degrees throughout the course with different bluegrass varieties that will add color emphasis from fairways to greens, to tees and cart path areas. Collars and aprons can now be different shades of green from that of the fairways. Cart path flare areas and concentrated traffic areas between greens and tees can now have beautiful dark green grass growing where none would grow before, because of the introduction of new elite turf-type perennial ryegrasses like Manhattan and Pennfine.

Athletic fields can now be maintained under a high degree of turf cover because of the new persistent varieties which have just recently been developed. Putting surfaces will be improved because of the development of new disease resistant creeping bentgrass varieties which are now on the rise in areas of the Midwest making great contributions to this field, such as the work being conducted by Kansas State, Pennsylvania State, and the University of California, not to mention the many new varieties from Europe as well.

Future For Turf Seeds is Bright---Green

There are promising new turf varieties in virtually every category or major species being presently utilized by the turf trade today. As turf seed users, you will be able to purchase at probably moderately higher prices new and elite, and certainly genetically improved bluegrasses, bentgrasses, fine fescues, ryegrasses, and even tall fescue. Each variety has its own unique characteristics, and unfortunately there isn't time nor space to list them all here.

Work with a reputable seed dealer and demand from him the information that you require for your own specific turf seed problem.

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MERCHANDISING NEWER GRASS PRODUCTION

Richard H. Bailey

My comments regarding merchandising newer grass varieties used specifically for athletic fields and sod production are based primarily on my experience in the production of turf-type perennial ryegrass varieties, and primarily the variety Manhattan as compared with the existing varieties of perennial ryegrass, such as Linn and some of the new elite types like Game and Pennfine.

Through the years I have been primarily engaged in the development of Manhattan perennial ryegrass from its beginning at Rutgers University. My association with this variety goes back to 1965, as I have been involved in the initial seed production evaluation of the variety prior to the time it was released by Rutgers University, and have been instrumental in the formation of the Manhattan ryegrass Growers Association. Quality seed production has been the goal of this

group, and the development of a classification called Triple 0, or Zero-Zero-Zero, has evolved from this group specifically for the marketing of Certified Manhattan. 0-0-0 denotes quality of zero percent other crop seeds, zero percent weed seed, and zero percent fluorescence.

The variety has in its pure form, a zero percent fluorescence. The fluorescence factor in germination indicates the presence of annual types or hybridization from other perennials that carry this fluorescence gene; therefore, pure Oregon Manhattan, which has zero fluorescence, based upon Oregon State University Seed Laboratory germination test, is the purest form of the variety. I can report that 92% of the certified seed marketed by the Association from the 1972 crop is zero percent fluorescence.

This is a useful tool in determining contamination, and when a percentage of fluorescence does show up, it means that there may be annual ryegrass somewhere in the lot. Needless to say, annual ryegrass in a turf mixture will not perform in a beneficial manner, and it will detract from the appearance of the variety. Therefore, any seed purchased which contains a percentage of fluorescence in excess of 2% should not be considered as true or pure Manhattan. Any uncertified Manhattan which contains a percentage of 5% or more probably is not Manhattan. Varieties, such as Linn, carry an inherent 5% fluorescence, and some unscrupulous growers have been known to substitute this variety for Manhattan because of the variance in price.

Winter Hardiness

Test data from across the country indicate that Manhattan has superior winter hardiness over most other varieties. It ranks No. 2 behind Norlea for winter hardiness in Northern Michigan. Recent data from Rutgers University ranks Manhattan first in winter survival with a score of 91% survival. Its nearest competitor, Pennfine, ranked second with a score of 54% winter survival and all other entries in the test were significantly poor. The variety, Linn, ranked tenth, with a winter survival of only 3%. Therefore, if a purchaser buys what he thinks is non-certified Manhattan and it turns out to be Linn perennial ryegrass, he may be in for a rude awakening come spring.

Many factors influence winter survival, one being snow cover, or the lack thereof; disease resistance, or susceptibility certainly is another major contributing factor to winter survival. After a disease invasion has taken place, another important factor is recovery, and generally speaking, Manhattan has the ability to recover from most of the major disease invasions^{such} as Coriticism red thread, which all perennial varieties appear to be susceptible to; Helminthosporium leafspot, winter leaf blight, and in some cases strains of Pythium and Fusarium patch. Generally speaking then, most of the improved turf-type perennial ryegrasses are in one way or another susceptible to most of these major turf diseases. The real proof of genetic superiority is limited resistance and its recoverability after invasion. Generally Manhattan rates quite high in its ability to recover.

Ryegrasses in Mixtures

Turf experts across the country are finally revising their thinking and recommending the new turf-type perennial ryegrasses in mixtures with the improved Kentucky bluegrasses for general turf uses, and certainly for athletic fields. This, I feel, is an important step towards the utilization of more of the new elite turf-type perennial ryegrasses, namely, Manhattan, Pennfine and NK 200. These I feel are the primary improved varieties which are available on the market today. Others will be coming on the scene, and local turf experts and seedsmen will be in a position to make specific recommendations.

RESEARCH IN BLUEGRASS---MOVING AHEAD

Richard H. Bailey

Looking ahead into the future it is not difficult to foresee certain problems which will tend to make it more difficult to produce quality, disease-free seed, especially of the bluegrass species from the production areas of the West, mainly Oregon and Washington. These problems manifest themselves because of the apparent future ban on field burning which will ultimately make it more difficult to produce a quality seed at respectable prices.

A great deal of research is presently being conducted regarding the utilization of straw residue and proper incineration of bluegrass seed fields by the utilization or sophisticated field sanitizers machines. Gradually, modern technology is developing units which will satisfactorily substitute for the present day open field burning. In Oregon, 1975 is the deadline, by prior laws, beyond which open field burning will no longer be tolerated. The problems this presents are many, and one which is very apparent is that of ergot in Kentucky bluegrass seed. This disease, when left unchecked by field sanitation or incineration, raises havoc with seed production, and primarily with the new elite hybrid selections now being increased.

Varieties like Sodco, Galaxy, Brunswick, Bonnie Blue and Merion could certainly be affected by this disease if burning stops. In the event that lower quality seed is produced, because of ergot, the seed trade must change its present criteria for mechanical purity. Germination on lots of seed will undoubtedly be lower, perhaps somewhat in the 60 to 70% classification, and the seed trade must consider this problem in the future.

Blends May Be The Answer

Experience tells us that seed production of the new elite bluegrass varieties in the Willamette Valley fluctuate considerably from a standpoint of yield per acre and germination of the seed produced. If the Willamette Valley is to stay in production of these new varieties, a different method of production must develop.

Blends of bluegrass varieties which are compatible with one another will certainly aid in the marketing of this seed. Most turf experts from across the country will agree that blends of bluegrass varieties which are compatible most certainly will produce the most pliable turf for the longest period of time. It is, therefore, consistent from a production standpoint and a utilization standpoint that blends be developed and fostered.

Climatic Conditions Designate Seed Production Areas

If the lack of field burning presents such a problem to the existing production areas from a disease standpoint, it seems logical to shift seed production to warmer, drier areas, such as Southern Idaho and Eastern Oregon. The problem apparently can't be solved so simply because the higher summer temperatures in these drier areas tend to limit the seed production per acre, thus making it economically non-feasible. Most of the new improved selections and hybrid types apparently are later in maturity, and the hot dry winds in late June and July simply devastate these crops. Generally speaking, most of the new elite bluegrass varieties presently under development, and/or production, tend to be low yielders. There is a direct correlation between turf quality and seed production capacity.

Varieties which do not become stemmy in May and June generally are poor seed producers, but varieties which are good seed producers generally are quite stemmy

under turf conditions in May and June. This concept leaves one to predict that improved turf varieties probably will be more expensive in the future because of their inability to produce maximum yields per acre. These hybrid varieties now under production tend to be extremely erratic relative to yield per acre. Perhaps production techniques will be derived whereby yield is more uniform - but this is not the case in the seed production areas of the West today.

Summary

In summary, the future of the seed production of specialized bluegrass varieties in the West depends upon the development of a feasible mobile field burning unit which will sanitize the field and remove the remaining crop residue.

Blends of the new elite types, with some of the compatible less expensive standard varieties, may be feasible in order to stretch limited supplies of the new elite varieties, as well as to minimize germination problems.

Shifting the seed production areas probably is not feasible because of higher summer temperatures encountered during the seed filling time.

Blends of the new elite varieties will tend to give better long-term turf performance, as well as minimizing the potential germination problems.

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OBSOLESCENCE IN EQUIPMENT

Robert G. Johnson, Illinois Lawn Equipment Company
Orland Park, Illinois

I remember, many years ago, when I was a young lad and an automobile mechanic, I bought parts at a Ford Dealership and read a large sign on the wall that showed a Model A Ford with the caption below - There has never been a mechanical device built that provided as great an after purchase market as the Ford Motor Car. I did not understand what was meant by this at the time; in fact, it took a few years of being in the automobile business to really understand.

Then some ten years later, I was employed by Ford Motor Company in their Aircraft Engines Division, and ran into the same Model A Ford picture with a different caption below - If it were not for engineering changes this would be today's latest model by Ford. Actually both thoughts go along in the same direction even though they may not seem to at first glance, that is, from the manufacturer's viewpoint.

If you want to keep your 1960 Putting Green Mowers for 15 years, and we have many that do, you will put parts into them yearly - even beyond the value of the mower. The manufacturer then feels that there is no need to put any capital into Research and Development, or new engineering as it is called in layman's terms. Why should he when he is not losing sales because of obsolete design! He may work on the product yearly to remove bugs, and perhaps to make it easier to produce so that he can fight higher wages, but there will be no steps taken to save money at the user's end.

This trend has been broken in recent years by the largest manufacturers of turfgrass maintenance equipment when they introduced the triplex riding greens mower. The pressure in this great breakthrough in labor saving for golf courses,

the greatest in history, did not come from the golf courses themselves, or from the manufacturers either, but came from a knowledgeable old line eastern distributor.

The manufacturer was satisfied with 80% of the greens mower business in the world, as well he might be. The user in the Midwest, formerly the market trend setter, was more concerned with saving the club money on new equipment. Therefore, obsolete equipment was perfectly acceptable to all except a very few forward looking individuals who awakened the whole industry to new concepts and new competition for the benefit of the golf courses.

Yes, I know what you are thinking, you could not possibly have a budget to keep up with all the new things that come on the market. I agree if you maintain the same budget for labor that you did in 1960, or at least the same number of employees. Any new piece of equipment must either do a job better than the piece that it replaces so as to have better turf with less maintenance, or faster than the last piece so as to have less labor cost. The man or club that perpetuates obsolete equipment does not help himself or the entire industry. He remains in the "Armstrong" Starter Age, or at best the Electric Starter Age. Both are a long way from the Jet Age that we are living in, and the Wankel Age that we are faced with tomorrow.

There is positive progress, however. I would like to quote from a report written by a young superintendent who has been a superintendent only fourteen months, and at this particular club only four months:

Maintenance: "The biggest damage concerning fairway units is due to driving over gravel or blacktop roadways. This creates excessive bouncing in the gear boxes and causes rollers to loosen. When the rollers develop 'play' due to loosening, they stop cutting smoothly and need to be disassembled and tightened. With the F-20 the mowing units would be above ground during transport, which would minimize damage. This would lengthen the life of the units by 2 to 3 years.

In dollars this could mean as much as \$ 300 a year in depreciation, and as much as \$ 200 a year in relation to maintenance parts and labor.

Labor: The biggest point is that one man can cut the fairways in 5 hours, while the conventional tractor method takes 7 hours. Figuring a minimum of 4 times a week at the season of 26 weeks, this shows us a savings of 208 man hours. In dollars - approximately \$ 600 a season.

The savings really adds up when we consider not only the better performance, but the maintenance to the equipment and the extended life of the machine. In dollars these advantages would save us approximately \$ 1,000 a year."

People like this who recognize the fact that methods become obsolete, and equipment has to be devised to update the procedures will be instrumental in eliminating OBSOLESCENCE IN EQUIPMENT.

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LIME AND DISEASES - SOME COMMENTS

Wm. E. Lyons, Sr., Lyons Den
Canal Fulton, Ohio

A healthy, vigorously growing plant has a more optimum chance of survival against diseases than one growing in a medium that is out of balance. That Dean of football coaches, the late Vince Lombardi, would always have his team go back to basics on Tuesday after a game in which they looked shabby to him. Taking a tip from Vince, maybe we should look at basics before trouble strikes. Perhaps a checklist of LIMITING FACTORS would be a good guideline.

The manufacturers, sales and service people in the fungicide business have done a tremendous job. To be able to do a more effective job of advising us (before trouble strikes) they, too, would want to know the LIMITING FACTORS.

High on the list of LIMITING FACTORS is, "What's the pH?" It can tell us many things. I can also catch us napping unless we get all the facts. The charts listed at the end of this talk are a condensed version of the study that took two years of midnight oil to assemble.

The symbol pH is used to express the hydrogen ion concentration of a soil solution. As you know, 0 to 7 expresses acidity, and 7 to 14 alkalinity. That is all it does. It does not tell us the measurable presence of calcium and magnesium in the soil.

Calcium and magnesium in themselves cannot change the pH. The change is made by:

- The oxides as in hydrated lime
- The carbonated as in finely ground limestones
- The silicates found in abundance in agrislag.

Calcium sulphate as gypsum does not change soil pH. It is used to flocculate a heavy or tight soil.

Magnesium sulphate (epsom salts) will not change pH. As the pH goes up, the intake of magnesium slows down. Magnesium in limestone is very hard. At pH 7.5 to 8.6, turf may begin to yellow. To overcome this LIMITING FACTOR, broadcast 5 lbs. per 1,000 sq.ft. of epsom salts. Magnesium is found at the center of each chlorophyll molecule. We owe much of the green beauty in nature to this element. (Apply epsom salts dry and irrigate. There will be no damage to turf).

Recommended reading includes, "The Soil and the Microbe," by Wakesman and Starkey. Their work shows the pH below 6.8 favors fungi. Above 6.8 favors the beneficial bacteria. Slime molds in the rootzone, so often overlooked, are most active below pH 6.8.

From the book, "Soil Conditions and Plant Growth," by Russell, one can learn much about the SOIL SOLUTION. So., why don't more turf managers use this method of feeding? It has worked very well for us for over 25 years - at a much lower cost, too. Professor Russell states that each time water passes through the rootzone, there must be enough free calcium and magnesium to bathe the roots in a weak alkaline to neutral solution.

A general rule is, that for each 1" of water passing through the soil - 1 lb. of liming material per 1,000 sq.ft. is lost. That is why Colin Smith

would always apply 25 lbs. of superfine lime per 1,000 sq.ft. to his green every spring. Those greens were always tops in the area.

Once we had a disease that no known fungicide at that time would control. We drove 500 miles in one day to Michigan State, William Klomprens gave us a helping hand. I decided on the way home to test the soil. The pH was very low and both calcium and magnesium were low. 100 lbs. of Superfine Dolomite lime per 1,000 sq.ft. - in 100° weather - watered in was the cure - almost over night.

The late K. B. "Doc" Crandall, owner of Cherry Ridge C.C. at Elyria, Ohio, awoke one Saturday morning to 10 dead greens. His panic button rang in my shop 75 miles away. Using methods taught us by the late Geo. N. Hoffer, we found a surface pH lower than a Purdue test kit would register. Then each $\frac{1}{2}$ " downward the pH decreased in acidity until, at the 6" level, it was near 6.8. That Saturday afternoon ample lime was applied (Superfine Dolomite), the first time golfers played on white greens - no turf. By the following Wednesday, 5 days later, mowing started. No seed was applied.

From Victor Tiedjens, then of VPI, we learned to look closely at plant response to lime. In a well calculated experiment, asparagus showed no response to 1 to 5 tons of lime per acre. At the far end of that field the farmer drove back and forth over the same area to empty out his lime drill. No one ever knew the total amount accidentally dropped. Yet, that was the only place where response was adequate. This illustrates the buffer capacity of some soils. Did you ever try to raise the pH of a muck soil?

Mr. E. B. Steiniger has been Superintendent of Pine Valley C.C., Clementon, N. J. for 50 years. This is an internationally famous course. It is built on acid sands. Each Spring "Eb" applies 100 lbs. of Superfine Lime per 1,000 sq.ft., plus 200 lbs. of Gypsum - this drives the lime through the tight acid sand.

The 14th green at Firestone C.C. had a good pH. It was a tight, black soil scooped up from a swamp, low in calcium and magnesium. In 1949, Victor Tiedjens suggested a random pattern of liming from 25 to 300 lbs. of Superfine Dolomite lime per 1,000 sq.ft. This we did and lightly watered to prevent blowing. That night a mid-summer downpour spread the lime over the whole green. It is still good.

Few are left in our midst who remember the war years when fungicides were in very short supply. Those old timers used to apply 1 to 2 lbs. of hydrated lime as a dust late in the evening. This is still a good practice if algae is a problem, as it can be, in wet, humid years on tight soils.

Prior to 1930 turf managers had no research to turn to. Just trial and error. They referred to summer liming as "sweet-sour." Maybe they had something we have overlooked.

The book says that greens grow best at pH 6.0 to 6.5. But, don't tell the plants that. Many managers have excellent putting surfaces on soils or mixtures with pH as high as 8.6. Their know-how, perhaps. Maybe they know that the higher the pH the faster nitrogen will release and more into the plant. Extreme caution is also used in stepping on the nitrogen accelerator during the heat stress.

After an unnecessary application of 800#/A of an organic fertilizer that let go on a hot Saturday afternoon prior to a big tournament, the course was saved by applying a ton of Superfine Dolomite per acre, at night, and washed in.

Experimenting with AGRISLAG (A Dolomite-byproduct from the steel mills), while at Yoder Brothers Greenhouses, Barberton, Ohio - Victor Tiedjens found that the trace elements for plant growth were of more value than the cost of the material, plus the fact that ton for ton AGRISLAG has neutralizing power from calcium and magnesium silicate equal to raw limestone. The Ohio Research Center had a bulletin on this.

Where heavy applications of AGRISLAG were used on wheat prior to bluegrass 20 years ago at the Lyons Den, there is a marked difference in turf quality and population. No question that dollar for dollar one will get better bluegrass using AGRISLAG as a source of material to correct soil acidity in fairways.

Someone started the "over-lime scare" many years ago. Rightly so if they used as much hydrated lime when Superfine ground limestone was recommended. Experimental work, in controlled alkaline conditions, show the main roots will harden at the surface. The crust will become so hard that the fine feeder root hairs could not break through the calcified walls. From a second-hand book dealer try to get a copy of "Roots of Plants" by Weaver - now out of print - it is worth \$ 25.00.

Driving a dusty limestone side road, a couple of counties north of Lafayette in the early fall, Geo. N. Hoffer skidded the old Buick to a halt in a cloud of limestone dust beside a field of soybeans. "Look how green the beans are in the east side of the road," said George rather proudly. Then from his pocket he came up with simple testing equipment that showed the green beans had ample magnesium from the lime dust. The beans on the other side of road, away from the prevailing wind, were yellow and were losing their leaves prematurely - a lower yield - lack of magnesium.

Dr. Melsted, Agronomy Department, University of Illinois, developed test papers for me that would show high and low levels of magnesium in plant juices. He suggested a maximum of 50 ppm.

George Hoffer was keenly interested in our simple work with epsom salts. He told me of a case in Kentucky where he was called in to analyze a pasture problem. This was related to a breeding problem with horses. He suggested 300# of epsom salts per acre to start; then 200# per acre annually. The problem was solved.

New greens at Lyons Den, 1972, were hastened to playability - 5# of epsom salts per 1,000 sq.ft., plus a few ounces of a chelated iron. The PGM greens bases will never have to have lime added to the soil. Sand particles are high in calcitic limestone chips. Roots are found growing in the gravel blanket all summer.

An extremely high pH was measured at OSU course in early 50's. Water for irrigation was pumped from an old limestone quarry. Either pythium (practically unheard of then), or too fast release of nitrogen resulted in a "golden-brown" set of greens. Diluting soil samples 4 times and testing with a Purdue kit, the samples were still above the readable range. The stress of summer heat took care of their mowing problems.

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CHARTS - WILLIAM E. LYONS

Lyons Den, Canal Fulton, Ohio

Chart 1

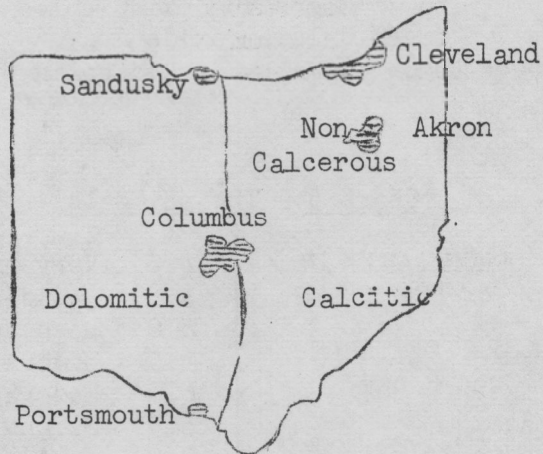
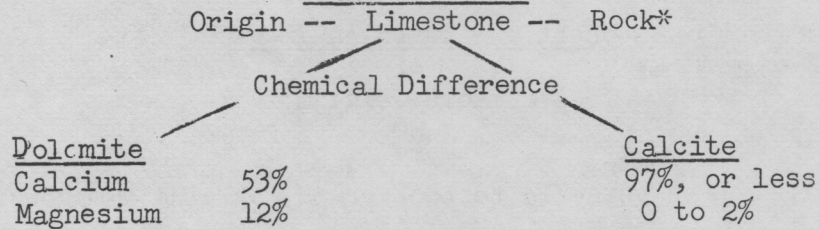


Chart 2 - Lime



*% variable with different stratas of limestone rock.

Chart 3 - Lime

<u>Grades</u>	<u>Action</u>
L. Screening	Extremely slow
L. Meal	Slow
Agri-Ground L	Gradual
Super-fine	Immediate
Hydrated	Extremely fast
Agri-slag	Variable

Chart 4 - AGRI-SLAG

Origin Dolomite Lime
Variable analyses

6 to 8% Calcium silicate (silicate ion produces weak acid)
5 to 7% Magnesium oxide
45 to 48% Calcium oxide
+ Trace elements picked up in purification of iron ore.

Chart 5 - The pH Scale

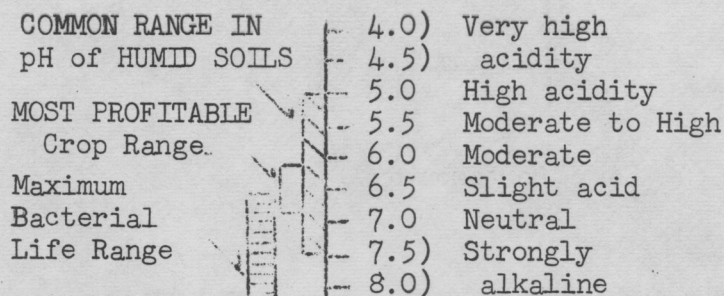


Chart 6 - Is pH An Index of Available Calcium? NO

Have soils tested for pH, calcium & magnesium

Chart 7 - Calcium in Soils

Chemical Effect

1. Neutralizes acid soils
2. Liberates excesses of HYDROGEN and ALUMINUM that have fixed plant food in acid soils.
3. Increase root growth
4. Increases bacterial life 6.5 to 7.5
5. Aids decomposition of organics
6. Mobilizes nitrogen & phosphorus

High Calcium Soil
produces
PROTEINACEOUS VEG.

Low Calcium Soil
produces
CARBONACEOUS VEG.

Chart 8 - Calcium a Catalysis
Low available calcium

pH 5.0 to 6.0 P_2O_5 Iron
Aluminum Phosphate

Medium Calcium

pH 6.5 Phosphorus as calcium phosphate
Both calcium & phosphorus is readily available
Below 6.5 phosphate ion unstable

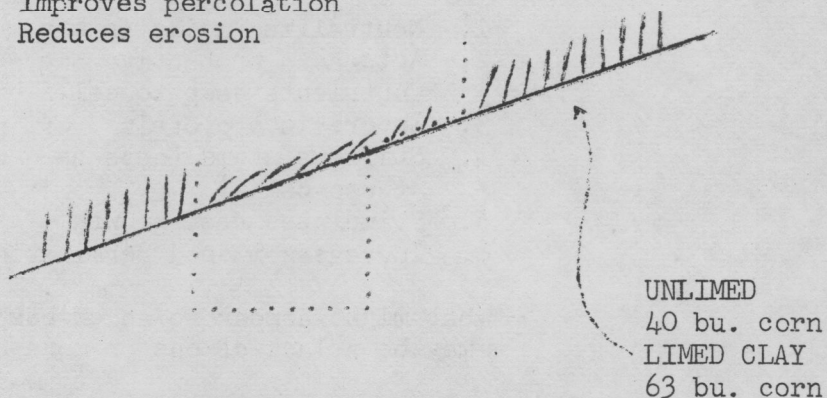
VERY HIGH CALCIUM

pH 7.5 & up - P_2O_5 intake slow
Many minor element deficiencies usually show at
this level - Mn, Fe, B., etc.

Chart 9 - Physical Effect of Lime*

FLOCCULATION

Loosens heavy soil
Improves percolation
Reduces erosion



GYPSUM -- CALCIUM -- SULPHATE

*Flocculates calcium without changing
pH. Makes subsoil porous. Aids
drainage, plus water storage.

Chart 10

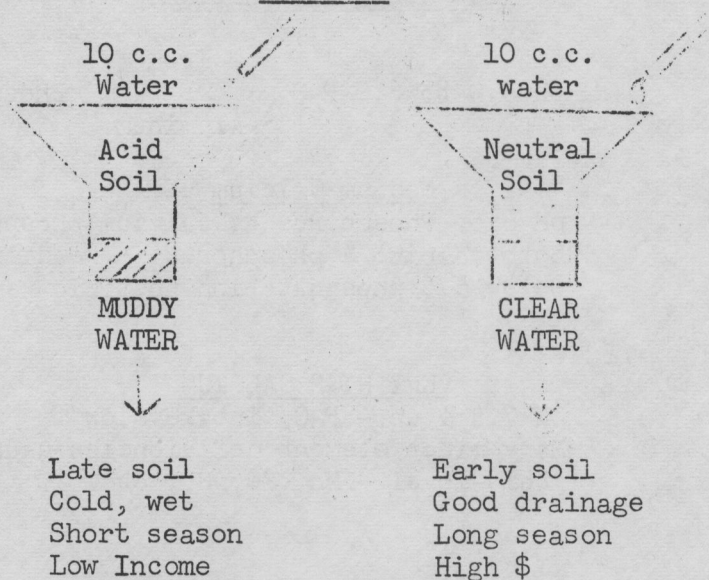


Chart 11 - Calcium in Plants

1. Neutralizes acids in sap
2. Acts as a protective sieve thru which nutrients seep to cells
3. Enters into proteins
4. Stiffens stems (acts as a cement between cells)
5. Stimulates root growth
6. Increases % seed germination

What might appear to an excess of calcium
may be a lack of one or more other elements

Chart 12 - Magnesium in Soils

1. Acts with calcium as a neutralizing agent
2. Readily leached from light sandy soils

* Most of east half of Ohio deficient in
magnesium

Chart 13 - Magnesium in Plants

1. Key element in Chlorophyll
2. Combines with phosphate (moves as magnesium phosphate)
3. Not readily stored in stems or roots

Found in foliage and seeds.

Chart 14 - Magnesium + Fertilizer

Farm No.	CROP	m	5-10-10 plus 200-epsom salts
1	Potatoes		2500 35%
2	"		2500 46%
3	"		2500 23%
4	Corn (grain)		1500 3%
5	Corn (silage)		1500 68%
6	Carrots		2500 23%
7	Grass		1000 7-7-7 + 200 15% to 59%

EPSOM SALT - Sul-po-Mag.
2% mg-oxide

Chart 15
Fertilizer --- Dry and in Water
Tomato production with

1000 lbs. dry	400 lbs. Dry	400 lbs. in water
5-10-10	4-12-4	4-12-4
9.0 tons	3.0 tons	9.3 tons
Defoliated	Defoliated	Full foliage
RYE	RYE	RYE
4"	4"	12"

Chart 16
Variation in Composition of
Kentucky Bluegrass

<u>Locality</u>	<u>Nitrogen</u>	<u>Calcium</u>	<u>Phos.</u>	<u>Potash</u>	<u>Ash</u>
Lexington, Ky.	1.91	.295	.373	2.15	7.08
Wooster, Ohio	1.77	.229	.272	2.09	6.22
% Difference	.14	.066	.101	.06	0.76

Lexington: High calcium & P₂O₅
Wooster: Low calcium & P₂O₅

PROPER USE OF SYSTEMIC FUNGICIDES

Dr. J. M. Vargas, Jr., Dept. Botany & Plant Pathology
Michigan State University, E. Lansing, Mich.

Systemic fungicides offer great hope for future turfgrass disease control. The systemic fungicides differ from their older counterparts, the contact or surface fungicides, in that they are absorbed by the plant. Once inside they can be translocated or redistributed to other parts of the grass plant to prevent infection. The contact or surface fungicides, on the other hand, were sprayed onto the plant surface and remained external.

While the word systemic implies translocation throughout the plant, the systemic fungicides are mainly systemic from the roots up to the foliage and not in the other direction. Therefore, to get the maximum benefit from the systemics they must be applied properly. Proper application involves getting the fungicide down to the root system where the roots can absorb the fungicide and translocate it up to the foliage. Failure to do this will result in loss of one of the attributes of the systemic fungicides, their residual control.

In turf, where the grass plant is mowed constantly, if we only apply systemic fungicide to the plant surface we will mow off most of the protection with the first cutting. On the other hand, if the systemic fungicide is drenched into the rootzone or applied with liberal amounts of water, the roots will continue to take up the fungicide and redistribute it to the new foliage which appears after mowing. Four to six weeks control of Sclerotinia Dollarspot can be obtained with the systemic fungicides when they are applied properly.

Systemic fungicides are the only means of controlling stripe smut. This is because stripe smut is a systemic disease and consequently can only be controlled by a systemic fungicide. To be effective the systemic fungicides must be drenched down into the rootzone.

Fusarium blight

Two systemic fungicides, Tersan 1991 and Topsin-M, are the only commercially available chemicals which will control Fusarium. However, this is due to the fact that they are excellent nematicides in addition to being fungicides. Drenching these fungicides into the rootzone is necessary so they will be in the soil where the nematodes are, and so the grass roots can take up some of the fungicide and prohibit the nematodes from feeding.

The systemic fungicides are not without their problems. The biggest shortcoming may be rapid development of strains of fungi which are resistant to one or more of the systemic fungicides. This has occurred in the case of powdery mildew and dollarspot. The second major problem is the inability of the systemic fungicides to control the Helminthosporium diseases. The exclusive use of the systemic fungicides on the golf course greens for the control of dollarspot and brownpatch will lead to severe problem with Helminthosporium.

These problems can be overcome in most cases. You can avoid resistant strains by alternating applications of a systemic fungicide with a good contact fungicide. This should help prevent the development of a resistant strain of either dollarspot or brownpatch. By properly arranging your spray schedule, so the application of the contact fungicide occurs when you have your worst outbreak of brownpatch, you can obtain even more effective control of this disease.

FUSARIUM BLIGHT

Dr. J. M. Vargas, Jr.

The disease Fusarium blight was first described on the East Coast about 15 years ago. It has been an important disease in the Midwest for less than 10 years. The disease is characterized by circles 1/2 to 2 ft. in diameter, which have dead and/or stunted grass in the outer circumference, and healthy appearing grass in the center. These circles have been called "frog eyes" because of their appearance. The grass in the center of these spots is not really healthy either, but has not been as severely affected as the grass in the outer circle. All grass plants in these circles have the characteristic^{of a} poorly developed root system, with roots no longer than an inch in length.

The disease Fusarium blight was originally attributed to the fungi Fusarium roseum and Fusarium tricinctum. Our data indicates that the disease is actually an interaction between the nematode Tylenchorhynchus dubius, and either the fungus F. roseum, or F. tricinctum. The nematode T. dubius also appears to be the dominant pathogen in this interaction since it alone accounts for the stunting of the top growth and root systems of the plant. It appears that the nematodes feed on the grass plant, weaken it, and change its physiology, and then, under conditions of high temperature and humidity, the predisposed plant can be attacked by Fusarium.

There are some environmental factors which also affect the development of Fusarium blight. Because these grass plants have poorly developed root systems, they are extremely susceptible to drought. Turf areas with Fusarium blight require more frequent watering than healthy turf areas. Grass plants growing on compacted soil are more susceptible to Fusarium blight than those grown in well-drained soils.

Fusarium blight can be controlled culturally by not allowing the top inch of soil to dry out, and by syringing the infected turf during periods of extremely hot weather. The only chemical controls currently available for the control of Fusarium blight are Tersan 1991 and Topsin-M. To obtain control with Tersan 1991 or Topsin-M they must be drenched down into the root system immediately after application before they dry on the foliage. It is also a good idea to water the infected turf area the night before to insure good penetration of the fungicide.

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DISEASE AND WEATHER OBSERVATIONS

Louis E. Miller, Supt., Louisville Country Club
Louisville, Ky.

One of the most prevalent problems in growing bentgrass fairways in the Louisville area of the Ohio Valley is disease. Over the past six years a careful study has been made, and a very definite pattern has developed that coincides greatly with the weather.

I would like to cover diseases in five separate categories, the same way we treat them with regard to control. The weather plays a direct part with respect to the amount of rainfall, approximately 48 inches yearly, daytime and

night-time temperatures, and humidity.

Helminthosporium leafspot is the first disease that we have to contend with. The cool wet weather of spring is the influencing factor, with the emphasis on wetness. We have found that we can expect an infestation of leafspot from April 19 to May 22, and it will usually persist to some extent until sprayed the third time. To control leafspot, we have gone almost exclusively to Dupont LSR and Zineb 75%. Zineb is considerably cheaper and is a fairly good fungicide if the disease is sprayed early enough, at a rate of 6 lbs. per acre. DuPont LSR applied at a rate of 5 lbs. per acre is a more effective fungicide and will control the disease quite readily. The leafspot is eliminated by the third week of May, and the grass plant is in a very healthy condition to start the summer.

Dollarspot is almost non-existent and is really no problem at all. If it does break out, it is usually from the third week of May to the first week of June. Usually one application of liquid cadmium chloride at the rate of 20 ozs. per acre and 8 lbs. Urea 45% per acre will eliminate the disease.

After six years of observation we can count on an infestation of brownpatch between June 8 and June 19. Brownpatch is usually easy to control, but if left unchecked will run rampant. The backbone of our control program is Thiram at the rate of 5 lbs. per acre, plus PMAS at 20 ozs. per acre. If the infestation seems particularly heavy the PMAS is increased to 25 ozs. per acre. The hotter the temperature the heavier the disease. This also holds true for the fungicide. The hotter the temperature, the more effective the PMAS. I have yet to see an infestation of brownpatch that could not be controlled with PMAS and Thiram that is allowed to remain on the turf for at least eight hours. This is giving consideration to rainfall and necessary irrigation. We have and do use quite readily systemic fungicides. It is too expensive to use them for the control of brownpatch alone.

Pythium blight is probably one of the worst and most prevalent diseases that we encounter during the season. I have seen pythium as early as June 8, and as late as September 25. All dates inbetween are fair game. When the day-time temperatures are above 85, and the night-time temperature 69 or higher, with the humidity 65% or better, you can count on pythium. It is easily diagnosed as the mycelia is prevalent in the early morning with the telltale blue-ring. The only two fungicides that are used are Koban and Tersan SP. Both materials are equally effective, and obtain good control of pythium at the rate of 4 lbs. per acre because it is cheaper, so merely a case of economics.

The 4 lb. rate will provide control for up to 4 days, if ideal pythium conditions persist. If the night-time temperatures dip to 67 or 68, it will slow the disease to almost a standstill overnight. If the night-time temperatures reach 65 or lower, the pathogen is stopped completely. One cool night in the low 60's will save us as much as \$ 800 to \$ 1000 in fungicides the next day. Keep in mind that in spraying for a disease as pythium it is not necessary to spray all fairways. Pythium is a predictable disease and will work in the low stagnant areas before coming to the higher ground.

Fusarium patch, or Fusarium roseum as it is more commonly called, has become a serious problem only in the past two years. The key to controlling Fusarium is early diagnoses. Each fairway is carefully inspected daily and the slightest change is easily detected. Weather conditions can be of some assistance in "anticipation" of Fusarium roseum. High humidity, morning fog, a lack of natural rainfall, or dry turf, can put you in the expectant stage for Fusarium roseum. On initial infestation it gives the symptoms of many things, such as isolated dry spot, sodwebworms, and even dollarspot. By the time the telltale "frogeye" be-

becomes evident, the grass is already dead. Once the pathogen reaches the crown of the plant, total loss can be expected for the infected area.

The only fungicide we have found that gives any margin of control is Tersan 1991. This material used at the rate of 5 lbs. per acre, and watered in immediately, will effectively control the disease. Fusarium patch usually runs in a 24 to 28 day cycle. You can count on infestation by the middle of June. It will repeat again in July and August. The one thing that helps is to keep a moist turf, and thus cooler. This, however, lets the grass vulnerable to pythium and brownpatch. It is like trying to decide which end of the snake to hold.

The Fusarium roseum will overwinter in the thatch, and will reinfest the identical area the following year. Once you locate the problem areas it will make it easier to help in early diagnosis. Using the Tersan 1991 for Fusarium roseum also helps in control of brownpatch, for up to three weeks.

Most fungicides are only doing you good if they are on the plant. It is another matter to get the material where it will do some good. Since we spray approximately 1200 acres per year, precision in application is a must, especially at the low rates that some of the fungicides are applied.

All materials are applied with 2 John Bean spray tanks, using 8008 teejet nozzles, on a 22 ft. boom, traveling 4 miles per hour, with the boom 20 inches above the ground, and a working pressure of 40 lbs. per square inch. All of the above provides 50 gals. of spray material per acre. A heavier gallonage is favorable in that it allows the material to soak the plant down into the crown area.

Keeping records of infestations and controls will, after a period of time, allow you to develop a definite pattern in disease control. The weather will average so many cool days, so many hot days, a certain amount of rainfall and humidity. With the summertime weather seeming to follow an 8-day cycle, it is easy to be prepared for disease diagnosis and early control.

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WHAT'S AVAILABLE TO CONSUMERS?

Jerry Waker, Chem-Lawn Corp.,
Troy, Ohio

Although the topic for discussion today is, "What's Available to Consumers," it could very well be - "What Does the Consumer Want?", or "What Does the Consumer Really Need?"

As we look back over the past few years, the answers to these questions would be quite different. It is our responsibility to play a significant part in educating the customer so that their desires are in line with what they really need. Our objective then should be to make available to the customer what he really needs. Therefore, we would be able to use the same answer for these three questions.

We could probably all provide some answers to these questions here this afternoon. However, I believe the real challenge is to provide the material and services that are needed and wanted at a price that the consumer is willing and able to pay.

I have selected a few slides that will help illustrate some of what is available, what Chem-Lawn is presently doing, some of the problems we face, and how we are changing these problems into opportunities.

There are many good dry fertility formulations available to the consumer - some include weed controls, insect and disease controls in many combinations. The problem arises when the consumer tries to distribute this product at the proper rate, uniformly over the lawn at the proper time. This job can be accomplished by using either a drop spreader, or a cyclone-type spreader. Spillage can also be a problem.

Chem-Lawn, and other similar companies, provide a service to the customer by spraying or spreading the needed materials at the proper rate and time for best results. These applications are made by professionals at a cost to the customer similar to the cost of material alone at a retail outlet. Everyone wants a beautiful lawn. When you are building your new dream house with a stony or muddy mess around it, you seem to visualize a beautiful, green, problem-free lawn.

There are a lot of problems that continually arise that keep this lawn from being what you really want. Some of the most frequent are insects, disease, drouth, short mowing, and any combination which places a severe stress upon the grass plant.

Thatch accumulation and compaction are problems that become an opportunity for Power-Lawn to provide a customer service of aeration, thatch removal and renovation, and mowing. A complete service to meet all the lawn maintenance needs will soon be available to the consumer.

I thought you might be interested in these few slides on special problems of vandalism, pet damage, granite for subsoil, and damage from a natural gas leak.

Diagnosing these, as well as iron chlorosis of pin oak, improper placement of ornamentals, improper use of materials and twine girdling, are all available as a service to the consumer.

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DISTRIBUTORS INTERESTS

Charles R. Schmidt, Indiana Seed Company, Inc.
Noblesville, Indiana

From a distributors viewpoint of merchandising newer turf grasses, my remarks will be primarily from the point of view of a small wholesale seed company. We do sell a small percent at the retail level, but our major effort is directed towards the landscape contractors, golf courses, park departments, commercial and housing developments, and garden centers.

Not many years ago turfgrass seed business was a very small segment of the total business of a seed company that also sold farm legumes, forage grasses, and seed grains. The basic turfgrasses were 21# Ky. bluegrass, perennial and annual ryegrasses, common fine leaf fescues, redtop, and a couple of bentgrasses. No effort was made to sell varieties and better quality grasses, but within the last ten years rapid changes have come about with the demand for improved turf for suburban developments, industrial parks, recreational areas and athletic fields.

Many new varieties of grasses are now appearing on the market, and creating interest in them starts with state and regional programs. News releases, both local and national, plus brochures, pamphlets and bulletins, are made available to the public. As a small distributor, it is impossible for us to offer seed of all varieties. We work very closely with the recommendations of the Purdue University Turf Department on varieties that will perform satisfactorily in our sales area. Once we have established ^{our} list, we consider the following program to promote and sell seed:

1. Wholesale turfgrass price card listing the elite grasses first, followed by the more common varieties
2. Mailing of brochures and pamphlets on bluegrass varieties, such as Sodco, Pennstar and Baron; also the ryegrass varieties, Pennfine and Manhattan.
3. Mailing of an inexpensive folder, giving a brief description of varieties on our price card.
4. Personal recommendation.
5. Demonstration plots
6. Advertising in publications
7. Testimonials

Our warehouse inventory of new grasses varies from a hundred pounds to several thousand pounds, depending on demand, cost, and the location of our supplier for each specific variety. We are not merchandising seed in attractive, colorful, varied sized packages at the present time. As the names of new grasses become more familiar to the buying public, we will then review our sales program. To encourage sales now, we will sell any quantity of seed to a prospective buyer.

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COMPROMISING AT THE SOD FARM

Victor R. Keigley, Red Hen Turf Farm, Inc.,
New Carlisle, Ind.

If there is one thing that is constant, it is change. Before I talk to you about the changes that we have gone through in the past 16 years in regard to bluegrass varieties, let me quickly review many other changes that have taken place to illustrate change is constant. (Colored slides for illustration).

We have changed from rolling sod by hand to the sod harvester which rolls it, conveys it to men who place it on pallets ready for the fork lift to load on wagons or trucks. We have decreased labor cost to the customer by eliminating unloading of sod by hand through the pallet and fork lift system, which places the sod exactly where he wants it.

We have also had some changes in the varieties and the blends of bluegrasses grown since our beginning in 1956. At the time of our beginning, we grew one field of Merion and one field of Kentucky bluegrass. When I think back to those days there was really no reason for growing two different fields of sod except that everybody else had two or more varieties, and you could sell the Kentucky bluegrass for less money and have an excuse. We had trouble with Kentucky bluegrass in early spring during cold wet weather, which was leafspot or "melting out" disease. This caused a delay in harvest and actually increased the cost of growing sod that was selling at a lesser price than Merion.

In the early 60's along came Delta Ky. and Newport Ky, and they were to be the answer to the leafspot problem. The first year everything was great, but the second year the same old problems were back again. At this time we were growing half of our acreage in Merion and half in Delta-Newport blend. Along in '63 and '64 we were going to eliminate our problems by growing a blend consisting of Merion, Delta and Newport.

Having half our acreage in Merion and half in a blend worked out fine for a couple of years until we had a very wet, cold spring which melted out everything except the Merion. This caused delay of harvest until late fall and was very costly. At this point we began to realize the blend that was selling at a lesser price was costing more to grow than the Merion Ky. variety. We tried Windsor when it came out and that also was disastrous when leafspot took over in May.

During this time of growing two different fields of sod, another cost factor was showing up very clearly. The best way to explain this cost factor is to give an illustration as follows: Let's say that your sod cutting and loading capacity per day is 10,000 yds. providing the men cut and load from the same field during the whole day. If you worked 10 hours per day you have an average of 1,000 yards output per hour. During this day you have five different customers come in and want a different variety than the one you are now cutting, which is in another field. By the time you have moved your men to the other field and moved back again, you have wasted one-half hour. If you move from field to field five different times during the day, you have wasted two and one-half hours, or you have cut down your cutting and loading capacity by 2500 yds. This is very costly.

During the time (between 1965 and 1970) that we were realizing the extra cost involved in delay of harvest due to leafspot and the very high cost of growing more than one variety, we were looking to the newer varieties that Dr. Daniel was telling about at the Purdue Turf Conference.

We grew an acre of Fylking a couple of years when it first came out. We were happy with the results of Fylking, so in the fall of 1970 we decided to grow one sod product, consisting of a bluegrass blend. This would conserve on acreage, as well as increase our efficiency and service to our customer. During this time, we were growing Sodco in an acre plot and were very impressed by this new variety. Now we are growing a bluegrass blend consisting of Merion, Fylking and Sodco. By growing only one elite sod product, we feel we are giving the customer more for his money and at a price that he can afford. This is made possible through the savings in the efficiency of the farm operation.

Since we are sod growers and sod growing is our only business, we take the attitude that we know more about grasses than the average man on the street. If he happens to call in for a particular variety of grass, we make no bones about selling him on our new Elite bluegrass blend. We take the attitude that we are giving the customer the most for the least cost, and we believe it.

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CONTRACT MAINTENANCE TODAY

John F. Kramer, Evanston Landscaping Company
Wilmette, Illinois

The past fifteen years have shown a tremendous increase in contract maintenance in home lawns, and recently most commercial, industrial and residential complexes are depending on a landscape maintenance contractor to provide the labor and equipment to properly care for the grounds. Many of these contractors denote up to 90% of their operation to the maintenance of factories, shopping centers and home lawns. With the rapid growth in building, the need continues to increase, and the number of qualified companies is not growing to keep pace.

With the vast improvements in mowing equipment and tools to groom lawns, gardens and ornamentals, large areas can be properly cared for with much less time and effort.

There is an increasing trend of parks, schools and public buildings to contract this work out simply because it is more economical and practical to do so. This fact is clearly evident when you consider public buildings, private buildings and institutions can create and maintain very good public relations with their clientele by well-groomed landscape surroundings. Private homes by the same means can achieve a certain status symbol in their neighborhood.

In these days of environmental awareness and ^{the} regulations concerning use of pesticides and weed control chemicals, the persons responsible for horticultural maintenance are turning to a specialist to provide the skill and ability to accomplish this service.

The following article by Sil Monday, owner-editor of the Golf Newspaper on remarks made by William Lyons, Lyons Den Golf, Canal Fulton, Ohio, at the Outdoor Recreation Association Clinic appeared recently -

Bill Lyons, owner of Lyons Den Golf, discussed Public Relations and Golf. He stressed the need for better public relations by applying child psychology, improving course and pro-shop appearance, use of flowers and gardens. Friendly greeting by owner, calling of names for starting times on PA system, and well-groomed course help make a player's dream of a golf course come true. Course should not be too difficult for players enjoyment. Roughs should be slightly longer than fairways, sand traps are not necessary (takes money out of the till). Firestone Public Course went from 9,000 rounds to 100,000 rounds when traps were changed to grassy hollows.

The use of the smile by course personnel will go a long way to promote public relations. People play golf to enjoy it. A smile doesn't cost a dime, but may get you one.

He stated that night mowing of fairways and rough with lights reduces interference with players and is successful. Mowing starts about 7:30 and ends about midnight.

Good public relations is also achieved through availability of clean, outdoor toilet facilities, using septic tank system, and the presence of ice water containers at convenient locations.

He recommended no snowmobiles be used on a course because of damage to course and injuries leading to lawsuits.

He pointed out the importance of saving 10 minutes a day on any particular function; practice putting - eliminate holes on practice green and use a spike with a round disc at the bottom; various view on threesomes, foursomes and fivesomes were discussed. Patrols should be used if play is over four hours. Several courses use fivesomes anytime.

Speed-up play on weekends can be accomplished by proper placement of pin to the rear of green on the side leading to next tee.

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SERVING GOLFERS INSIDE AND OUTSIDE THE CLUBHOUSE

Timothy Rhodes, Hinckley, Ohio

Even though the title of this presentation is "Serving the Golfer Inside and Outside," I will concentrate on what I consider to be some important aspects of a good inside operation. Serving the golfer outside is primarily the Superintendent's job, so I will leave those problems to you men who are responsible for turf care. I hope, however, that I can shed some light for some of you who may not have the time to devote to clubhouse operations, but need some ideas to help ease the burdens of clubhouse demands.

It is difficult to talk in general about golf course problems and the techniques used for handling these problems. The best way for me to approach this discussion, then, is to reference my remarks to Skyland Golf Course, and hope that you

will be able to let that relationship work in common with your work situation.

On the same line

Briefly, Skyland is an 18-hole, semi-private golf course located 15 miles south of Cleveland, and 15 miles north of Akron. It became the family business in 1928 when my father purchased an existing 9-hole golf patch. Of course, we have progressed a long way in these 45 years, to a point where our management structure provides a place for three men to function. Besides the standard duties of his job, our President is also in charge of implementing all special projects, such as installing a new irrigation system, building expansion and improvements, and any unforeseen jobs that come along. Our Turf Superintendent's responsibilities need no elaboration. My job, as I said before, encompasses clubhouse management.

Getting specific, it is my responsibility to handle the head on relationships with the customers. Head on means more than the face to face obvious business relationship that we all have. It also takes in being able to alleviate problems before they develop.

For example, and you have all seen this if you have spent any time in the clubhouse at all, you will run into the guy who is steamed before he gets to your front door, and he is not about to let any rinky-dink golf course get the best of him. Well, it is our job as managers to foresee this, and to be prepared to ease tensions before they develop into problems for you. How? Good organization and training is the first step. The best way to achieve this depends upon how you organize yourself, and more important your staff. They must be skilled to handle your business without your having to be constantly hovering. Therefore, they must be well trained.

At Skyland we have a staff of eleven people to fill positions in the pro-shop, bar, kitchen and catering service. The bartenders, of course, are all over 21 years of age, and provide the maturity necessary to handle most customer problems. The balance of the staff, however, is of high school age. In order to have success with this age group, training early in the season is critical. They must be able to think through a business situation carefully and quickly. I have certain minimum requirements to help effect good performance:

Their academic standing in school must be above average. This shows that they have a sense of responsibility.

They must be active in school activities. This shows that they are interested in things other than themselves. It also promises that they have a good personal appearance, and are oftentimes outgoing.

In return I offer hourly pay rates which encourage dependability and quality. I also use job titles. For example, General Operations Manager was given to a 17 year old fellow who wanted a good, substantially high paying job to help finance his college education. He was placed in charge of banquet preparations, such as furniture moving, rest room cleaning, carpet vacuuming, table bussing, and dishwashing. Even though these jobs are all fairly menial, he felt very responsible as General Operations Manager to work hard and see that it was all done right and on time. It has proven to be a successful motivator at Skyland.

By putting some of these ideas into effect and following through, you help achieve one of the most valuable assets your business can have - the ability to always create a good first impression to the customer. There are several first impression areas to be considered. How does your staff handle telephone calls? Are they always friendly, courteous, and enthusiastic? You all know what it is like to be handled otherwise. What do you as Superintendents do to help provide the business with a good first impression?

It is important to train your maintenance crewmen how to act on the golf course around customers. They are excellent mirrors of your attitude. What about your customer's visual first impression? Does he see neatly trimmed and manicured landscaping? Are your maintenance barns visible to the customers? What does your driveway and parking area say about you? Litter, driveway ruts, unkempt buildings all help destroy what might be a beautifully kept golf course.

It is very easy for us to overlook an eyesore if we see it every day. We must make sure they don't develop because the customer is not always able to overlook it. It is everyone's responsibility to make sure the customer is impressed the moment he turns into your driveway. Serving the golfer is more than just selling a ticket or providing a great golf course.

Now, there are some obvious ways to serve the golfer. One of them is your Pro-shop merchandising program. Does it attract loyal buyers, members and players that will come to you first when they need equipment? Skyland players, I'm sorry to say, are more the discount store buyers. Therefore, rather than committing ourselves to an equipment stock that overburdens our time and space, we only stock those items that have a rapid turnover, such as balls, gloves and inexpensive items. We had to look to other sources for generating some appreciable revenue. That left us with our bar and catering potentials. Possibly you are able to work well in both equipment and catering - that depends on your personal abilities and time limits.

Since my success has been with catering, I'd like to spend a few moments discussing that. We have three main entrees on our menu - Steak, Roast Prime Beef, and Chicken. With only three, you can keep most of the preparation for yourself and your staff a simple procedure. You can also have meals available in three separate price categories, thereby being able to fit into the budget limitations of a variety of golf groups.

At Skyland, our buffet style steak dinner is the most popular selection. This dinner is served where the golfer chooses a 13 oz. Delmonico steak from the buffet line, and takes it to our built-on bar-b-q fireplace to cook it himself. Near the fireplace is a keg of beer which keeps the "chef" lubricated while he cooks. When he is finished cooking the steak, he returns to the buffet line to be served the balance of his meal.

The advantage to me is that I don't worry about ruining someone's steak by my cooking it wrong. Also, I need only hire two people to run the buffet line and clean up. The advantage to the customer is that he cooks the steak to suit himself, and he can eat as soon as he comes off the 18th green, or he can wait for any length of time prior to having dinner. He gets a great dinner, but enjoys the informality of its style.

One of the key reasons for the success of this type of meal, however, is I buy the very best steak available through local wholesale markets. Quality beef has been the reason for my serving a high volume of steak dinner. Don't let your customers get the better of you by being able to find fault with the beef, or any meat portion that you serve.

How do you initiate a good food service operation if time limits you? I might suggest that you find and hire a college student who is in the food service study area. Let him spend a summer setting up an efficient catering service for you. It is likely that given a substantial wage for his efforts he will develop your catering to a point where you will be able to function without him in subsequent years.

Once Skyland refined its catering techniques, we were able to offer a package plan to our customers. We now offer golf, dinner, and in most cases, unlimited keg beer for a reasonable price. The food service, it turned out, created a new aspect for our business. There are no discounts as the term package plan implies. The single price quoted is simply a total of the prices of each segment of the package. We found that by promoting this plan positively we got results. For example, when we pointed out how the price represented a cost of only \$ 1.20 per hour, based on an 8-hour recreation day, the total price per man was accepted readily. Now, that's a good deal, Mister!

Another phase of the business that should be talked about is your advertising program. Skyland tried some 30 second radio spot commercials on NBC Cleveland, and it was a dismal failure, and very expensive I might add. However, our use of local suburban newspapers proved very rewarding. The ads we placed were the coupon type which gave two 18-hole rounds of golf for the price of one on Monday through Friday from 8:00 A.M. to 2:00 P.M. It's not a new concept by any means, but it works well to generate revenue. It is especially for Skyland since we are located out of town. The price incentive was enough to keep us busy every day. It is also a great way to introduce new customers to your business. You will find that even though you cut the price of golf in half, these fellows will increase your bar and short order food volume nicely. You must get them to your golf course some way, and that is one way worth trying if you haven't already.

Don't forget the free advertising you get - Word of Mouth. Do your best to see that you get good reviews in this area. You have all heard what golfers say about your competitors - they do talk, and their opinions can do much to help and hinder.

Finally, let's talk about what I think is the most important issue facing us in the next 10 years - the four-day work week. Labor is negotiating for it now, and many business and professional people seem to already have it. Have you made any preparations for it?

At Skyland we have developed what we call a 15-year phase plan. The first phase has already been completed, and that is our multi-purpose clubhouse for year around use. This has kept us in the revenue ball park all year, and promises quite a future. Other plans include a pool facility in order to allow us to provide recreation services to the entire family, not just the golfer.

We also hope to have a tennis area. If you have looked ^{at} the trade magazines lately you have seen tennis promotions coming on strong. Our next project, though, is to build a simple pole building shelter in our picnic grounds. This shelter would be able to accommodate up to 150 people, and would include electric and water service. An attractive built-in bar-b-q- pit would help us use this area for serving simple, picnic-style steak dinners at a lower price. This will give us more flexibility for serving our customers at a relatively cheap cost. Maybe some of you who don't have a clubhouse large enough to provide catering space can consider this method of offering meal service to your group outings. Again, a qualified high school student could operate this segment for you at a fairly low cost.

I think it is safe to say that the future looks good for us, especially if we prepare for it now. The recreational businesses will be more and more in demand. Let's let it pay off for us.

PESTICIDE LAWS - WHAT THEY MEAN TO YOU!

Dr. George Hutton, Biochemistry Dept.,
Purdue University

This opportunity to meet with you and discuss the growing impact of pesticide legislation is very timely. Some of the contents of new legislation is certain to affect you in the development and protection of turf within the next two to three years. In the 1971-72 Congress, over 100 pieces of legislation were proposed that would affect the use of pesticides. Now all 50 states have pesticide legislation in effect, and more legislation is expected to come. Why?

After 25 - 30 years of unrestricted use of nearly all pesticides, what has caused this change in public attitude? Facts or Fiction? - A little bit of both. If you were to ask "are there any real pesticide problems?," the answer based on facts must be "yes." These problems center around water accumulation of persistent pesticides. Several of our better known pesticides such as DDT, Dieldrin, Mercury, Heptachlor, have the ability to remain effective for many years in our ponds, streams, lakes and even our oceans. In some areas, the levels of these pesticides have already reached levels that are affecting several species of aquatic life. In most areas, these levels have not been reached, but with knowledge we now have of the extremely long life of these chemicals in aquatic environments, we know we must sharply curtail their use around watersheds and streams or we will build an unsolvable problem into our future. The facts indicate that the uses of pesticides in aquatic areas with long residual capacities must be reduced and applied only when necessary by personnel trained in their characteristics and effects.

But, what about the fiction and emotion? Is the world and future generations being poisoned forever? Are total bans really necessary? Without intending to add any more emotional fuel to an already overcrowded and overworked theme, my answer to these questions is a plain and positive NO! The National Pesticide Monitoring program under the Federal Work Group on Pest Management has analyzed soil, water and air samples throughout the U.S. for the past five years. The first data indicates that in most areas the pesticide problem has not reached damaging proportions and is not reported as increasing.

It is interesting to note, however, in a recently released report by EPA on soils analysis of the top 3" of soil as a part of the National Monitoring Program, Kentucky and Ohio are listed among the states having the highest arsenical residues in the sampling -- greater than 8.4 PPM. Michigan is listed as having the highest residue of 2.09 PPM of the total DDT group of pesticides, but these were confined to less than a quarter of the samples taken in Michigan. Illinois had the highest average residue of Dieldrin and Aldrin at 0.11 and 0.13 PPM, respectively. The same survey showed Indiana as having the following (based on 78 pesticide analyses):

	<u>ppm</u>
Arsenic	7.88
DDT Group	0.01
Dieldrin	0.03
Aldrin	0.07

The National Average of all states (based on 1729 analyses):

Arsenic	6.43
DDT Group	0.31
Dieldrin	0.03
Aldrin	0.02

Please refrain from any quick judgment comparisons of these figures as they are intended only to try to eventually establish a National Monitoring picture of pesticides and these are the earliest returns. Also remember that for many years arsenic had a tolerance of 7 PPM on apples and other products. There are no alarm figures for Indiana. There are some indications that we should study and plan our future wisely. These are also the type analyses that we can expect to hear about for many years to come.

Let's talk about the two laws that will affect you.

1. The State Pesticide Law passed by the Indiana legislature in April 1971 which became effective on January 1, 1972.
2. The Federal Environmental Pesticide Control Act passed by Congress and signed by the President on October 21, 1972, which will become effective over a period of from 90 days for some provisions to 4 years for others.

First, the Indiana Pesticide Law -

The law provides for definitions of Pests and Pesticides. These are probably more comprehensive than you might expect. Pesticides include insecticides, herbicides, rodenticides, nematocides and very broad definition of fungicides which includes germicides, disinfectants, and most biocides except those on living man or animals. It also includes plant regulators, defoliants or desiccants.

Registration is required with the Office of the State Chemist of all pesticides or devices including each product of each brand which is sold, distributed or transported in the state. This registration procedure provides the consumer as well as the manufacturer the following protection:

1. A statement of active ingredients on the pesticide.
2. A label stating use directions, claims and safety instructions.
3. Inspection to assure that all pesticides are properly registered and identified.
4. Analyses to determine that the pesticide products are meeting the claims of the label.

The above procedures provide the public and the state a "truth on labelling" procedure which identifies the product and assures its quality.

The law also provides for an Indiana State Pesticide Review Board to provide current review and guidance of pesticide policies for the state. This review will include the responsibility to declare pesticides as "restricted" use or "prescription" use should the use experience and hazards justify. These restrictions can include sale, distribution or use as deemed necessary to protect persons, animals, wildlife, crops or vegetation other than those to be controlled. The Board may regulate the time, conditions of sale, or area of use should it deem necessary to all or a part of the State. It may also adopt rules and regulations for safe handling, transporting, storing, displaying or disposing of pesticides and their containers. The Board may set forth restrictions of the use of certain types of containers for pesticides. The Governor has appointed members of the Board to represent the many segments of interest.

The Federal Environmental Pesticide Control Act of 1972 -

This new federal legislation is the most sweeping single act in pesticide usage history. Changes in pesticide administration and use are so far-reaching that four years are allowed to place the law fully in effect. While it is still too new to have details on how the provisions will be initiated, some of the new prerogatives of the Environmental Protection Agency include the following:

- a. Federal registration of all pesticides by all establishments, local or national within one year.
- b. Classification of all pesticides within two years. The General category shall be those pesticides which can be utilized with safety by carefully following the label. The Restricted category shall include those pesticides, which when applied according to directions for use, may still be able to cause, without additional regulatory restriction, unreasonable adverse effects on the environment, or injury to the operator.
- c. Federal Requirements for Training and Certification of Pesticide Applicators. For the use of restricted pesticides, personnel may be certified either as -

Private or Commercial applicators

Private applicator is a certified applicator who uses or supervises the use of any restricted pesticides on property owned or rented by him or his employer (or in an exchange service between neighbors without compensation).

Commercial applicator is a certified applicator who uses or supervises the use of any restricted pesticide for any purpose (or on any property other than included under private applicator above).

d. Certification Procedures.

Federal certification - within one year the EPA shall prescribe standards for federal certification of operators. An individual must be determined to be competent with respect to the use and handling of pesticides.

State certification - each state desiring to certify applicators shall submit a State plan within three years. The administrator shall approve the plan submitted by any state if the plan:

- a. Designates a State Agency responsible for administering.
- b. Contains assurances that the State Agency has necessary legal authority and qualified personnel to carry out the plan.
- c. Gives assurance that the State will devote adequate funds for administering the plan.
- d. Provides for State reports to the Administrator of EPA.
- e. Contains assurances that State standards for certification of applicators conform with EPA standards.

Within four years the administrator shall approve or disapprove of a State plan.

Summary

As Indiana has already included several of the federal provisions within the law now in force, it appears likely that Indiana will seek approval for a State Certification plan rather than have the decision on - pesticides to be used in Indiana made in Washington under a general federal plan. To fully meet federal requirements, Indiana may wish to consider a companion applicator law to go with the present registration and use law.

If these actions occur as projected, you will still be able to use pesticides in accordance with your needs. But, you and your neighbor will know that the man using the pesticide will be trained in its use and effects.

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INTERPRETING THE MISINTERPRETED
INTERPRETATIONS ABOUT PESTICIDES

Walter Weber, Indiana Farm Bureau Coop.
Indianapolis, Ind.

What kind of an animal is that with the four wieners? The teacher knew the answer, so told the Indianapolis youngster it was a cow. But, what happens when the misinformed are explaining things to the uninformed?

"This has been so interesting. It is the first time I have ever heard anything except bad things about pesticides." That was the comment from one of the educators enrolled in a workshop for environmental teachers. I gladly accepted their invitation to discuss pesticides. One teacher asked what I meant by 2,4,5-T. Another wanted to know the difference between an insecticide and a pesticide. It was obvious that we have been negligent in assuming that everyone understands even the common terminology, or the safety factors in properly used pesticides.

Today everyone has a smattering of knowledge, and has benefited from technological progress. This includes those emotional environmentalists who are writing against pesticides and chemical fertilizers. They are frequently highly educated, respectable people who have good intentions, but have not taken time to check all the facts.

The rhetoric against pesticides sounds good to those who do not understand, and there are many who do not understand. Some folks have been generous in writing sensational misinformation which has not been substantiated by research. They haven't taken time to learn the truth. Perhaps it could be explained by a sign at the entrance of a bookstore - "Those who will not read have no advantage over those who cannot read."

I wish to share some of these misleading excerpts (grouped by sources).

BOOKS

Chemical poisons should never be used for nuisance pests like midges or misquitos.

1971 Indiana University Yearbook (This does not reflect the thinking of the I.U. Entomologists)

Natural grasses are resistant to insects.

1971 Indiana University Yearbook.

The FDA does not routinely consider indications that a pesticide may cause mutations, birth defects or chromosome breaks when it sets a tolerance.

The Nader Report - The Chemical Feast - page 112.

Use wet Kleenex. Wipe eggs off leaves. Wet the leaves. Sprinkle with ashes. Non-chemical pest control for cabbage butterfly eggs.

Vast quantities of insecticides are applied with little regard for what happens to the chemical once it is on the land.

Man and the Environment - Jackson & Paul Ehrlick - page 20.

MAGAZINES

Farmlands need human fertilizer to create a permanent agriculture.

Organic Gardening - Nov. 1971.

Last year I used muriate of potash under my vegetables, but I won't make the same mistake again since I have learned it is a chemical.

Organic Gardening - March, 1972 (There are 16 chemicals in a cup of coffee).

I have a hunch that the main trouble is another kind of pest - someone who wanted to make money, and he thought up chemical fertilizers. Then went on to poison spraying.

Organic Gardening - June 1971.

Insects don't seem to care much for plants in rich ground, but they go for those in poor soil.

Organic Gardening - January, 1971.

Organic soil keeps the insects away.

Organic Gardening - January, 1971.

The best way to control all kinds of weeds is to build up your soil with organic matter. Weeds don't seem to flourish as well in a healthy soil.

Organic Gardening - January, 1973.

The Agriculture Department encourages farmers to misuse pesticides.

Life Magazine - March 6, 1970.

Organic farmers either tolerate weeds, or hoe, or hand-pull them, or choke them with ground cover.

Life Magazine - December 11, 1970.

NEWSPAPERS

Editorial cartoon on front page of the Indianapolis Star. The grim reaper shown with many skulls in the background, along with one word - Pesticides. (It should have been - Without Pesticides).

Editorial cartoon in the same section of the same paper. Depicted a man at the dinner table using a salt shaker which was labeled DDT. There were also containers of Aldrin, Dieldrin, Endrin, Chlordane and other pesticides on the table.

SCHOOL MATERIALS

Learn how to use your own manure as fertilizer if you are in the country.

The Environmental Handbook, prepared for the first National Environmental Teach-in, April 22, 1970 - page 326

Crossword puzzle - Initials of a dangerous insecticide. Answer provided - DDT.

My Weekly Reader, Vol. 5 - May 18, 1972

ORGANIZATIONS

Warning: Lettuce may be hazardous to your health. Many lettuce fields are sprayed with 2,4-D.

Cincinnati Citizens for the United Farm Workers

Organic gardeners believe that pesticides and chemical fertilizers have no place in the home garden. These polluting chemicals are not needed in the home environment.

Organic Garden Secrets - Lafayette Environmental Action Federation

Write or call the County Agricultural Agent and tell him to get on the organic wave length.

Lafayette Environmental Action Federation

It's better to have your egg plants wiped out by flea beetles than to destroy the ecosystem you have been building up by rushing for the spray.

Organic Gardening Secrets - Lafayette Environmental Action Federation.

Hard tomatoes show how the land grant college complex has been used by the chemical industry to give a veneer of academic legitimacy to the excessive use of pesticides.

Lafayette Environmental Action Federation - November, 1972.

Resist the temptation to regard a few dandelions as sinful. They aren't thought to cause birth defects like some common lawn herbicides.

Lafayette Environmental Action Federation

Editorial cartoon - A bucket labeled DDT under the cow's udder.

Prepared by the Lafayette Environmental Action Federation

Use fly paper and a fly swatter to kill bugs. Avoid fertilizers containing arsenates and chemical sprays of all kinds.

Our World is Dying - Tuberculosis Institute of Chicago and Cook County

The above pamphlet also states "use only white paper products - dyes used in others are pollutants" (The folder was printed with green dye and black ink).

LEGISLATIVE

Are the emotional environmentalists being heard? Just listen to these 4 examples -

The town of Huntington, New York has local restrictions on pesticides. Warfarin is on the approved list, but it has placed Fumarin, Dylox and Vapona on their denied list. (Fumarin is more effective against mice than Warfarin).

The Oregon Department of Agriculture offered a proposed definition of natural foods on September 13, 1972.

The California Legislature scheduled a hearing on organic foods for September 11, 1972.

Representative Koch introduced HR 14941 on May 11, 1972 on organic foods produced without pesticides or artificial fertilizers.

My last example really shocks me. It is almost unbelievable that a man who graduated from an agriculture college, then from law school and is now a senator from a really great state would repeat some of the misleading statements. I am referring to the way the Ecological Manufacturing Corporation used the name Emtex for methoxychlor, and promoted it as a replacement for DDT. The following excerpts are in the Congressional Record of August 17, 1972, starting on Page S13814:

Methoxychlor had been patented in Switzerland, bought by DuPont, but never offered for sale.

Emtex can be pigmented into paints to provide a permanently bug-free room.

Emtex is harmless to people and pets.

It works as a fungicide on molds which attack plants.

Kills all manner of household farm and granary pests.

The ecology movement's dream product

The firm should get a Nobel Prize.

WHAT ABOUT BIOLOGICALS?

The June 8, 1972 issue of Insect Alerts from Michigan State reported that checks of toads show they feed more on beneficial insects (ladybug beetles, ground beetles, inc.) than on insect pests.

Another publicized biological control is the white amur grass carp. Missouri has banned the importation, sale or release of the fish, since tests conducted by Dr. Jim Wheatley of the conservation department has proven that it prefers amphipods instead of weeds.

The above are a few examples of misinterpretations which are in print. These examples of misinformation are presented as evidence that we need to put on our fighting clothes and participate in disseminating the true side of pesticides.

In conclusion, it's not all bad. Many people recognize the fallacies of the misinformed. Some folks are making special efforts to disprove the false statements. For example, Dr. J. R. Lodge of the University of Illinois recently reported that when mice were fed from 5 to 30 ppm DDT it often resulted in larger litter size and more mice weaned than from the controls. It was evident from his investigations that the levels of DDT, which might normally be encountered in the environment, are not detrimental to reproductive efficiency, and may, under certain circumstances be beneficial.

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GROOMING ATHLETIC FIELDS

Melvin J. Robey, Supt., Athletic Facilities
Purdue University

The appearance of your football field catches the attention of every fan when they enter your stadium for the first home game. The fans expect to see a beautifully prepared field, one they can take pride in and brag about to their friends and guests. They are not interested in knowing of all the tedious work that went into getting the field ready for the football season. Having the field in near perfect condition, well-lined and decorated is very important. First impressions are lasting ones.

After the first game, as the football field gets torn up by the football players and the band, the spectators are willing to accept the field in a little less than perfect condition, providing it does not affect the play of the game. They have seen the field getting torn up and relate the condition of the field to some of the exciting games they have seen. Thus, they will make some excuses for the condition of the field, providing it was well-groomed for the first home game.

The only time the crowd will not^{be}/tolerant of a shabby appearance of a field is for the annual Homecoming game. This is especially true for a college field. When the old grads return it is wise to have the field in tip-top shape. The important point to remember is that the field and how it appears is the stage or backdrop for which the football team and band have to put on a show to please the paying customer. Similar to the scenery used for a theatrical performance, the grooming of your field sets the stage for the game to be played. Grooming a field has nothing to do with the daily turf maintenance program. Instead it deals with the finer procedures which can be used to dress-up your field.

What are some of the grooming techniques available for you to use? One important grooming technique is that of "ribboning" or "stripeing" the football field. This is best accomplished by using a reel mower and mowing the grass between each 5 yard line in opposite directions. If this is done you will have alternating light and dark stripes (ribbons) across the playing area for the full length of the field. You will receive many questions about how you managed to get the ribbon effect on your field. Usually the spectators think you are growing two different kinds of grass, or have dyed the field. Another point to remember is to trim the grass and in some cases weeds from around the fence which surrounds your field. Although not critical, it will influence the over-all appearance of your sports complex if neglected. Pay attention to the smallest details!

Fertilization is primarily a maintenance procedure, but the selection of a fertilizer which will give your grass a deep green color in the fall affects the appearance of your field, therefore, it is also considered a grooming technique. As mentioned previously, you want a dark green grass late in the season, not one that is yellowish because of a lack of nitrogen. Slowly soluble fertilizers which require micro-organisms to breakdown the fertilizer granules, will not give your grass as good a color in the late fall as will the water-soluble nitrogen fertilizer.

The cooler fall temperatures slow down the activity of the micro-organisms, reducing the breakdown of the organic fertilizers, thus limiting the amount of readily available nitrogen for the grass plant's use. The reduction of the activity of the micro-organisms has only a small effect on the availability of the nitrogen for plant use from the water-soluble fertilizer. Therefore, in the cool weather during the last half of your season, the nitrogen is still released by hydrolysis for the plant's use, thus giving you a green field in the cooler part of the season. This darker green field, with its ribboned effect and field markings, will make your field a show place you can be proud of.

Good field markings and decorated end zones are both important techniques to use in the grooming of a field. Straight, 3 to 4 inch wide lines will set off the boundaries of the field as well as the "ribbon effect" discussed previously. No amount of grooming can offset the carelessness of haphazard, crooked line. You will have better results using a water-base latex field marking paint than the older powdered lime material. Select your school colors for any end zone decorations, but do not try to become too fancy with your designs. Keep them simple and large so that the crowd can easily see what you have done.

As the season progresses, and before your field begins to show signs of heavy use, start an overseeding program. This not only helps to maintain grass on your

field year after year, but it keeps the field green and helps to keep the dust and mud to a minimum. If the field starts to wear out between the hash marks, consider using some of the newer perennial ryegrasses which are now available. They blend in well with other grasses and germinate quickly. You can turn a bare, worn out field into one with a good cover of grass in two weeks (under proper climatic conditions). This new grass growth will not be a dense, thick, wear-resistant turf, but it will produce a field cover which is pleasing to the eye.

Weed control is another one of the often overlooked grooming ideas which needs close attention. Nothing looks worse than to see a football field with the edges of the field a nice lush green color and the center a strawish-brownish color from the tell-tale signs of crabgrass, knotweed, nimblewill, and all the other weeds which turn brown after the first frost of each season. Get on a maintenance program to keep these weeds out of your field! A few isolated weeds can be hand-pulled, or spot-treated to eliminate a spotty field. If necessary, sod plugs can be placed in the bare spots to help keep the field looking green.

If you use a field cover there is not a lot you can do to correct the special problems it creates. Two things to do to help reduce the effects of the canvas are:

1. Do not leave it on the field any longer than is absolutely necessary; the longer it remains the more it will mat the grass and ruin the "ribbon" effect on your field.
2. Be sure the canvas was washed before the start of the season or dirt will come off of it onto the grass, marring the appearance of the field. (When the canvas is removed from the field the yardage lines can be washed away, thus making it difficult for the officials, players and spectators to distinguish them during the game.)

The last grooming technique to be considered is the use of turf colorants (dyes). These dyes are expensive (\$75 to \$100 will do one field) and must be mixed and applied properly. A poorly dyed field looks worse than a bare or brownish (due to weeds or dormant grass) field. Colorants are more commonly used on fields in the South where the bermudagrass turns brown during the football season. Under normal circumstances, this technique should not be considered unless you have a very justifiable reason (Homecoming game next on the schedule, or TV Game of the Week and your field is an unsightly mess). Before applying the colorant to your field, spray an area off to the side and check the color to be sure it is as near as possible to the color of natural grass.

It should be remembered that grooming of a field is done only to improve the appearance of the field and to give the spectators a little more pleasure for their money. Grooming of the field is that little extra something you do to enhance the game, but a good, well-planned and executed maintenance program is by far the most important responsibility of the turf manager. Every athletic field turf manager should be keenly aware that he must be more concerned with the safety of the field from a player's point of view than the grooming of it for the spectator's pleasure. Keeping the field level and free from holes, resilient to cushion falls, a good dense stand of grass for sure footing, and free from mud to reduce injuries, are all important to the players and the final score of the game.

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PLAYERS' TEST OF FOOTING AND TURF

R. P. Freeborg, Dept. of Agronomy
and
M. J. Robey, Athletic Dept.
Purdue University

Stability of a surface is one of the key factors in assuring satisfactory player performance. A concrete surface would offer the most stability to PUSH by the downward thrust of the leg muscles as a player starts an action. Football on a concrete surface, however, is not recommended because of the body injury that will certainly result. Thus, the other factor that must be considered - the resiliency of a surface to protect players from physical harm.

In natural turf this resiliency comes naturally from the soil, that mat formed by old grass and clippings, and the existing, growing turf. In the outdoor carpets currently installed in some fields, this resiliency is obtained by various synthetic mats that function as the combination of soil, mat and grass. In either case the objective is the same - to protect the player from injury, and to give adequate stability for action and reaction by the players. In reality, we are seeking the proper balance between stability and resiliency.

The objective of the tests was to measure the player's response to dry and to wet bluegrass and Zoysia grass turfs. We were trying to determine what constitutes satisfactory stability and resiliency in a natural grass playing surface from a football player's viewpoint.

Player evaluations were made on two separate occasions - the first evaluation was on dry bluegrass and Zoysia grass turfs; the second on bluegrass and Zoysia grass turfs that had been saturated and were thoroughly wet. It should be noted that the first tests conducted were in a low maintenance area. The bluegrass was not as dense as it would have been on a playing field. The thin turf was the result of a very low fertility level.

Zoysia used for the first test was in need of thatching, therefore, the turf was fluffy and was not an ideal testing surface. The Zoysia was just recovering from winter dormancy. This contributed to its being torn up easily. A Zoysia field topdressed to bury the runners and firm up the surface would obtain different results than the unmanaged Zoysia used in our tests.

Nine players responded to the various drills on these turfs. There were 12 different drills the players were required to perform. After each drill players were asked to respond, with comments, about the feel of the turf, any discomfort, any security or insecurity of footing, their likes and dislikes - if any - which turf would they prefer to play on, etc.

The following observations were made:

- A. Upright wave drill, i.e., make a change in direction with lateral stops & starts
 - Dry - Zoysia was better when a foot was planted it stayed in that position. There was very little give - in bluegrass there was more slippage.
 - Wet - Traction on Zoysia and bluegrass was similar
- B. Back Pedal 5-10 yds. Plant foot, stop, and sprint forward
 - Dry - Zoysia, shoe stops so quickly that the foot slides in the shoe. Very good for abrupt changes in direction.
 - Bluegrass - there was more slippage

- C. Back Pedal 5-10 yds. Plant foot, Break right or left
 Dry - Zoysia not good for this drill. When foot was planted it became difficult to make a slight adjustment as needed to shift weight. Bluegrass was quicker, a faster surface.
- D. 90 Degree angle cuts as a ball carrier
 Dry - Bluegrass was better, easier to pivot in blue than in Zoysia
 Wet - Less mud in Zoysia. Zoysia was better for cuts.
 In bluegrass there was slippage. It felt as though the ground would give way.
- E. Buddy Drills (traction) One on one, Head-on blocking
 Dry - On Zoysia - that player initiating action will be less favored, have greater slippage than the player with permanent stance.
 Wet - Zoysia - some moderate foot slippage (with cleats in soil). This tends to overcome earlier objections where feet were fixed in a somewhat permanent position. At the point where water was covering the lower part of the shoe, good traction was still obtained, supported by heavy rhizome growth, even when soil was "soupy" or muddy.
 Measurements were made of the turf damage -
 On wet grass, depth and length of cuts were generally similar in both Zoysia and bluegrass.
 Average cuts were 2-1/2 to 3 inches deep by 9 to 10 inches in length.

Summary

- A. Bluegrass was the better grass when pivots were required, or some slight adjustment in foot location or placement was required. Some players thought it was faster, but there was no general agreement about this.
- Zoysia was better when a firm foot placement was required, or where a sudden change in direction was needed. Wet bluegrass was considered to be undesirable by all players, whereas wet Zoysia acted more like good bluegrass in that slight adjustment in foot placement was easily obtained and so pivots were made more readily.
- B. Players felt that a combination of the two grasses would be better than either one alone. This is based on the assumption that each grass would contribute its desirable qualities to a turf.
- C. The players comments on the two types of grasses varied according to the position they played. The linemen made more favorable comments about the Zoysia and the good footing it gave them, while the backs in general did not like the Zoysia as well as the bluegrass because their cleats would catch on the runners (stolons). This condition could be corrected by using the proper management techniques.

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NEW NATURAL TURF SYSTEM AIDS PLAYERS
The PAT System - (Prescription Athletic Turf)
W. H. Daniel, Purdue

Just turn on the suction pumps - if it rains during a game! Suck the rain-drops down before mud forms! Give the players the firmness for running, resiliency for falling, and traction for turning. Give the coach, the players on the bench and spectators a better view by having a flat field. For baseball - help the front office minimize rain check; keep drier base paths by suction. A new concept in athletic turf is now a reality!

Remember When?

Rain meant MUD! Because the extra water at the surface during rain (regardless of construction) would cause surface wetness - slippery playing conditions. It was true, crowning the field limited the size of puddles; that tile drains helped in springtime dry-out; and sandy soils are preferred over clay soils. BUT, in common, all are too wet at the surface when rain falls during the game. And, that's why the PAT System is NOT AN ADDITIVE - it is a REPLACEMENT! Now, the licensed architect can specify; the contractor can comply; the inspector can approve; then the field manager can manage!

The Idea and the Ideal

During December, 1970, the idea evolved, putting suction pumps onto drains - to pull raindrops down. We first tested a 10 sq.ft. area in the greenhouse, and later a 400 sq.ft. area outside. The vacuum developed (4 - 6" Hg.), rapidly stripped water and air through sandy subgrade and playing surfaces. In field tests (Goshen) excessive surface water (from hose) would be removed within 10 min.

Then, based on turf research and wide observations, a System evolved including -

11 ITEMS which combined can make 9 FEATURES

Suction pumps	Suction pumping - as needed
Collector drains	Level fields - water moves down
Plastic sheeting	Water conservation - outflow control
Sand	Subsurface watering - as needed
Peat	Nutrient conservation-above plastic
Calcined aggregates	Porous rootzone - ample air
Slow release fertilizers	Heat adding - keep soil thawed
Soil heating cables	Heat conservation, reduce frost action
Vented plastic covers	Wear-resistant - increased growth
Power rollers	

What PAT Does

A. Gives Improved Playability

1. Gives firmness for running - vacuum assures
2. Gives for falling - turf, peat, sand, aerify as needed
3. Minimizes rain effect - just pump and forget
4. Can adjust water while using - subsurface
5. Encourages minimum cleat use - increase use potential
6. Allows level field - the best view - uniform

B. Counteracts the Very Wet

1. Assures rapid infiltration - textured firmness
2. Allows internal storage - in sand
3. Permits rapid adjustment - through slits in drains
4. Provides ample aeration - in large pores

C. Counteracts the Very Cold

1. Keeps soil thawed - safe footing
2. Extends growing season - keeps roots above 40°F.
3. Reduces frost action - on leaves - improves color
4. Reduces frost action - on soil surfaces
5. Conserves soil heat - by vented plastic covers
6. Traps sun's energy - under clear plastic
7. Adds soil heat - by electric cables
8. Permits warm season grasses to be used further north

D. Counteracts the Very Hot

1. Favors evapotranspiration - from soil and turf - cools surface
2. Conserves nutrients - in dilute solutions
3. Requires minimum watering frequency
4. Provides economy of water and labor

E. Counteracts the Very Dry

1. Conserves rain water - as reserve above barrier
2. Allows subsurface recharge - no wind effect
3. Corrects for poor distribution
4. Has "wick" action in 3 directions - either side and up

1972 Models Now in Use

The first field at High School, Goshen, Indiana, was limited to the center 36,000 sq.ft. with one pump, and 14 - 16" rootzone above plastic. Kercher Landscaping contracted the work, and was aided by Larry Gadsden, Supt. of Facilities, and Rieth & Riley, general contractor. The construction took two months, and sod was laid two months prior to first home game. Cost estimate was 75¢ per sq.ft. for that area. Field had 26 uses, including football for High School-Junior High, as well as band practice - normal use for a community high school. Light overseeding before games, and light rolling after games was normal management. Even with 5" of rain within 48 hours prior to game the field was ready for use.

The first full-size field, 62,000 sq.ft. with 2 pumps, was installed by Grand Valley State College, Allendale, Mich. Including extra excavation and extensive site work, their estimate is \$ 1.10 per sq.ft. It was first used in late season (October 21) during an all-day rain - only the field itself stayed firm and ready for use.

Cost Estimates

It is estimated ready-for-use costs will range from 75¢ to \$ 1.50 per sq.ft., depending on location, delivered sand costs, overhead, etc. Although the question of "How much cost?" is always important, the BIG questions are - "How well can it be constructed," and "What level of turf maintenance can be developed to assure good, healthy turf."

Building and Maintaining Your Field

Assuming that - based on information and observations - YOU are interested in a PAT System for your field, how do you proceed?

First, share information with the architect or designer for your school system. Consider what is possible in scheduling construction and use. Also, you are encouraged to go see models already installed.

A national licensee is anticipated who then would work with local architects and contractors. The national licensee will have consultants and will have a program of continued turf observation to assure success.

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IMPACT OF THE GOSHEN FIELD

Richard Kercher, Kercher Landscaping, Inc.,
Goshen, Ind.

I am honored that Dr. Daniel has asked me to tell you the story of the new Goshen High School football field and share with you some of our experiences.

First of all, those of you who are familiar with Goshen are aware we have never been what might be called a football power. Consequently, the question asked by many has been - "What prompted the decision in Goshen to install a new football field, especially one of an entirely new, untried concept?"

As time is responsible for many changes, it is also one of the important factors in the beginning of our football renovation program; namely, the old permanent wooden grandstand was over 50 years old and no longer in a safe, repairable condition.

Money, like at all schools, is limited and a bond issue would be the way. The school board wanted to upgrade the playing field and track, which were long overdue for some attention. In fact, the playing field looked just as it did over 30 years ago when I played on it - nothing more than a field with a barren, concave center full of knotweed with puddles of water whenever it rained. This was surrounded by a cinder track having its share of crabgrass and weeds.

Knowing the school authorities were discussing a renovation program to the athletic field, I invited the then Superintendent of Schools, Dr. Bivens, and Superintendent of Building and Grounds, Frank Algate, to come to the Turf Conference last year for one day and hear the latest on athletic fields and talk with Dr. Daniel about the proper approach in constructing a football field. They accepted my invitation and, of course, this was just the situation Bill had been looking for because it didn't take him long to start his sales pitch on the PAT system.

Superintendent Bivens was well sold, and a meeting was set up. After Bill had given his sales talk on the PAT System, the Board authorized Superintendent Bivens and Dr. Daniel to prepare the plans and specifications for the construction of a new football field containing the PAT System, a new hard surface track and new bleachers.

On May 12, 1972, work started on the reconstruction of Foreman Field for Goshen High School. Construction progressed on schedule with sodding being completed on July 14. Track and bleachers were then completed, lighting revamped, a new concession and electrical control room completed in time for the first home game on September 16.

During the entire construction the people of Goshen became more and more interested in the project. The sports editor of the paper would stop by the site almost every day, take a picture or two of the work being done, and without exception a week did not go by without mention on the sports page of progress on the new football field. People would stop in the evenings to check on the day's progress, try and second guess what we were doing and why.

After we had started laying sod, one man in a big Continental stopped by, walked out to the field, reached down to the sod, and we heard him say, "Hell, that's not what we want. That's just grass." Before we could explain what we were doing he had jumped back in his Lincoln and took off. He's probably still looking for his answer to a football field.

I've never worked on a landscaping job that had the sidewalk superintendents we had on this job. I might add I was happy and proud to see the interest taken in this project by the people of Goshen. When the local newspaper reviewed the highlights of the 1972, we had been rated as the 8th important local story of the year.

Since construction of the field, hardly a day goes by but what someone will ask me how the field held up - anyone else going to build on, and so on. They inform me they just got back some pictures they took of construction and that they'd like to show them to me. I even discovered one interested citizen who unbeknowning to me had taken movies of the construction. All in all, you can see it became a community project.

As far as actual construction, this project was without a doubt the most interesting and challenging project I've ever had the opportunity to work on. In this job there was no previous pattern and every day became a challenge. This held true all through construction and into the management of the playing field.

For example: holding the 20' x 100' sheet of 10 mil Visqueen in place with the wind blowing; taping the joints and still not let the plastic get torn or snagged; making our own underground drainage fittings to go from 2" to 4" and 6" when there was no commercial ones available; even to how to hold the drainage pipes in place as you doze the sand over them. Those are just a few of the challenges. Then after it was constructed, the questions of how long should the pump run to have best soil moisture? How long should you have the water on for subsurface irrigation?

By trial and error, the results we obtained were rather humorous. Take the first time we were sub-irrigating and discovered we had left the water on too long when the young man operating the mower informed us, "Something must be wrong. Water is coming out from the bottom of my mower." That was easily corrected by starting the pump and removing the excess water. Never any great big problems, but always enough little ones.

The day after the first game I talked with the coach, asked him how he felt the field was for the game. His reply was that it was in good shape, but maybe a little slow. I assured him we could correct that for the next game and make it a little more solid.

I couldn't resist saying though, "Coach, the way the opponents went around end all night and picked up yardage, are you really sure you would have wanted it faster?" He quickly agreed maybe it's just as well it wasn't any faster for that game. We jokingly decided maybe we'd better have communications between the pump pit and coaches rather than the press box and coaches. Might be able to control the opponents better.

Up until the beginning of the football season, interest and publicity had been mostly local. However, once the season started, newspaper, television and radio from

other areas began to take a look at what we had. We received excellent coverage in Indianapolis, Chicago, Lafayette, Dubuque, Iowa, and South Bend to name just a few places. We also received a nice writeup in Sports Illustrated in the November 13 issue. Without a doubt interest in a new concept of football fields is great, and I am sure those of us interested in turf are more than pleased to see interest in turf on football fields pick up. So you see the PAT system has put Goshen on the map.

Interest in the new field has in turn carried through to the students. We have not been interested in letting the field become hallowed ground, but rather we have encouraged use by all under a managed situation. The Junior High School teams in the past were not encouraged to use the field. However, they have been urged to play their games on the new field, and you'd be surprised what this has meant to the students as well as their parents. It's hoped this can even help increase football participation in the future.

The field this past season was used a total of 26 times. This included varsity games, junior varsity games and Junior High School games, plus once a week both varsity practice and band practice. As most of you are aware, the rains this fall were excessive, giving us an excellent fall to test this field. In Goshen we had 9.6 inches in September, and 3.6 inches in October. In fact, the day before the first home game we had an official 3.1 inches of rain recorded. Without the PAT System I am sure it would not have been in good playable condition.

One of the interesting observations we made this fall was that at no time did any player's uniforms look muddy. So, another plus might be the saving on cleaning costs. Interest in the field has also been shown in the willingness of the administration to provide necessary funds for proper maintenance, and complete cooperation in providing facilities to show and demonstrate the PAT System.

Following each varsity game, I checked the field for divots, and we averaged one divot torn out every 5 yards between hash marks. Prior to each of the 5 varsity home games, the playing area between hash marks was overseeded with 5 lbs. of Sydsport bluegrass. Following each varsity game the PAT System area was rolled. In early use, where a back had made a sharp cut, there was some movement of grass roots and sand. They had not pulled loose, but only shifted, leaving a wrinkled-like effect. The rolling easily put it back in place.

Needless to say after our publicity we have had many visitors to Foreman Field. The Seattle, Washington Public School Athletic Director came to see the installation, as have representatives of the New York Giants and their engineers who are constructing a new sports complex in New Jersey. We have also had visitors from Bethlehem, Pa., Davenport, Iowa, Clinton, Iowa, and several places here in Indiana. Harold Benninghoff and Don Swain of Notre Dame have been over several times to see the installation. Arrangements are now being made for Notre Dame to use the field for a scrimmage during spring practice in order for them to have an opportunity to evaluate the field.

When we knew visitors were coming we have arranged to demonstrate some of the highlights of the field in order that they could see the drainage work, and observe the root system we have been able to obtain. I have made no mention of the Goshen football team record on the field, but I will say our opponents were all very well pleased with their own performance on it.

I would like to close in saying that in Goshen we are very proud of our Pre-scrip-tion A-th-letic T-urf, the first in the nation. If anyone is desirous of seeing and learning more about Foreman Field I will be happy to make arrangements to explain and show it to you.

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BERMUDAGRASS AND ATHLETICS

W. B. Gilbert, N. C. State University

Every school that has an athletic team should have a good athletic field made for hard use. Production and maintenance of a dense, wear-resistant turf depends upon the -

1. Species of grass used
2. Proper design and construction
3. Good soil drainage
4. Adequate fertilization, and
5. A management program which recognizes the problems involved.

Bermudagrass (Cynodon spp.) is widely used for many types of athletic programs in the South. It is used on fields for football, baseball, soft-ball, soccer, rugby, lacrosse, track, field events, and generally physical education and other athletic functions. The bermudagrasses are very resistant to wear, and make rapid recovery from damage by cleats and traffic. The varieties that are used for athletic areas include:

Tifway (T419). This is a very dark green hybrid, has fine, stiff-textured leaves, is resistant to wear, and retains color late in the fall. It is the best selection available for football and other heavy-duty fields.

Tiflawn (T57). This is a dark green hybrid, coarser than T419, but quite wear resistant.

Tifgreen (T328). A dark green hybrid, fine-textured, soft leaves, widely used for golf greens and baseball infields. May be cut to 1/4 inch in height.

Tifdwarf. A dwarf mutation of T328, very dark green, used for golf greens and baseball infields. May be cut to 3/16 inch in height.

Common. Does not have the density, disease resistance, or cold tolerance of the hybrids.

Midiron - a release from Dr. Ray Keen of Kansas State, has been released for athletics and fairways in the Midwest.

Bermudagrass is somewhat tolerant of compacted soils so does not require as critical soil conditions for satisfactory growth as do cool-season grasses. Heavy soils, high in clay content, must be modified for good turf on football fields in particular. These soils compact much more rapidly than sandy soils, and must be amended with sand and organic matter. The quantity of materials needed depends on the character of the soil with the silt-clay content of the modified soil needing to be below 30%. The addition of organic matter helps to absorb moisture, gives a cushioning action, and helps granulate the soil as it decomposes. Reed sedge peats and composted, milled pine bark are excellent conditioners, and are generally used at 1½ - 2 cu.yds./1,000 sq.ft. to obtain ± 15% organic matter.

Bermudagrass makes little growth until soil temperatures reach 50°F, so new plantings should be delayed in the spring until warm weather. Three to 5 bushels of stolons/1,000 sq.ft. will be needed to establish the hybrids, and 1 - 2 lbs. of seed for the common bermudagrass. Late April or early May plantings establish best. However, later plantings should be quite suitable if the sprigs have 6 weeks in which to grow before frost.

Optimum temperature for growth is from 90 - 100°F, and it is not unusual to obtain complete coverage in 4 - 6 weeks. Fertilization is at 1 lb. nitrogen per 1,000 sq.ft. per week until coverage is obtained; then reduced to 1 - 2 lb.^N/per month during the growing season. The phosphorus and potassium should be maintained at medium and high, respectively, with a pH of the soil between 6.0 - 6.5. Experimental results indicate that applying proper rates of potassium 6 to 8 weeks prior to frost increases cold resistance.

The bermudagrasses should be cut to a height of 1 to 1.5 inches for football and similar type uses, and .25 to .50 inches for baseball infields and outfields. Heavy aerification is a must where heavy traffic has been encountered, beginning in the spring as soon as the grass starts to grow. Immediately follow the aerifier with the vertical mower to remove the thatch and break up the plugs, and then apply the maintenance fertilizer. The heavily used fields would benefit by both aerification and vertical mowing every 4 - 6 weeks during the summer. The turf should not be heavily cultivated 3 - 4 weeks before the first game.

Irrigate established stands only when the bermudagrass shows signs of wilting and discoloration due to lack of water. In general, it is not necessary to irrigate established football fields during summer if these fields are not used during this period.

The hybrid bermudagrass varieties are more sensitive to 2,4-D type chemicals than the common strain, and all varieties have moderate to severe root injury by pre-emergent crabgrass type chemicals. The stolons produce stubby roots at the nodes and fail to peg down.

Since the bermudagrasses become dormant and the tops turn brown with frost, many playing fields are overseeded with ryegrass at rates of 30 - 10 lbs./1,000 sq.ft. The general practice is to repeat seedings before or following heavy traffic. A difficulty with football fields, in particular, is the necessary delay in overseeding until cool weather (late September in the Upper South), so that the football season may be almost over before the overseeded grass makes much growth.

The use of a winter-lawn dye, when the grass has become dormant, has given very satisfactory results. Diluted 5:1 with water, sprayed in 3 directions requires 120 gallons for coverage. Materials may cost \$ 300 - \$ 400 and lasts most of the winter if properly applied and does not damage the grass.

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PURR-WICK ROOTZONES - SIX YEARS EXPERIENCE

Dr. W. H. Daniel, Purdue

The principles of water conservation and the practices of construction of PURR-WICK rootzones has been explained since the 1967 Conference. Recent changes include:

1. A higher 6 - 8" (even 10") vertical baffle between compartments minimizes siphoning between compacted sand areas. The older 4" earth mound was inadequate at times.
 - a. To accomplish this use 10" masonite strips held up by stakes - to get fallow contours.

- b. Consider driving strong stakes, then stretching a taut rope across at approximate contour line. Then, spread plastic and put in tubing for drains. Add sand and when loose full (so plastic is pinched upright between sand) loosen rope and pull out one side for reuse.
2. In economy installation, internal drainage from upper to lower compartments may be easier to install and save some time. The tubing leads to flanges at outer ends of internal barriers, which regulates outflow from compartment. The lower compartment has a regular drain in it as usual.

Recent research in Arizona (at Tuscon by Dr. Gordon Johnson), shows that recharge three weeks apart in direct weather to three months apart in cooler winter periods maintained turgid turf in plots underlined with plastic.

By the end of 1972 it is estimated over 100 greens have been constructed by the PURR-WICK method. The principles of uniform moisture at the surface continues to be the key value.

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CHEMICALS FOR TURF USAGE SYMPOSIUM - 2nd YEAR

Dr. W. H. Daniel, Purdue

The 40 attendees included -

T. R. Arntz	G. D. Donohue	S. Frazier	H. L. List	M. Rosener
J. Boswell	W. C. Duwe	W. T. Harden	P. F. Miller	G. Rosentreter
T. Brehob	W. Eckert	R. J. Harper	S. Miller	E. E. Schmitt
H. T. Coons	W. L. Eichott	N. J. Hoffherr	J. L. Morris	R. Simons
Pete Coval	E. Ensfield	J. R. Johnson	J. R. Odle	D. Sircy
R. Craig	M. L. Etchison	J. E. Joines	R. K. Odle	D. Smith
R. Delong	D. A. Eubank	K. A. Kraly	K. Reedy	G. Weideman
R. A. Denny	D. Foust	R. L. Kramer	R. Griggs	D. Whan

The objective was to utilize the educational program and University facilities to increase the chemical knowledge of attendees. There were 29 hours of lectures and attendance was required. Four tests each on a special subject provided a total of 233 questions.

Both commercial and Experiment Station literature was made available to the attendees so they received over 130 pieces of literature. These were passed out as segments with the appropriate lectures. The short course will be repeated again in January, 1974. In 1972 - 37 attended.

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