1976

TURF CONFERENCE PROCEEDINGS

Sponsored by the

MIDWEST REGIONAL TURF FOUNDATION

and

PURDUE UNIVERSITY .West Lafayette, Indiana

March 1-3, 1976

PROCEEDINGS OF THE
1976
MIDWEST REGIONAL TURF FOUNDATION

(Continued on page 2)

The 33 talks included in these Proceedings are condensations of talks by speakers before sections and divisions of the 1976 M.R.T.F. Conference. We appreciated the willingness of the speakers to participate and prepare material for your reading. Proceedings of each annual Conference since 1948 have been prepared. A limited number of 1971, 1973, 1974 and 1975 Proceedings are available at $2.00 per copy.

A copy of these Proceedings were mailed to:

The 710 attending the 1976 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
Department of Agronomy, Purdue University
West Lafayette, Indiana 47907

For Lawns - first see articles starting on pages -

15, 21, 31, 33, 37, 43, 44, 50, 54, 55, 57, 60, 63

For Golf Courses -

15, 18, 21, 22, 28, 31, 33, 37, 39a, 42, 44, 47, 49, 50, 54, 55, 57, 59, 60, 63, 66, 67, 69, 72, 74

MIDWEST REGIONAL TURF FOUNDATION MEMBERSHIP 1975

In prior years a special leaflet has reported membership. The listing below, organized by states, gives current support (1975), as well as the number of years of membership according to our records.

ILLINOIS:

Aurora C. C. , 28
Beverly C. C., Chicago, 20
Briarwood C. C., Deerfield, 17
Bryn Mawr C. C., Chicago, 15
Carmi C. C., 22
Catholic Cemeteries, Hillside, 16
Central Illinois G.C.S.A., St. Anne, 11
Champaign Co. For. Pres. Dist, Mahomet, 19
Chicago Heights C. C., 17
Cog Hill G.& C. C., Lemont, 29
C. C. of Peoria, 21
Crystal Lake C. C., 5
Danville C. C., 26
Geo. A. Davis, Inc., Chicago, 24
E. I. duPont, Chicago, 24
Edgebrook C. C., Sandwich, 5
Edgewood Valley C. C., LaGrange, 29
Exmoor C. C., Highland Park, 29
Flossmoor C. C., 29
Forest Hills C. C., Rockford, 29
Geneva G. C., 5
Glencoe G. C., 8
Green Acres C. C., Northbrook, 1
Greider Sod Farm, Carlock, 3
H & E Sod Nursery, Markham, 23
George Haddad, Park Forest, 3
Clifford Helwig, Naperville, 2
Highview Hills C.C., Washington, 1
Hinsdale G. C., Clarendon Hills, 1
Hinsdale Nurseries, 11
Idlewild C. C., Flossmoor, 4
Illini C. C., Springfield, 25
Illinois Lawn Equipment, Orland Park, 17
Inverness G. C., Palatine, 2
Bob Jordan, E. Peoria, 4
Kankakee C. C., 20
Knollwood Club, Lake Forest, 29
LaGrange C. C., 29
Lakeview C. C., Loda, 17
Lansing Sportsman's Club, 5
Lockhaven C. C., Alton, 24
Charles McKeown, Pekin, 2
Macomb C. C., 8
Mattoon G.& C.C., 17
James E. Maxwell, Springfield, 2
Medinah C. C., 27
Midlothian C. C., 29
Midwest Assoc. of G.C.S., Arlington Hts., 21
Paul F. Miller, Carterville, 4
Mt. Emblem Cemetery Assoc, Elmhurst, 23
Mueller Sod Nursery, Ontarioville, 16
Northmoor C. C., Highland Park 29
North Shore C. C., Glenview, 29
Oak Park C. C., 28
Olympia Fields C. C., 29
Onwentsia Club, Lake Forest, 18
Robert F. Parmley, Elk Grove Village, 4
Permalawn, Inc., Evanston, 18
Pontiac Elks, 10
Prestwick C. C., Frankfort, 9
Ridgemoor C. C., Chicago, 25
Riverside G. C., 23
Roseman Mower Corp., Glenview, 22
Seaboard Seed Co., Bristol, 5
Sears, Roebuck & Co., Chicago, 15
Shoreacres, Lake Bluff, 29
Leon Short & Sons, E. Peoria, 9
Silver Lake G. C., Orland Park, 29
Sportsman C. C., Northbrook, 14
St. Clair C. C., Belleville, 11
Jay Strasma, Hoopeston, 6
Sunset Ridge C. C., Northbrook, 28
Thornton's Turf Nursery, Elgin, 9
Timber Trails C. C., LaGrange, 27
University of Chicago, 8
Velsicol Chem. Corp.,Chicago, 16
Wadsworth Co., Plainfield, 16
Warren's Turf Nursery, Palos Park, 17
Westmoreland C. C., Wilmette, 29
Woodward Governor Co., Rockford, 22

INDIANA:

American Legion G.C., New Castle, 12
Anderson C. C., 22
Julian E. Baggett, Indianapolis, 1
Ball State Univ., Muncie, 7
Randy A. Ballinger, Upland, 2
Beeson Park G.C., Winchester, 4
Blackford G.C., Hartford City, 25
Board of Park Comm., Evansville, 20
Board of Park Comm., Ft. Wayne, 20
Tom Brehob, Plainfield, 4
Broadmoor C. C., Indianapolis, 29
Brookshire G.C., Carmel, 5
Chester, Inc., Valparaiso, 17
Clearcrest C. C., Evansville, 23
Connersville C.C., 27
C. C. of Indianapolis, 29
C. C. of Terre Haute, 22

INDIANA: (cont.)

Crooked Stick G. C., Carmel, 5
Culver Military Acad. G.C., 11
Cyclone Seeder Co., Urbana, 8
Decatur G.C., 3
Dearborn C.C., Aurora, 13
Delaware C.C., Muncie, 29
Desco Chemical Co., Nappanee, 10
Edgewood C.C., Anderson, 25
Elanco Products Co., Indianapolis, 10
Elks C.C., Plainfield, 12
Elks #649, Richmond, 13
Evansville C.C., 26
Evansville Dept. of Parks, 19
Forest Hills C.C., Richmond, 7
Forest Park G.C., Noblesville, 12
Forest Park G.C., Valparaiso, 8
Fort Wayne C.C., 28
Frankfort C.C., 25
French Lick Sheraton Hotel G.C., 6
Friendswood G.C., Camby, 8
Gary C.C., Merrillville, 29
Green Acres Sod Farm, Columbia City, 8
Greenhurst C.C., Auburn, 14
Greensburg C.C., 12
Harrison Lake C.C., Columbus, 22
Hillcrest C.C., Indianapolis, 29
Highland G. & C.C., Indianapolis, 27
Huber Ranch Sod Nursery, Schneider, 6
Indiana Farm Bureau Co-op, Mt. Vernon, 14
Indiana G.C.S.A., Carmel, 17
Indiana Univ. G.C., Bloomington, 15
Jansen Landscaping, Elkhart, 3
Kenney Machinery Corp., Indianapolis, 24
Richard Kercher, Goshen, 2
Gary Kern, Carmel, 1
Killbuck Rec. Assoc., Anderson, 10
Kokomo C. C., 28
Knox Fert. & Chem. Co., 5
Lafayette C.C., 28
LaGrange C.C., 1
L. C. Lane, Lafayette, 1
Maplecrest C.C., Goshen, 14
Mead Johnson & Co., Evansville, 10
Meridian Hills C.C., Indianapolis, 29
Meshingomesia C.C., Marion, 29
Michigan City Mun. G. C., 21
Martinsville C.C., 14
New Albany C.C., 22
Old Oakland G.C., Indianapolis, 17
Old Orchard G.C., Elkhart, 9
Otter Creek G.C., Columbus, 11
Pine Woods G.C., Spencer, 2
Pottawattomie C.C., Michigan City, 24
Riley Lawn & Golf Equip., Indpls., 23
Robbinhurst G.C., Valparaiso, 2
Rolling Hills C.C., Newburgh, 17
Seymour Elks Club, 1
South Bend C.C., 17
Speedway '500' G.C., Indianapolis, 14
Sycamore Spring G.C., Indianapolis, 7
Swan Lake G.C., Plymouth, 6
Tippecanoe C.C., Monticello, 14
Tri-State G.C.S.A., Mt. Vernon, 2
USS Agri-Chemicals, Jeffersonville, 18
Valparaiso G.C., 25
Vincennes Elks C.C., 15
Washington C. C., 12
Western Hills C.C., Mt. Vernon, 12
Wicker Park C.C., Highland, 13
Woodland C.C., Carmel, 22
Woodmar C. C., Hammond, 20
Youche C. C., Crown Point, 20

KENTUCKY:

Audubon C.C., Louisville, 29
Big Springs C.C., Louisville, 28
Harmony Landing C.C., Goshen, 18
Geo. W. Hill & Co., Florence, 14
Hunting Creek C.C., Prospect, 6
Hurstbourne C.C., Louisville, 5
Irrigation Supply Co., Louisville, 7
Ky-Inna Turf Supply, Louisville, 3
Louisville C.C., 25
Met. Park & Rec.Board, Louisville, 13
Millery, Wihry & Lee, Louisville, 3
Owensboro C.C., 14
Standard C.C., Louisville, 27
Summit Hills G.&.C.C., Ft.Mitchell, 8

MICHIGAN:

Bay City C.C., 14
C.C. of Detroit, 29
Dearborn C.C., 9
Detroit G.C., 17
Down River Lawn Serv., Trenton, 16
Flint G.C., 29
E. Johanningsmeier, S. Lyon, 6
Maple Lane G.C., Sterling Hts., 29

MICHIGAN: (cont.)

A. J. Miller Inc., Royal Oak, 2
Oakland Hills C. C., Birmingham, 9
Orchard Lake C.C., 18
Point O'Woods G & C.C., Benton Harbor, 11
Tam-O-Shanter C. C., Orchard Lake, 7
TUCO, Div. of Upjohn Co., Kalamazoo, 26
Wilkie Turf Equip. Co., Pontiac, 4

MISSOURI:

Bellerive C. C., Creve Coeur, 15
Beckmann Turf & Irr. Supply, Chesterfield, 2
Bogey Hills G.& C.C., St. Charles, 5
City of St. Louis, Div. of Parks, 22
Glen Echo C. C., Normandy, 29
Lakewood G. C., Fenton, 4
Link's Nursery, St. Louis, 24
Mallinckrodt Chemical Co., Hazelwood, 24
Meadowbrook C. C., Ballwin, 27
Miss. Valley G.C.S.A., St. Charles, 22
St. Ann's G. C., 4
St. Andrew's G. C., St. Charles, 2
Westborough C. C., St. Louis, 22
Westwood C. C., St. Louis, 25

OHIO:

Arrowhead Park G. C., Minster, 5
Beechmont C. C., Cleveland, 29
W. L. Braverman, Cleveland, 10
B.P.O.Elks #93, Hamilton, 6
Brown's Run C.C. , Middleton, 18
Camargo Club, Cincinnati, 16
Cemetery of Spring Grove, Cincinnati, 29
Century Toro Dist., Toledo, 14
Chillicothe C. C., 14
Cincinnati C. C., 28
City of Dayton, 3
Clovernook C. C., Cincinnati, 29
Columbia Hills C. C.,Columbia Station, 3
Columbus C. C., 29
Country Club, Inc, Pepper Pike, 27
Crest Hills C. C., Cincinnati, 26
Dayton Power & Light, 23
Sidney L. Dryfoos Co., Cleveland,27
Edgecreek G. C., Van Wert, 12
Edgewood G. C., N. Canton, 20
Elyria C. C., 16
Findlay C. C., 19
Firestone C. C., Akron, 29
Gate of Heaven Cemetery, Cincinnati, 25
Stephen K. Gipson, Chesterland, 6
Glengarry C. C., Holland, 22

OHIO: (cont.)

Golden Tee, Inc., Cincinnati, 10
Golf, Inc., Vermilion, 12
Greater Cincinnati G.C.S.A., 19
Greene C. C., Fairborn, 5
Hartwell G. C., Cincinnati, 24
Highland Meadows G. C., Sylvania, 7
Arthur Hills, Toledo, 6
Hyde Park G. & C. C., Cincinnati, 28
Inverness Club, Toledo, 25
Ironton C. C., 19
Kenwood C. C., Cincinnati, 29
Kunz Lawn & Garden Center, Dayton, 19
Lakeshore Equip. & Supp., Elyria, 7
Lander Haven C. C. Mayfield Hts., 18
Little Turtle Club, Columbus, 2
Losantiville C. C., Cincinnati, 29
Lyon's Den Golf, Canal Fulton, 25
Maketewah C. C., Cincinnati, 22
Mayfield C. C., S. Euclid, 15
Robert C. Meier, Jr., Cincinnati, 19
Moraine C. C., Dayton, 28
Mr. Green Corp., Fairfield, 1
Harry Murray, Lebanon, 5
NCR Emp. Ben. Assoc., Dayton, 20
Jack Nicklaus Golf Center, Mason, 1
N. Ohio G. C. S. A., Westfield Ctr., 26
Oakwood Club, Cleveland Hts., 28
Ohio St. Un. G. C., Columbus, 28
Ohio Toro Co., Cleveland, 27
Piqua C. C., 21
Rawiga C. C., Seville, 2
Scioto C. C., Columbus, 28
O.M. Scott & Sons, Marysville, 24
Shawnee C. C., Lima, 22
Springfield C. C., 6
Richard Stone's Landsc.,Willoughby, 12
Sylvania C.C., 7
Tri-County Turf, Maineville, 6
Valleywood G. C., Swanton, 4
Walnut Grove C.C., Dayton, 19
Western Hills C. C., Cincinnati, 14
Wildwood G. C., Middletown, 6
Wyoming G. C., 28

WISCONSIN:

Blue Mound G. & C.C., Wauwatosa, 8
Horner Farms, Inc., Union Grove, 11
Loft-Kellogg Seed Co., Milwaukee, 3
Milwaukee C. C., 14
North Hills C. C., Menomonee Falls, 14
Sewerage Comm, City of Milwaukee, 22
Somers Landscaping, Stevens Point, 2
Stevens Point C. C., 17
Wisconsin G.C.S.A., Milwaukee, 20

OUTSIDE MIDWEST:

Aquatrols Corp. of Amer., Delair, NJ, 9
Agrico-The Bishop Co., Lebanon, PA, 19
Diamond Shamrock Corp., Des Moines, IA, 8
R. M. Duke, Englewood, FL, 4
Bob Dunning, Shawnee Mission, KS, 16
Harold W. Glissmann, Omaha, NE, 18
W. C. LeCroy, Mt. Airy, MD, 2
Miracle Hill G. C., Omaha, NE, 14
Mock Corp., Pittsburg, PA, 12
Northrup-King & Co., Minneapolis, MN, 23
The Toro Co., Minneapolis, MN, 26
Vaughn-Jacklin Seed Co., Spokane, WN, 9

305 in 1975, apeak of 385 in 1962

PRESIDENT'S REPORT

John Spodnik, Supt., Westfield C.C.
Westfield Center, O.

Continued success can only be accomplished through good planning and hard work. We are most fortunate in having a dedicated Executive Secretary, therefore, I would be amiss if an expression of deep administration and appreciation was not extended to Dr. Bill Daniel and his staff for the exceptional job they have done in the administration of the Midwest Regional Turf Foundation. Any present or past member of the Board of Directors can attest to the fact that serving on the MRTF is most enjoyable, with responsibilities designed primarily to guide and plan for progressive growth of the Foundation.

The educational sessions that have been presented at Purdue over the past forty years have been professionally beneficial to thousands in the turf industry. In order to duplicate such an effort in the future we urge all of you to support the Foundation whenever and wherever you can.... Please stimulate more interest in your local area by contacting prospective members, or try generating funds to contribute to the research program.... Use your imagination.... Get involved.... This is your Foundation.... Your participation is "what it's all about."

Humbly I will accept a place on the Honor Roll of our industrious past presidents, but it will be with a sense of pride that I rededicate myself to the continued success of the Midwest Regional Turf Foundation. Thank you for your confidence and direction in 1975.

- - - - - - - - -

QUITE A STORY - THE MIDWEST REGIONAL TURF FOUNDATION

W. H. Daniel, Executive Secretary
Purdue University

In 1946 it was receiving first membership. In 1963 it reached a peak of 385 memberships. In 1976 it continues to serve as a regional turf resource.

The first Conference (of which we have records) was in 1937. Now the Indiana golf course people (greenskeepers) had prior meetings, but our record is blank. Mr. Mert Clevitt of the Physical Education Department organized the program in 1937. Attendance of 37 included Illinois, Kentucky, Michigan and Ohio.

Attendance grew to over 100 before World War II interrupted and changed as that dynamic thought leader, Dr. George Scarseth of the Agronomy Department, took the program towards research.

In 1942 no program was held as the war effort, gas shortage and lack of priority was evident. But, the need was evident too, so in 1943 a meeting was held for 55 - then up to 150 came in 1945.

During 1944 and early 1945 plans were formulated to form a non-profit foundation for research support. Dr. Gerald Mott came to Purdue in 1943 for grass forage interests, and had a war time research on gravel-turf runways for airports.

So, Carl Bretzlaff, Superintendent of Meridian Hills C.C. of Indianapolis, Al Brandon, Editor of Golf Course Superintendents Magazine, Joe Graffis of Golfdom, Cliff Runyan of Cincinnati, and George Donahue of the Chicago Parks Department were the first Board.

In 1946, the first year of MRTF, 126 memberships were paid. Graduate students used the funds to research new information. Dick Davis, Don Likes, and Willis Skurdla were the early ones.

Attendance expanded up to near 300 during the late 40's. A strong force was Dr. Fred Grau's push for turf research around the country. And for Bill Daniel it was thus. MRTF joint-sponsored a PhD study at Michigan State University, so 1948-50 under Dr. James Tyson and Carter Harrison, my <u>life</u> turned to turf.

In 1950 the part-time turf work of Dr. Mott was expanded. Oh so well I recall Carl Bretzlaff being at the job interview and his enthusiasm and support. Quite naturally I was available, having been trained on MRTF funds. Dr. J. B. Peterson, Head of the Agronomy Department, asked me to come by May 1, 1950, and to be full time turf research, extension and teaching. So, for 26 years of my life has literally been your Midwest Regional Turf Foundation since the Executive Secretary is the active position.

During the 50's membership moved up to over 300 and attendance at Turf Conferences expanded to over 500. In the 60's the attendance averaged over 600 and membership peaked at 385. During the 70's attendance has been over 700 each year.

Now adjacent states have strongly increased their programs and developed in-state foundations and councils. What a fine thing, for our current busyness would be compounded by excessive demand.

A special thanks to all those who have continuously supported the MRTF year after year. The original concept of a strong research program has been a continued goal. We have published less than we might. However, through Conference Proceedings, Field Day Reports, and writing for magazines it has been possible to move ideas out.

- - - - - - - - - -

<u>ONE MAN'S M.R.T.F.</u>

Harold Glissmann, Pres., Harold W. Glissmann, Inc.
Omaha, Nebr.

One Man's M.R.T.F. is a fine headline as far as I am concerned. As many of you in the audience know that have been up here, or at some podium, we don't always agree with the program chairman's assigned title - but this is down my alley.

It may not interest all of you, and I am not going to try and reach you older members and guests. I am going to try, in the next few minutes, to reach you younger people. I have enjoyed putting this talk together and hope that it will stimulate and encourage a few of you out there. If, when I am finished, any of you take home one word or phrase that would help you, I shall be well paid for my effort and time.

First of all, this country boy never graduated from high school, was born and raised on a dairy farm that was later turned into a golf course, and the dairy barn turned into the club house, and it's really true.

Does everybody here know what MRTF stands for? It doesn't stand for My Right to Freedom - it stands for Midwest Regional Turf Foundation. To me, MRTF has almost been a religion, but not entirely. I am a Deacon in the Presbyterian Church, and have served two terms as President of the Board of Trustees. I don't have a certificate for perfect attendance at public schools, but did have a record of perfect attendance at Sunday School.

Sincerely, the MRTF has been a great part of my life over the last 30 years, give or take a few. Gerry Mott and his associates were responsible for the beginning of MRTF. A few who were or still are, very close personal friends and were a part of the start of this Turf Foundation include: Carl Bretzlaff, Taylor Boyd (Dick Craig's father-in-law), Pete Coval, Herb Graffis, Al Linkogel, and we can't forget Mal McLaren, Frank Dunlap, Clarence Wolfrom, Cliff Runyan, and Father Miller who became active after Cliff Runyan passed on. Also, memories include the night Joe Graffis and I caught a train for Chicago at about 1:30 in the morning and the train was full of New York peddlers, all selling different clothes, hats, guns and what-have-you to outfit the kids as the Lone Ranger. I guarantee you we didn't get any sleep that night; in fact, we were scared to go to sleep.

What a pleasure to recall the great meetings in my room with O.J. Noer, Burt Musser, Marshall Farnham, Chet Mendenhall, Marvin Ferguson, Charlie Wilson, Bill Daniel and Bill Glover, to name but a few. And, think of the long tradition of Bill Lyons' room with his great cheeses, apples and whatever you might want, to keep you from thirsting to death! One night I had seven people sleeping in my room, but that was before they built the annex. Anyhow, now we have more rooms to sleep in and it's a good thing as much as this Conference has grown. The peddlers had their room downtown at the Fowler Hotel as it was <u>not socially accepted</u> to have any spirits at the Union. If you did sneak some in you couldn't get any ice or glasses.

It was always a good evening as O.J. and Dr. Grau didn't always see eye to eye in this turf business, especially after Fred went to work for Hercules. Another old timer I remember was George Hoffer with the American Potash Institute, and we can't forget the Mighty Mouse, Tom Mascaro, and that machine he showed here years ago called an Aerifier. A lot of superintendents said no way am I going to put that damn thing on my nice greens and tees.

The early speakers were my close friends - O. J Noer and Uncle Burt Musser, and my childhood neighbor, Dr. Fred Grau, to mention but a few. At the first meeting I attended in 1939 or 1940 there were less than 50 people in attendance. We always had our pictures taken on Tuesday A.M. in front of Fowler Hall which stood about where the regis-

tration lobby is located now. It has grown from about 50 to over 700 in attendance, and I am sure we will reach that number again this week.

The MRTF is without any doubt in my mind the King of the Hill when it comes to turf conferences. I have missed very few here at Purdue - a few during World War II days. I am sure my batting average for attendance is over 800, and that's not bad for someone who must travel over 1300 miles for the round trip. I never had my expenses paid by my organization as many of you out there do. Only during the years I was Superintendent at Boys Town did I go at their expense.

As I mentioned earlier, I am trying to reach the "Young Turks." Any of you who are not past 40 years of age, so that when you reach 66, you might have something to say about what the MRTF has done for you.

I have been honored to appear on the MRTF program many times, to serve on your Board of Directors, and Master of Ceremonies at our banquet, and last but not least to receive the MRTF plaque in 1974 which was a highlight in my life, and to those of you here that were responsible for this honor I again say "thank you"from the bottom of my heart.

Another highlight of my years here was being able to call Dr. Peterson about 10 years ago and ask him if I could get a former employee of mine in Graduate School. The young man was Melvin Hansen. When I got the O.K. from Dr. Peterson, Mel still had about 60 days to serve as a lieutenant in the Navy, but that didn't stop me. I got in touch with our two U.S. Senators and they arranged to have him discharged 45 days early, and Dr. Peterson okayed his late arrival for the fall term. Mel graduated from here under Dr. Daniel, and wrote his Thesis on soil amendments. I made the mistake in the fall that he graduated - while attending a Field Day and Board meeting - of introducing him to a fellow Board member who was a representative for the Upjohn Co. Mel is now "Mr. Big" for Upjohn in the western United States area, and I have been told he will go to the top.

Probably the number one reason I can give this talk honestly and sincerely is my attendance at a field day in Beltsville, Maryland, as many years ago, in fact, as Bill Daniel has been here at Purdue, and that's a "fur piece" of time. Dr. Bill had just finished at Michigan State and I am sure it was one of his early field days. Dr. Bill took me to the National Airpot enroute to his coming here to Purdue, so we have been friends for quite a period of time.

In a "so-called" keynote speech I gave from this podium two years ago, I talked a good deal about the "Old Pros," but today it's Young Turks and One Man's MRTF. What really gives me as great a thrill today is to come back here for Field Days, Board meetings and Conferences and see and get to know and become friends with turf students who have graduated from here under Dr. Bill. Some graduate students are: Norm Goetze now at Oregon State; Jim Beard, at Texas A & M; Bill Lobenstein, at Missouri; Ray Freeborg, who is helping Dr. Bill; and Dave Ralston, now in Louisville.

Undergraduates that come to mind are: Ted Woehrle, Steve Frazier, Charlie Tadge, Don Likes, Hobe Burgan, Buzz Lewis, Dave Fearis, Gene Johanningsmeier, Dave Harmon, Don Clemans. Last, but not least, to see Kaye House, our beloved secretary for many years before she retired, and Bob Seager, Dr. Bill's right hand man for many years, who could always find time in his busy day to get me to the Airport.

Another thought about One Man's MRTF is being able to see years ago more bluegrass seed harvested within a 200 mile radius of my home in Nebraska than any place in the world. Then see it move completely to Oregon and Washington and grown like regular row crops under restricted and inspected conditions.

And, the finding of Merion has expanded to 50 plus bluegrass varieties we have to select from today. Also, the change from push-type mowers, greens' and trimming, and others to the modern 3-gang riders, and 9 - 11-gang self-contained fairway mowers. The first mower I ever used was a 3-gang fairway unit puled by 3 horses. National Mower had pictures of that at the Minneapolis show.

One Man's MRTF must include the three D's - Desire, Dedication, and Determination, plus by all means, Motivation to keep attending conferences and field days. Seriously, after you get to be 66 years old and have attended conferences and field days for over 50 years, you really don't go to them to get any SMARTS. You attend to renew old friendships and try to make a few new ones. Honestly, that's why I am here today, and will continue to come here as long as the good Lord allows.

Talking about friends, I earlier mentioned Carl Bretzlaff, bless his soul. Carl was a fine a man as I ever hope to know. I could stand here and reminisce about our times together and what he did for the MRTF. Some place, somewhere I would like to see a plaque dedicated to this great gentleman and golf course superintendent extraordinary. Why don't some of you Old Pros give that a little thought? I will start the ball rolling with a donation if anyone gets it started, A good place for it would be at his old golf course club house.

Another part of One Man's MRTF is this Conference has helped me to help other areas to have good conferences. Here at MRTF we try to run on time. The feeling you receive from being a speaker is great - you are given the best cooperation and facilities that one could ask for. The pay for this speech is not good,but if I was interested in money I would not have spent most of my lifetime trying to grow grass and attend field days, conferences, and national shows. However, I have been rewarded many times over what it has cost me. I have had my day and now I am enjoying it.

The license plate on my new car tells everybody what I have been interested in most of my life - all that is on it is TURF - 1976. So, will close with this little graffitti - I'm not a failure, I just started at the bottom and I liked it there! Thanks for listening!

- - - - - - - - - -

PARKS AND RECREATION -- A WORLD-WIDE PERSPECTIVE

James A. Peterson, Associate Professor-Indiana University
Recreation & Park Specialist-Purdue University

Thanks to my colleagues at Indiana and Purdue Universities I have

been privileged to do what no other park and recreation professional has had the opportunity to do--to circle the globe with the sole purpose of investigating park and recreation facilities and programs.

My greatest problem today is how to condense into 40 minutes a trip that took two years to plan, 6 months to execute, covered over 33,000 miles in 19 countries, produced 60 pages of single-spaced typewritten notes, wore out three pairs of shoes, and would have tried the patience of Job. The obvious answer is that it cannot be done. So, sit back, relax and we will attempt to cover some of the highlights of a most unusual trip.

I wish I could portray to you a world at play, one that is consumed by its efforts to find the true meaning of life through the constructive use of leisure. I am sorry, but I cannot do that. I will tell you about, and show you pictures of some exciting and innovative developments in the park and recreation field throughout the world and of isolated breakthroughs that will benefit mankind in his search for the good life. However, my first general impression of the world I saw was one that was a bit more troubled than one at play.

Of course, we have our problems - take your pick, Watergate, racism, run-away inflation, drugs, ad infinitum. Other countries have problems just as serious. As I traveled through England, for example, I found a great deal of unrest over the Indian and Pakistan immigration problems. All I have to do is mention Ireland and you can quickly identify religious strife, civil strife, economic doldrums of the first order and pollution of a magnitude that we seldom find. The Liddy River running through the heart of Dublin is a sewer and stinks like one. In Sweden, as in all Scandanavian countries, the people are upset with too much welfarism and excessive taxes running to 50% of salaries and wages for the average worker. In Germany, it's the Romanian, Italian and Yugoslovian labor problem that is easily identifiable. Holland is greatly concerned over the Indonesian immigration problems of jobs and housing. Ironcially many of these people note how much more serious they think our racial problems are than theirs.

I could go on and on with troubles in Greece, and the mid-East,or with the excruciatingly painful problems of the emerging nations of Afghanistan and India which far outweigh those just mentioned. But, enough is enough and you didn't come here to listen to a discussion of world problems.

This does lead me, however, to my first general observation and it concerns my American citizenship, and how very fortunate I feel to be an American. Our way of government may be cumbersome and frustrating at times, but I'm convinced more than ever that we are fortunate indeed to live in America. Our self-cleansing democracy is, in my opinion, far superior to anything that I have seen in 19 other countries, and I wouldn't trade America for any one of them or all 19 put together. Now, after that rather somber beginning, let's turn to more of what you might have expected to hear and see.

I found much beauty in the world, some even created by man, but most created in the beginning by an incomprehensible power far beyond my ability to understand. There are magnificent scenes of beauty to be found everywhere and I will share some of those scenes with you in just a little while.

I also found my share of ugliness and deprivation in the world and I will contribute that to powers we can identify, even if we cannot comprehend them. Those powers are man himself. Most of the ugliness in the world I saw is the result of man's insensitivity to man. I suppose we could call it a monument to his avarice, cupidity and greed. Hey! I'm getting negative again, aren't I? I really don't mean to and now that I have it off my chest for a second time I promise not to dwell on it again. Maybe mention, but not dwell on it.

Overall, I was pleased with the concerted efforts being directed toward open space problems, land use problems, master planning for parks and recreation and the high level of professional skills of those responsible for the work, even in the emerging nations.

Essentially, in this study, I was concentrating on four main areas which were of particular interest and value to me. First, I concentrated on open space standards relating to new towns and satellite communities.

Secondly, I was interested in the administrative aspects of how park and recreation departments are operated in other places, and in their design and development techniques, particularly the creative and innovative features, that might have some application here in the states. In addition, I gathered information for a pictoral and historical perspective on the early development of the park movement. Thirdly, I wanted to investigate recreational programming with the thought of looking for new ideas and concepts. Lastly, I visited private and commercial recreation enterprises, such as campgrounds and amusement parks, with the purpose in mind of using the material gathered in my teaching and consulting work for the universities.

In trying to find an orderly and rational system of reporting to you and to keep us from wandering aimlessly all over the world, I will concentrate on the public park and recreation phase of the study and leave the rest for another time and place.

FOLLOWING THESE INTRODUCTORY REMARKS MR. PETERSON SHOWED 364 SLIDES FROM 19 EUROPEAN AND ASIAN COUNTRIES. THE REMARKS THAT FOLLOW ARE HIGHLIGHTS OF THE DISCUSSION DURING THE SLIDE PORTION OF THE PROGRAM.

<u>First to Great Britain -- Gardens, Parks, Sport Facilities</u>

<u>New Town-Stevenage</u>: This was my first visit to what eventually would be 15 or more new towns or satellite communities throughout the world. I was disapppointed. I couldn't help think how I would feel if I had to live there. I found this particular new town, which incidentally was suggested as a good example, to be sterile, dull and unimaginative in its design and layout, and suffering from a sickness in planning--what I call "sameness." Honestly, it wasn't much different from the ugly row houses in old London or old Baltimore for that matter. In fact; there appears to be more joy of living in the older sections of London than in some of the so-called "new towns." Given a choice, many people would elect to stay where they are rather than suffer the shock that moving from the familiar to the unfamiliar causes. The planner who took me around told me, when I asked him about standards for open space, that they had to plan space for cars, but not for playgrounds and open space. I was appalled. Essentially, I think this new town suffers from -

1. Too much government control
2. Sameness of design, probably due to government control.
3. Not enough stratification in their population distribution
4. Insufficient attention to the factors that tend to humanize life in such areas.

Even though we, as park and recreation professionals, tend to look at a city from a singleness of purpose, we must be ever mindful of the whole of human life and constantly be aware of the inexhaustible variety of factors affecting life as lived in a city. I sincerely hope that in our attempts to develop new towns and satellite communities, we can take advantage of England's mistakes.

Royal Botanic Gardens at Kew: Essentially the gardens are for educational and research purposes, but they are open to the public. It is a magnificent garden and a must for any park and recreation visitor to London.

Sport Center Guildford: I traveled about 30 miles outside London to visit a typical sports center. It's comparable to what we call a community center only when they say sport that's what they mean. The building cost over $7 million, has a full-time staff of 42 people, including 24 sports assistants. Their annual budget is 100,000 pounds, or approximately $250,000. Their income almost equals that. They have a 33 1/3 meter indoor pool with separate diving well, a teaching pool, gym, squash courts and a restaurant and bar. There are two public baths, a large sauna that holds at least 15-20 lawn chairs with piped-in music. It's built as a family center and really used as such. They pick up where the National Sports Centers leave off. My only complaint is that their concept of programming is rather narrow. It could, in my opinion, be much more appealing to the total community if they would provide some activities in the fine arts.

Greater London Council Department of Parks: This organization reminded me of the Chicago Park District in size and composition. They do not maintain the Royal Parks, but are responsible for some 6,000 acres of land. Totally there are 41,000 acres of parks in the Greater London area for a 5.5 acres per thousand average, one of the best in the world. I'll only mention one of many creative programs they pioneered. It's called the one o'clock clubs for children up to five years of age. This child must be accompanied by a parent or guardian, a nursery school type program is offered free of charge by department staff, very popular.

Most of my time in Ireland was spent with men from the Ireland National Parks and Monuments Department and the Dublin City Parks and Recreation Department. I visited Phoenix Park (2,760 acres) which is reported to be the largest in-city park in the world. It is managed and maintained by the National Park system. There are several deer herds that roam freely in the park, and it contains the President's residence as well as the residence of our U. S. Ambassador.

Dublin: A city of 750,000 population has only 4,000 acres of park land, .05 acres per thousand, and over half of that, Phoenix Park, with 2,760 acres, is operated by the National Park system. I was disappointed in Dublin. I did take time to see some of the Irish countryside, but I regret I did not have time to see the beautiful country in the south and west of Ireland.

Scotland-Glasgow: I could spend two hours talking to you about Scotland. Here is a country on the move. I was privileged to have an extensive look at the Glasgow Park Department which was one of the finest I have visited anywhere. This city of 900,000 maintains over 7,000 acres of park land, including a 200 acre park at Loch Lomond approximately 20 miles from Glasgow. I will show you several slides from Glasgow, most notably their flower beds, and a stone quarry that was converted into a beautiful rock garden. Glasgow is in the heart of the Scottish industrial belt, but this old city has been made a comfortable place in which to live by the efforts of a very progressive park department.

Ayr, Scotland: Another very impressive city, alive with color, it was named Britain's floral town in 1972 and hopes to repeat the honor in 1973. For you golf nuts, there are 3 public courses in Ayr and 30 others within a few miles (their standard for golf courses in Scotland is one course for each 16,000 population). Ayr is on the west coast of Scotland.

Edinburgh, Scotland: Here I will concentrate on a most unusual facility, the Hillend Ski Centre. The divided ski slope is 400 meters in length, and is served by a chair lift 350 meters long. The material is made of a nylon substance called Dendix which provides a very good skiing surface.

The Scandinavian countries are quite advanced in the park and recreation field and we have much in common with their professionals. The train ride from Bergen to Oslo takes you through some extraordinarily beautiful country. At these northern latitudes you reach the timber line at about 3,500 ft.

I will concentrate on two or three items that may have some application here. First, in Stockholm their chief engineer showed me an unusual system for purifying lake water and opening a beach that had been closed for about fifteen years. They have developed the technique of creating a wall of air bubbles around the swimming beach which acts as a buffer against pollution from the main body of water. They also introduce chlorine through the system to bring the water up to safe swimming standards.

Of course, the Scandinavians are great on physical recreation and you can find more jogging trails, cross-country skiing trails, exercise stations than in any other place in the world. This hill was made artificially for a variety of recreational activities. If you have a downtown park and don't know what to do with it, try some of these ideas.

Near Helsinki is the "New Town" of Tapiolia - in my opinion one of the most livable of all the new towns or satellite communities I saw. The combination of high rise, low rise and single family units with generous amounts of open space made a world of difference. As you can see, the Scandinavian has a little more imagination and creativity in their development of new housing areas.

Stockholm Archipelago: Once in Scandinavia you must stop in Copenhagen or you will have missed where most of the action is, according to the college crowd at least. The most photographed mermaid in the world "Langelinie" is there, plus the fabulous Tivoli Gardens. This is the granddaddy of amusement parks. I spent hours wandering around its 20 acres, enjoying some of the 20 restaurants, the free shows, the beautiful flowers, the colored lights and people watching. They accommodate 5 million visitors during the summer months, as many as Disneyland handles in 12 months. An exiciting experience, one not to be missed in Copenhagen.

Hamburg, Germany: I stopped in Hamburg to attend the International Horticulture Exhibition and these pictures will show you why I was elated about the stop. I saw more creative playground equipment and flower displays than I ever hope to see again in one place. The exhibit was called "Planten un Blomen" and I think you can see why, and mind you this was the last of August which is not normally the best time for this type of display. Earlier in the spring they had 400,000 tulips and 70,000 pansies displayed in a festival of color.

I spent the next month traveling throughout Germany, Holland and Switzerland and will show you just a few slides from that experience.

Zurich: The Robinson Playground Movement

Munich: Olympic Grounds, Botanical Gardens

Garmisch-Partenkirchen, Germany: slides, mountains, castles and Garmisch-Partenkirchen.

Italy: Venice -- I was disappointed. I found very little in the way of public parks and would not get any clues to the Italian's park design capabilities until I arrived in Florence and Rome. Unless you are absolutely hung-up on seeing the canal phenomenon, I would suggest that you say away from Venice.

Florence: Oh, yes! You must go to Florence if you are in Italy. In fact, skip all the rest and spend your time there. This was the home town of Dante, Leonardo da Vinci, Michelangelo, Cellini, Machiavelli, and many other great artists and scholars. Michelangelo's original "David" is here, as well as many of the master's originals.

My main purpose though in coming here was to study the piazzas, park and villas for hints of our early park heritage. My first real find was the Giardino di Boboli. These beautifully terraced grounds are part of the Pitti Palace and is one of the most characteristic examples of Italian formal gardening. The Boboli has sloping paths, broad tree-lined avenues, hundreds of statues, secluded nooks, flower beds, an ampitheatre still used in the summer, and an extraordinary view of the city. In fact, during my tour of the property I was delayed in a gazebo overlooking the city for an hour while a rather violent early autumn electrical storm passed over. The highlight of the gardens is a circular pond at the end of a long tree and statue lined avenue with a beautiful island in the middle of the pond complete with minature orange trees in tubs and of course another statue. There is also the famous Neptune statue and pond by Grambologna on the property. The garden was commissioned by Eleonora da Toledo, the Spanish wife of Cosimo I.

Rome: I spent one week in the "Eternal City" and would not select it as my favorite large city. The traffic congestion and noise is unbelievable. Here are a few scenes from that very crowded city.

Tivoli and the Villa D'Este: After spending a day in Tivoli, Italy, at the Villa D'Este where there are 50 fountains, 255 waterfalls and 100 ponds that all function without the aid of any mechanical pumps (gravity flow only) I take my hat off to these fine craftsmen who are among the most talented in the world. Tivoli is an ancient city about 20 miles from Rome, and the Villa D'Este was started by Cardinal Ippolito II D'Este in 1550. It can be cited as one of the finest examples of the residences of Renaissance Princes, of that period of elegance when the

home performed not only the role of a dweller, but was also an artistic and cultural center in which, under the patronage of the owner, scholars, musicians, painters and writers could meet.

The garden was designed by architect Pirro Ligario who introduced a new concept in this design which basically stated that the garden should not be considered an element in itself - it should be complementary to and an integral part of the house and that it should be conceived as an architectural composition. Ligario followed this concept and incorporated into the landscape the canons of geometry, perspective and architecture so characteristic of the Italian Garden, such as sloping paths, tree and shrub-lined avenues, and in this particular garden, the fantastic water displays. Therefore, this garden has many of the characteristics I described earlier when commenting on the Boboli Gardens in Florence. To supply the water necessary for the fountains, waterfalls and ponds, they built a tunnel nearly a mile long under the city to divert water from the River Aniene to a reservoir above one of the large fountains and from here distributed water through the 8-1/2 acres of garden.

Much repair work has been done in this century and essentially all fountains, sprays, spigots, etc., are functioning today. Truly a masterpiece of design and construction.

Athens: I missed my contact person here, but spent three good days visiting what every visitor sees - the Agora, the Acropolis and the Parthenon, plus a few of their very nice public parks.

Afghanistan: From southern Europe I took the big hop about 3,000 miles to Kabul, Afghanistan. I'm not over the cultural shock yet. To be in Kabul is like walking through Alice in Wonderland's looking glass and finding yourself in Biblical times. This part of Asia is a different world from the one we know, and unfortunately much of Afghanistan has not yet arrived in the 20th Century. Without wanting to sound morbid, I think I should reveal some background about this impoverished nation.

Living conditions for the majority are extremely primative. University professors earn approximately $30 a month. There is absolutely no television (some may see this as a blessing). Only main roads are paved. They have never conducted an official census, but figures range from 9 to 16 million. There are no civil courts. The World Health Organization estimates that 40-50% of children die before age one, and another 20-25% die before age 12. The life expectancy is 39 years.

Dishes, clothing and people are often washed in open irrigation ditches. Thousands live on the outskirts of the city in tents. The majority in the city live in mud houses. On top of all this, they have just experienced a devastating drought where livestock died by the thousands for lack of food and water, and children were sold because parents could not feed them. Mohammed Farzad, a former student of ours at I.U. who is now Director of Housing for Kabul University, told me that students are given meat only three times a week, a result of shortages caused by the drought.

In trying to assess the recreation interests, I find children's play to be very much like children everywhere. They fly kites play pitching games, make games out of jumping the water ditches, play soccer, go to movies, listen to the radio. I found thousands of people in the parks each day. Adults seem to use conversation as their chief form of recreation. They simply cannot afford to entertain. Radio news

broadcasts and music are also popular. They love music, and make many of their own instruments, and the men seem to do most of the dancing. Many marriages are still arranged according to family tradition and consequently young people do not date and dance like their Ameircan counterparts.

My visit here was a rude awakening. I carried away an image of a nation suspended somewhere between Biblical times and the 20th Century. An image of unpaved roads, mud bricks and chaudris (a veil with latticework peepholes) that many women still wear in public. I also carry away the hope that Afghans are seeking a better life for themselves and with the help of other more advanced nations progress will take place.

India: Following Afghanistan India was less painful than I had imagined it would be. Please don't misunderstand me - India is a troubled place, but in comparison with Afghanistan it's not quite so bad. Permit me to show you some slides of Delhi, Bombay, Calcutta and two outstandingly beautiful places, the Taj Mahal in Agra and the Himalayan range from Darjeling. I returned to Calcutta in order to catch a plane to Bangkok. I was truly relieved when the plane left, but my heart aches for the 600 million who cannot leave like I did.

Singapore: 85 miles north of the equator, hot humid, yet one of the most interesting, cleanest, and most beautiful large cities I had been in in months.

New Jurong, Singapore: Bird Park, Japanese and Chinese gardens.

Hong Kong: A beautiful port city that is still a British Crown Colony. A crowded city of 4-1/2 million trying to exist on 600 sq. miles of land. Today they only have 1,000 acres of open space and are trying to establish a pattern of 30 acres per 100,000. Considering they only had 150 acres of open space 15 years ago, I think they are doing a commendable job. As you might expect, what land they do have is quite extensively used. Parks are open 24 hours a day and everything has a multiple use connotation to it.

Tokyo: 11-1/2 million people, 20 million in metropolitan area. As far advanced as the northern European countries they are doing a conscientious job of providing park and recreation opportunities. Thanks to Professor Ebashi of the University of Tokyo, who served as my guide and interpreter, I had an excellent visit in Tokyo and the surrounding country.

Kyoto: In what little time that is left, and after such a busy trip around the world, let's take a few moments to reflect and cherish what our business really means to those we serve. I would do it by showing you some of the slides of Japanese gardens taken in Kyoto, Japan, and share with you some thoughts on these places of beauty and what they mean to the Japanese. I will close by quoting from a piece by Joei Matsurka, abbot of Ryoanji Temple, as he commented on the world famous "Garden of Stones"- "Let us sit down quietly and contemplate this garden of sand and stone.

Soami, the famous artist who created this garden, here expressed his understanding of Zen enlightenment with great simplicity, requiring neither words nor precepts to convey his limitless message.

We can view the garden as a group of mountainous islands in a great ocean, or as a mountain top rising above a sea of clouds. We can see

it as a picture framed by the ancient mud wall, now in itself regarded as a national treausre, or we can forget the frame as we sense the truth of this sea stretching out boundlessly.

Soami's eloquence will speak forever to those who will look at the garden with inner eyes. Absorbed in this scene, we, who think of ourselves as relative, are filled with serene wonder as we intuit Absolute Self, and our stained minds are purified.

In Zen, everything, even a leaf of grass, expresses ultimate Reality, thus we can say that this simple garden of itself suggests to us absolute value.

This garden is such a profoundly meaningful one beyond any comparison with others of the world, that it might better be called, Mu-tei - "Garden of Nothingness," or Ku-tei - "Garden of Emptiness," than Seki-tei - "Garden of Stones."

- - - - - - - -

TURF PESTS AND QUESTIONS

Prof. Donald L. Schuder, Dept. of Entomology
Purdue University

The entomologist noted that many people think the only good bug is a dead bug. This is not true for only a few of the 1,000,000 insects known to science are pests. Many insects that you find on plants are just resting there - some may be beneficial species that attack and kill the pests. Insects have three body regions, six legs, a pair of antennae, compound and simple eyes. Arthropods, such as mites, have 4 pairs of legs and two body regions. Young mites, however, have only six legs, the entomologist said.

Schuder commented that the large insects usually are not important economically. The destructive pests are usually small but very numerous, for example the aphids, leafhoppers and chinch bugs.

Insects, like frogs and toads, are cold blooded. When it is warm insects are active; when it is cold they become inactive. Insects, therefore, are not a problem out of doors in the winter time, but in a warm greenhouse, or in a home on foliage plants, they remain active during the winter because it is warm inside.

The first thing to do when a problem is discovered is to identify the pest. This requires that you see the pest or its damage. Schuder urged that everyone obtain a magnifying glass so that they could see the pest and its damage and make a correct diagnosis.

Plants that have been attacked by insect or mite pests develop typical symptoms, Schuder said. Through practical experience, study and by attending meetings, such as this, people learn the symptoms produced by pests and are better able to identify the problem

The entomologist used the sod webworm and its damage to illustrate where to look for the culprits causing turf damage. "Never look in the

dead areas of the turf" he said. The insects that remained in this area would have died. Always look at the peripherial edge of the damage where the healthy and damaged areas of turf join. Here is where you will find the sod webworm larvae. The larvae live in the top of the mineral soil or thatch. The larvae are cream colored and spotted with black and about 3/4 of an inch long when mature. Thatch is a factor that contributes to the buildup of sod webworms because it produces a friable medium in which they can live and construct their webs. Removal of grass clippings and using vertical thinners in the fall after egg deposition are all helpful in reducing sod webworm infestations.

The most important species in Indiana for the past dozen years has been Crambus trisectus. There are three generations each year. Adults of the first generation start to fly in early June, the second brood emerges about the third week of July, while the third and largest brood occurs the last of August and the first part of September. The last generation produces the most damage to turf because it occurs when it usually is hot and dry. This is when people want to treat, but since the eggs produced by this generation over winter any insecticide applied in late August, or early September, would have been detoxified by the time that the eggs actually hatch in April of the following year. The best time to apply materials for control is between the middle of May and the middle of June. Applications at this time interrupt the cycle and the populations never build up into destructive numbers. The materials that are effective for the control of sod webworms are Aspon, Dursban, Phosvel, Dylox and Spectracide. The materials should be applied at the rate of 2 ounces of actual toxicant per 1000 sq.ft. Of these materials, only Spectracide must be watered in in order to be effective. Paired tests of granular applications versus sprays, nearly always result in the granular applications being superior because the material is found in the same area that the sod webworms live, and further the insecticide is protected from the ultra violet rays of the sun which destroy the effectiveness of the materials.

Turf that is damaged by sod webworm attack will usually recover nicely if fertilized, watered and bare spots over seeded.

Several species of grubs attack and kill turf by eating the roots of the grass plants. Such damaged turf can be rolled back like a carpet. It is important to be able to identify the species of grub responsible for the damage. Some species, such as Japanese beetles, are under quarantine, some species of white grubs have a three year life cycle and may not require an annual treatment. The species can be differentiated by examining the setal pattern on the ventral side of the grubs abdomen. The Japanese beetle, for example, has a v-shaped pattern, while the grubs which have three year life cycles have a parallel pattern.

The white grub adults are known as May beetles and June bugs. They feed at night on the foliage of oak and maple trees and return to the turf to deposit their eggs during the daylight hours. They are attracted to light and grub infestations are often heaviest near lighted areas and near large shade trees.

Grubs have been controlled in the past with the long residual insecticides such as aldrin, dieldrin, chlordane and heptachlor. They have now all been banned by the EPA. "It is still legal to use chlordane as long as the present supply lasts," the entomologist said.

The chemicals now labeled for grub control are diazinon and Dursban.

They are more expensive and must be applied annually tocontrol grubs in turf.

Schuder suggested the possibility of using milky spore, marketed under the trade name of Doom, to keep the Japanese beetle grub population at low non-economic levels.

The small black dung beetle Ataenius spretulus has become a problem in Poa, bentgrass and bluegrass sod throughout the midwest and eastern states.

As of October 1975, damage by Ataenius spretulus (Hald.) grubs to Poa-bentgrass fairways occurred at the following locations: Toronto, Canada; Michigan, Gull Lake); Illinois (Chicago, Belleville); Indiana (Indianapolis); Kentucky; West Virginia (Parkersburg); Ohio, (Cincinnati, Dayton, Cleveland, Elyria, Toledo, Columbus); New Jersey (Managuan); New Hampshire; New York (Poughkeepsie, Long Island, Manhasset); Connecticut (New Haven, Watertown); Washington, D.C., and Maryland. Damage to Kentucky bluegrass in home lawns occurred in Cincinnati and Long Island, New York.

The entomologist showed slides of A. spretulus grub damage to Penncross greens at Hamden, Connecticut, and to Poa-bentgrass fairways in Ohio. The small white grubs with brown heads eat off the grass roots killing patches of sod. Birds such as starlings, blackbirds and grackles often damage the turf attempting to find and eat the grubs. Grub populations have averaged as high as 300 per sq.ft. Populations are heaviest in low, wet areas. Two generations of grubs are present, the first in June, the second in August.

Chemical control has proven to be very difficult. The grubs of A. spretulus are resistant to the cyclodiene insecticides standardly used for grub control. Diazinon and Dursban are only partially effective since they are tied up by the thatch and organic matter.

The results obtained by applying trichlorophon (Dylox, Proxol) have been variable. One possible explanation is the detoxification of the chemical by alkaline spray and irrigation water. A pH of 8.0 breaks down 50% of the trichlorophon in approximately 1 hour. The limestone aquifiers of the midwest not uncommonly produce water with a pH of 8.0. The Upjohn Company has recognized this problem and has an experimental "cook book" combination to lower the pH and to supply micronutrients. The code number is Tuco S8314.

Dr. Harry Niemczyk of Wooster, Ohio, indicates that Ciba-Geigy's Experimental compound 12223 and bendiocarb (Ficam) were effective experimental materials, but neither are commercially available at the present time.

Dasanit, Chemagro's insecticide-nematicide, has been shown to be effective, but is a highly toxic chemical and is not presently labeled for grub control.

The professor concluded his presentation showing a brown lawn which resembled chinch bug damage. Examination revealed an infestation of aphids, "Green bugs." The problem was solved by applying malathion, but he noted that it is always proper to be humble and get down on your hands and knees and look at the problem closely.

- - - - - - - -

A NEW TURF PROBLEM IN OHIO

John Fanning, Supt., Terrace Park C. C.,
Milford, Ohio

It is both an honor and a pleasure to be here today. I have been asked to share with you today my experience with the Ataenius spretulus grub during the 1975 golf season.

I gave basicly this same talk at the O.T.F. Conference in Cincinnati in December. Something very interesting happened at that time. I was returning to my seat after I had spoken, and the gentleman seated next to me extended his hand and said, "Congratulations." I said very modestly, "Thank you very much." He said, "Not for the speech but for still having a job."

At first this didn't mean much to me, but the more I thought about it the more I realized he was probably right. I could have avoided everyone and hid in the barn. But, instead I took an 8 mm movie of the damage and insect activity, specifically to show the board of directors at the monthly board meeting. I also had a letter sent to each member, explaining what was happening to our golf course before rumors started. With the movie, the letters and cooperation with the local newspapers, my entire membership knew I was doing everything possible to solve the Ataenius problem. The point I am trying to make is that good communication is an essential part of being a golf course superintendent.

I feel that this insect is a definite threat to quality turf in the Greater Cincinnati area. A very probable threat to turf in Ohio and possibly the entire country.

Prior to the 1975 golf season very few superintendents could even pronounce Ataenius spretulus and only a handful could identify this insect. The only real contact superintendents had with Ataenius was some limited research done at the Cincinnati Country Club in the fall of 1974 where they were asked to help collect data taken from test plots applied earlier in the year by Dr. Harry Niemczyk. At the time Cincinnati, Western Hills and Coldstream Country Clubs were the only three courses in the city to be plagued with Ataenius damage. More superintendents felt at that time that the Ataenius problem was not a great problem.

However, as the 1975 golf season progressed, everyone in this area became very well acquainted with Ataenius. Reports of Ataenius populations sprang up from all over the city. Of the 18 golf courses in the Cincinnati area with watered fairways, 11 courses reported the Ataenius munching away at the roots of their turf, mainly on fairways; however, some greens and tees were affected. These reports varied from small populations to as large as 250 grubs per sq.ft. at the Hyde Park Country Club, the worst hit golf course during June of 1975.

Realizing that there was truly an epidemic at hand, superintendents reached for their sprayers and spreaders and what little research information that was available. The most reached for material was Proxol. Proxol is labeled for white grubs and can be used legally to combat Ataenius in Ohio. However, success with this material varied. Sprayed at 10 lbs./acre, most superintendents felt they had gotten about 50% control or less.

Two courses were doing Dasinit applications for control of nematodes and chose not to spray additional material for Ataenius control. In addition to nematode control they noticed close to complete control of the Ataenius from mid-June through the entire season.

This is where my story begins: On June 20, 1975, upon investigation of suspicious wilting areas, I found 25-100 Ataenius spretulus grubs per square foot. With further investigation, I found that 8 of 18 fairways were covered with Ataenius grubs under what appeared to be healthy turf.

After a five-day wait for materials, due to panic buying, I sprayed 25 acres of fairway turf at a rate of 10 lbs./acre with Proxol. During the next week I felt that I had gotten about 50% control of the Ataenius, but at the same time damage had increased.

During the first week of July the surviving Ataenius population began to pupate. This is nothing obscene, but merely the process in which grubs become adults. They burrow into the soil to a 2-4" depth where they form the wing structure and take on the characteristics of the adult. By mid-July all Ataenius seemed to have vanished. I noticed very little adult activity during July.

On August 1, 1975, I discovered what turned out to be a second generation of Ataenius spretulus. At this time, most damage from the June attack had healed, and very little damage had shown from this second generation.

On August 6 damage began to show. Almost overnight 95% of fairway Poa annua had died, and 50% of fairway bentgrass was dying. It was like cut sod left out to dry.

By August 10, 1975, I had lost the golf course. There were Ataenius grubs on every fairway ranging from 100 - 400 per sq.ft.

At this time I would like to show you a film taken at the Terrace Park C.C. on August 10, 1975. Since this is a movie and not slides, I would like to tell you just what you will be seeing. During an early morning check of the golf course I saw from a distance what appeared to be an area vandalized by a car. As I approached the area the sod was indeed torn up, but not by a car, but by hundreds of birds which flew away as I came closer.

1. You will first see the area picked by birds.
2. A close-up of the same area will show 300-400 Ataenius per sq.ft. at work.
3. You will see some damaged areas.
4. You will see the method of counting, using a cup cutter as 1/10 of a sq.ft.
5. You see how easily the sod is rolled back.

What happened to Terrace Park? Well, during the third week of August I had appropriated money to overseed the entire 25 acres of fairway. This seeding was a tremendous success. My membership for the most part had forgotten about the Ataenius spretulus, but I haven't. I am sure it will be back next year. I have not yet decided what steps I will take for the coming year. Some superintendents plan Dasinit applications for nematodes next year in late May and early June.

The Ataenius has, for the most part, attacked fairways. Greens in this area have not been seriously affected. I feel there are two reasons for this. First of all, I have experienced relatively easy control of the Ataenius adult with Sevin or Proxol. I feel that since most courses in the area are treating greens with one of these two materials bi-monthly they are at the same time controlling Ataenius adults before they lay their eggs. Some superintendents feel that the use of lead arsenate in years past may have something to do with the absence of Ataenius spretulus on greens.

What about home lawns? I saw three home lawns infested with Ataenius with some damage to bluegrass.

We hope to have some control and timing information by next year. Initially I hoped that this insect was on a cycle similar to the 17-year locust, hopefully on a 50-year cycle. Unfortunately, this is not the case. It looks like the Ataenius spretulus is here to say and we will be forced to find ways to combat it.

- - - - - - - - - - - -

CHALLENGES AND ASSETS OF A SMALL BUSINESS

Tom Allen, Allen Landscape Construction
Highland, Indiana

Allen Landscape Construction is in Highland, Indiana, which is located in the northwestern tip of the state. The surrounding towns are bedroom communities, and the high demand for housing offers a good climate for this landscape business. My business offers four types of services: landscape designing, landscape installation, turf chemical programs, and landscape maintenance. These areas of business can be divided, such as in our bookkeeping system, to enable us to evaluate each area at a glance, or they can be combined, such as in advertising, so that each area can complement the next to provide complete services.

The business started through my working at a local garden center throughout my youth. Later, through the cooperation of family and the owner of the garden center, I started to offer small individual services. This work began to take priority over my early college years. The need for more technical and relevant knowledge required a change in colleges and continued education at Purdue University.

Marriage can play an important part in the small business. Cooperation on the part of my wife allows the division of essential business functions such as bookkeeping, appointments, payroll, correspondence, etc., leaving me with more time to expend my energies toward the further development of my Company. Making use of professionals in the areas of accounting, taxes and advertising is advised.

Learning advanced management skills, as well as technical skills, is most important. Eight management qualities are: organization, planning, decision making, entrusting authority, achievement, scheduling, motivating and problem solving.

The vertically integrated management is the most common and efficient in small businesses. It can, however, cause problems when the key employees leave. There are two ways to discourage this. One can make use of employee covenants, which would restrict an employee from some type of work for a limited period of time and over a limited area. Also meeting your employees' financial needs can be sufficient motivation to inspire loyalty.

One of the responsibilities of the small businessman is to be ready to turn new technical information into a consumer product. We must be aware of need to assist people entering our field and alert them to the possibility of small business as a career alternative.

- - - - - - - - - -

VIEWS ABOUT FERTILIZATION

A. J Powell, Jr., University of Kentucky
Lexington, Ky.

Almost everyone is an expert when it comes to fertilization. A nuclear physicist, policitian or housewife can apply fertilizer and get a turf response. So, why even waste time discussing fertilization?

To professional superintendents the answer to this argument should not be difficult. Because turf does respond readily to most fertilizer, it greatly affects our entire maintenance programand budget. Nitrogen fertility can be correlated with almost every maintenance problem; from the necessity for seasonal labor, to new mowers, to diseases and weeds, to the gas and oil requirement, etc.

To further complicate matters, the fertilizer picture is always changing. We now are sometimes asked to defend our use of turf fertilizer and may be asked (or forced) to use the natural forms. There may be no fertilizer shortages today, but tomorrow may bring short-term shortages, transportation snags and real serious problems, such as Canada's proposed nationalization of their potash supplies.

Within the next ten years we will likely see production shifted from the popular ammonium nitrate to urea nitrogen. We are already seeing a re-surge in minor nutrient development and testing. Can we afford the luxury of applying minor nutrient mixes just in case we might see a response? Also, is it really to our benefit that pesticides are being combined with fertilizer to make the job easier?

Are we totally aware of what we should be doing fertility-wise? At present, there is very little research correlating soil test results with turf responses. We have a lot of experience, but little factual information. Everyone's experience is different, even with production agriculture. The universities and private soil test labs have not combined forces and efforts. Unique problems occur with turf because a single recreational area, such as a golf course, will have soil variations from heavy clay to 100% sand. Also, we are fertilizing turf for

aesthetics, persistence and playing quality. These cannot be measured in bushels per acre. We manage turf 365 days per year, but most agricultural crops (and available soil test correlations) are very seasonal.

This does not mean soil tests are useless to turf managers. They are still the best guides available. We should use the soil test, our experience and keep our minds open to new ideals and methods. Turf is still a young industry and we should be careful not to jump on every new bandwagon.One university or one company is not likely to develop miracle products.

The development of many new specialty turf fertilizers has complicated nitrogen fertilization. Since it is very expensive and labor consuming to apply small amounts of nitrogen to turf every few days, these specialty fertilizers have helped pave the way for more uniform feeding.

Most general turf areas do not get fertilized according to the textbook. What if only one application of nitrogen can be made per year? If color and yield were your only criteria for turf fertilization, then you would likely make that application of nitrogen in the spring or summer. In reality, fall is certainly the best time to fertilize temperature grasses with nitrogen. Fall nitrogen not only increases color and growth, but also increases root development, tiller initiation and tiller development, all adding to turf density. Likewise in most climates, winter applied nitrogen increases the density and root growth of cool-season grasses. Spring and summer applied nitrogen may give a big yield, but it also tends to decrease root growth and increase disease, weeds, thatch and wilt problems. Your safest and most efficient fertilization is applied during fall.

How do you decide upon which nitrogen source to use? We may easily understand that solubility decreases as we go from urea to the natural organics, to IBDU, to UF. But there are many more factors involved, such as: Initial Response, Rate/Application, Safety, Frequency of Application, Residual Nitrogen, Control of Nitrogen Availability, Color Response in different seasons, Total Nitrogen required per year, Mower Pick-up, effect on Phosphorus, Potassium and pH, Spreadability, Availability, Cost, etc. These are all interrelating factors.

The highest priority to developing a nitrogen program is not which material you use, but being able to fully understand and predict the turf response to the nitrogen source (s) you choose.

- - - - - - - -

GETTING A CITY GOLF COURSE

Fred Stewart, Midwest District
National Golf Foundation, Chicago, Ill.

Municipalities, park districts, state park systems, the federal government and other governmental agencies must play an active role, if needed public golf courses are to continue being built at a rate sufficient to meet present and future demands.

Government's role may be to build and operate municipal courses, to lease government owned land under a long term leasehold agreement to private investors who will provide the development capital and operational know-how, to pass "greenbelt legislation" which will tax golf courses on a realistic basis, or to establish a low interest loan fund available to private investors for the purpose of developing public golf facilities.

The decade of the 1960's saw the golf business experience its greatest boom in the new course construction. During this 10 year period the number of golf facilities increased by 60%; an average annual increase of 6%. The number of golf facilities increased from 6,385 in 1960 to 10,188 in 1970, a gain of 3,803. Daily fee courses accounted for 53% of this gain; municipal courses 11%.

Investors and many farmers, who at the time were faced with depressed crop prices, obviously recognized that daily fee profit motive golf courses could provide an attractive return on their capital investment. During this same period the golf course real estate development boom was building up a full head of steam and accounted for much of the 36% increase in private club facilities. By 1970 population growth patterns and economic conditions were effecting a change in golf course development trends.

Between 1970 and December 31, 1975 the number of golf facilities increased from 10,188 to 11,370, a gain of 12% or an average annual increase of 2.4%, approximately one-third the annual growth rate of the 1960's. Of the 1,182 new golf facilities opened for play during this five year period 64% were daily fee, 23% were municipal, and 13% were private.

More signifacant, however, was the growth rate by type of course. Municipal courses, for the first time in history, increased at a faster rate than either daily fee or private courses. During this five year period the number of numicipal courses increased by 20%, daily fee courses 18%, and private courses 3%.

The question logically follows then, has the golf boom reached its peak? The answer to the question is a resounding no! At least from the standpoint of player and spectacular interest. Existing golf courses handled record play during 1975 with but few exceptions. More women and juniors are taking up the game of golf than in any previous year according to studies done by the National Golf Foundation, National Sportsman Consumer Audit, and Operation School Golf. A recent survey by NGF indicates over 90% of our secondary schools now offer some type golf program with 19% of the students receiving at least beginning level golf instruction.

This bodes well for the future as 45% of the schools indicated their golf program had been started since 1970. The PGA tour, golf's biggest showcase, again set a new record in total purses for 1976, with the men's tour totaling over $9 million and the women's over $2 million. More PGA, LPGA and USGA events will be televised this year than in previous years - attendance at tour events is up over last year.

Notwithstanding these healthy signs indicating a bright future for the game of golf and the fact that most of our nation's metropolitan areas need additional public golf courses, few private investors or real estate developers are presently planning to build new public golf facilities.

The reasons for this paradox are readily apparent. Land costs near metropolitan areas have reached $5,000 to $10,000 per acre and up, golf course development costs have more than doubled during the past ten years, property taxes for many daily fee and private golf clubs have increased tremendously in some states, golf course maintenance costs have increased 9% annually during the last decade, and interest rates on venture capital remain at a prohibitive level for most golf course investment purposes.

The prospective daily fee course builder is affected most severely by these increases since the only short term return on his investment is what he can make off the golf course and supporting facilities. While these same cost increases affect the real estate developer, he has historically been able to spread the costs out over a large number of individual homesites or living units.

Such golf course real estate projects require several million dollars in front end money to build the course, clubhouse, streets, utility systems, golf course maintenance center, purchase of maintenance equipment, maintenance costs. Then obviously, a reasonably rapid turnover of property or living units is necessary to generate the cash flow needed to meet the developer's debt requirement, overhead and profit margin. Overbuilding in some locations and the soft housing market nationally during the past two years have combined to put some existing golf course real estate projects in financial jeopardy and caused others to put their plans in abeyance pending a turn around in the demand for housing.

During the last four years the number of golf courses associated with real estate projects has increased from 40% of new course openings in 1972 to 63% in 1975. The number of such projects now in planning is only 31% of the total, indicating we cannot presently look to real estate developers to provide the additional public golf facilities needed.

Last November, during a three day Management Seminar sponsored by the National Golf Foundation for Daily Fee Course owners and operators, a large session of one morning's program was devoted to the issue: "Are Municipal Courses Unfair Competition For the Daily Fee Course Operator?"

The issues were clear: municipal courses cost more to build (approximately 20% more), usually cost more to operate, at least in cities with strong civil service unions, are operated inefficiently, charge artificially low prices since they don't have to operate at a profit to survive, and do not pay real estate taxes which gives them an unfair competitive advantage over the daily fee operator.

In spite of the inequities which exist between municipal and daily courses, most daily fee operators will agree that the two type courses can enjoy a complimentary relationship so long as municipal courses charge realistic fees, the market is not over-saturated with public courses, and municipal courses are operated on a businesslike basis.

A Feasibility Study would be the first step for any city considering construction of a municipal golf course. A municipal course should not be built on the whim of a politician without the benefit of a feasibility study clearly establishing the need for the facility and the degree to which it will be capable of supporting itself.

A feasibility study may be done by a citizens committee of local residents, or by a reputable golf consulting firm. A feasibility study may be comprehensive or limited in nature, depending on the specific project. Consideration would generally be given to the following items in the study:

1. Location and site considerations
2. Existing golf market in the area
3. Development costs
4. Method of finance
5. Personnel requirements and method of operation
6. Income and expense projections

Careful consideration should be given to the effect the proposed course will have on existing profit motive courses. This is especially true in those areas with a population per public course ratio of under 20,000 population for each 18 holes of public golf. There are few areas in this category. However, some counties in NE Ohio, Central Wisconsin, and Southern Michigan do have as few as 14,000 people for each 18 holes of public golf. In such a market area a new municipal course could hardly be justified.

Perhaps the primary reason many municipal courses have been built in recent years is the federal assistance programs and methods of financing recreational projects available to municipalities and other governmental agencies which are not available to private enterprise.

The Land and Water Conservation Fund program administered by the Bureau of Outdoor Recreation (BOR) has done more to stimulate development of needed public recreation facilities than any other program. Since the program started 11 years ago, a total of $62,630,000 has been spent on 398 golf related projects. This money, when matched by the state or local political subdivision, provides a total investment of $125,260,000. The fund is financed by revenues the Federal Government takes in from royalties on offshore oil and mineral drilling, sales of surplus real properties, and motor boat fuel taxes.

These funds, when matched by state and local money, have made possible an investment of over $2 billion for public outdoor recreation. The total amount appropriated for 1976 is $175,840,000. It must be emphasized that this appropriation is for all recreation projects, not just for golf facilities.

To be eligible for BOR funds each state must have a state-wide comprehensive outdoor recreation plan. Each state is responsible for determining how the BOR funds will be allocated within its boundaries. Generally, approximately 50% of the funds are retained by the state parks system, and the other 50% is allocated to eligible political subdivisions.

Use of BOR funds for golf course development projects in the Midwest Region has been more limited than most other regions of the country. Six such projects have been funded in the state of Indiana. However, Illinois, Ohio, Michigan and Wisconsin have determined golf's priority to be near the bottom of the list of eligible. This is a reflection of two things: the generally good job private enterprise has done in those states of meeting the demand for public golf courses, and the high de-

velopment costs and acreage required for golf course projects in relation to the number of potential users.

Current allocations for BOR funds to the Midwestern States are: Illinois, $6,957,989; Ohio $ 6,670,490; Michigan $5,794,807, Indiana $3,711,982, and Wisconsin $3,309,309. Golf's current low priority notwithstanding, municipalities or other political subdivisions should at least consider BOR's Land and Water Conservation Fund as a source of financial aid to acquire property, or share development costs of building a municipal golf course. BOR officials indicate golf course projects will get some consideration in those areas having a definite need for additional public courses.

Most municipalities rely on the sale of bonds when developing a golf facility. The general obligation bond is widely used for this purpose. It derives its name from the fact that the municipality pledges its full faith and credit to the payment of this type of debt. General obligation bonds come in two varieties. Let's look first at the unvoted GO Bond.

This type of debt is probably the easiest form to issue. Since it is unvoted, it only takes action of the legislative authority. In most states this type of obligation must be sold at public sale, and after a certain period of advertising, as outlined by state law, bids are taken. The highest and best bid is awarded. The time period from the taking of bids until the delivery of the bonds to the purchaser varies in length. However, it usually averages about 30 days. Since this type debt is created strictly by the legislative authority, the payment of this debt will come from already existing revenues over the life of the bonds. Some of the good points about the unvoted General Obligation are: they usually carry a lower interest rate due to the fact that the full faith and credit of the city is pledged for its repayment. An investor is usually willing to accept a lesser return on his money when he knows his investment is low risk. Secondly, the time consumed from the passage of the bond ordinance until the delivery of the bonds and the availability of the monies to develop the course is comparatively short, three months or less.

The bad points of this type debt are: the municipality must service such bonds from existing revenues - no new taxes are available. However, if the course is a money maker, excess income over expenses could be used to help pay the interest and principal on the bonds. Second, since cities are controlled by debt limits, this type of financing usually falls in the primary debt limit of the city, precluding to some extent the issuance of the bonds. A tax levy to service the debt may also be called for. While much work is involved in researching the need for the course and selling the need to the electorate, once they have passed the bond issue, you have built-in support for the golf course and made it a decision of the majority of the community, not the politicians.

Revenue bonds, which pledge the net revenue after operations and maintenance costs from the course and clubhouse for the retirement of debt, were used in recent years by several municipalities to finance golf course projects. The difficulty in this type of financing is that most municipal courses do not generate enough revenue to properly operate and maintain themselves and have enough left over to pay any sizeable debt service. The longer the playing season, and given a fee schedule commensurate with development costs and those charged by other good daily fee operators in the area, and enlightened promotional, operational and main-

tenance practices, it is possible for a municipal course to support a revenue bond issue.

It should be noted, however, that it would be extremely difficult to sell a revenue bond issue for this purpose in today's market. While there is still a good market for highly rated GO Bonds, few buyers exist for revenue bond issues regardless of the premium interest rates they might offer.

Another method of obtaining a city golf course is the leasehold agreement. In our metropolitan areas most large pieces of land in or close to the city are owned by government agencies. Under a leasehold agreement the government agency would lease the property to an individual or group of investors under a long-term lease. The group of investors would then provide the capital to build the golf facility and would pay the governmental agency a percentage of course income over the life of the lease. Such leasehold agreements have been used for many years in the West and Southwest for this purpose, but have only recently been introduced to the Midwest. Such agreements can be beneficial to all parties - the city, the investors, and most importantly the golfers.

The city gets a golf course without any increase in its debt load and without the responsibility of operating and maintaining, a responsibility it may be ill prepared to do effectively. The investors, who should be knowledgeable golf course operators, get a prime location without any investment in land cost. The lease term should be long enough, usually 30 years or more, to enable the investors to amortize their investment. The golfers stand to benefit from the high quality golf experience provided by the private entrepreneur.

Inaddition to the above methods of financing or obtaining a city golf course, there are several other programs which can be used to help a city build a public course. The Farmers Home Administration, FmHA, Community Facilities Program authorizes the use of a loan guarantee program to help finance recreation projects, including golf courses,in communities of 50,000 population and under. This program's emphasis is on making loans in communities needing such recreation facilities as an attraction to industry.

The Federal Surplus Property Act may also be used to help a community obtain property for a public course. The city of Arlington Heights, Illinois, is currently using this Act to have property previously used by the Army and Navy transferred over to it for development as an executive type course. Another possibility not to be overlooked by a city in need of a course is the possibility of obtaining contributions from wealthy area residents either in the form of land, cash, or other assets. Many municipalities in the Midwest have city courses as a result of such contributions from civic-minded citizens.

Still other municipalities and governmental agencies are getting into the golf business by purchasing existing daily fee, or real estate project courses from their properties to take the long term appreciation in land values. Five sales of this type took place in the Chicago area alone last year.

Most of the same methods of financing a new municipal course can also be used for the purchase of an existing one. The sale of general obligation bonds for the purchase of an existing course is usually easier

to get voter approval on since the golfers already using the course and property owners living around it are likely to support the purchase.

Consider briefly the operation of municipal golf courses. There is a need for more professionalism in the operation of governmental owned golf facilities. Such facilities represent an investment of over $1 million in most cases, and have annual operating costs of $150,000 and up, depending on the operation and method of finance. In light of this investment it is imperative that they be operated in a business-like manner and promoted intensively to ensure total course income is at least sufficient to meet all annual operating expenses, necessary capital improvements, and amortize some of the debt service.

Municipal courses should also take a more active role in the development of new golfers. A driving range or practice area should be a part of every new municipal course, and existing ones should build one where land is available for this purpose. Instructional programs should be a part of the golf program both during the season and in the winter through clinics and instructional programs conducted in community recreation centers, school gyms, or other suitable areas.

Nearly all public golf courses are saturated with weekend play. Few, however, reach this same level of play during weekdays. Our studies indicate a 28% increase in golf play by women taking up the game for the first time. A similar increase in new junior players is also indicated. Women, juniors, and senior citizens all have the opportunity to play golf during weekdays in the golf season. All public course operators would be well advised to develop programs to get them out on the golf course. It is good business...It will also keep them off the tennis courts.

- - - - - - - - -

RECORD KEEPING AS AN ECONOMY TOOL

A. J. Powell, Jr., Turf Specialist,
University of Kentucky, Louisville, Ky.

First of all, I am hardly qualified to give a talk on record keeping. I am an Agronomist. Second of all, I would like to say that that is the excuse we as Agronomist and Golf Course Superintendents have been making for many years. We have become completely frightened by the fact that we are not financial managers.

Most golf courses have the services of an accountant. The superintendent can furnish him certain information, but that may not help the superintendent perform his managerial duties. What can improve the efficiency of the superintendent? What will the new machine cost over the next few years?

Record keeping and budgeting go hand in hand, if, in fact, the budget means anything. You are not doing your job by just adding 15% on last'year's budget. But, when we try to get help concerning financial management we may get a lot of big words and a record system that does not apply to our job. The jargon loses us. Although agricultural

record systems are very common, we are not selling a commodity. We are selling pleasure (recreation) so it cannot be measured in dollars per bushel. We can, however, devise our own system for our own purposes.

What influences your achivements in management? There are undoubtedly a number of personal characteristics, such as experience, education, ability and attitudes that have an effect on your management performance. However, assuming the manager has the personal characteristics, his potential success may never be attainable simply because he does not use all the necessary and available tools. Could you overhaul a tractor without using tools? That's a silly question, but it's just as silly to try to manage your business or your golf course without using the available tools. Good business records are the basic tools of management.

What kind of information as far as records are we speaking of? Let's don't always picture the difficult in keeping records. If it's too difficult to keep specific records the year around, then why not keep them for only a few weeks during the year? Try to establish seasons in which you can project what the total costs would be. It may be that each month you could keep records on a different problem that is of concern.

Dr. R. A. Luening of the University of Wisconsin lists four main uses of records: (a) as a service tool, (b) diagnostic tool, (c) indicator of progress, and (d) forward planning.

(a) As a <u>service</u> tool - the records system provides income tax information for filing federal and state income tax returns and social security reports. Some of this information must be supplied by the superintendent.

(b) The second use is as a <u>diagnostic</u> tool. This use of records helps you identify strengths and weaknesses of your management. You can pick out strong points and capitalize on them while trying to take steps to correct the weak points. What can you do along this line? One thing is decide what your objectives are. All the training the state universities offer in Business Management won't get the job done for you. YOU have to put the figures in and YOU have to decide what is important. As a diagnostic tool, let's look at some comparisons that can be made:

(1) Can we not compare <u>labor</u> with <u>equipment</u>? We usually talk of labor costs as being 60 to 70% of our golf course budgets. We make this statement, though, usually with no consideration given to the relationship between labor costs and machinery costs. In reality these two items substitute for each other. In the past, we have been increasing machinery without a reduction in labor. Our excess labor or our saved labor has always gone into further manicuring our courses. At some point we may have to go to our record system and determine, in fact, what this manicuring is costing the golfer. Record how much time is involved and put a dollar figure on it.

An attempt should be made to try to level out the peaks and the lows in labor requirements. Equipment will help do this. Costs per hour or per acre of major machines, such as tractors or aerifiers can be determined. If thinking of adding machinery determine the annual costs of the machinery to be added and the value of labor saved with this machinery.

(2), Secondly, we can compare labor with labor. This may be very difficult with a big work force, but the efficiency of a particular laborer can sometimes be pinpointed. Then he can be better fitted to the job or weeded from the labor force.

(3) Thirdly, we can compare manicuring with common sense management. How much time does it require to rake the sand traps once per day as compared to three times per week? How much does it require to maintain weed control around the perimeter fence? Or, to mow the grasses under the heaviest shade trees? In reality, the club should know these costs.

(4) Fourthly, we can compare new equipment costs with the old equipment maintenance costs. This doesn't always mean you buy the new equipment. Be fair. New equipment looks and handles better, but it's not always cheaper.

(c) The third use of records was an indicator of progress. As a business indicator, the manager can measure change in productivity, in efficiency, or actual performance in comparison with planned performance.

If beauty or esthetics is the by-product of efficiency, then I wonder what we have been waiting for. We should act like the professional we are supposed to be and get off the tractors and out of the pick-up trucks. How often have you actually looked at the mowing patterns used on your course or turf areas after the men are trained? Mowing may likely require 50% of our labor and gas budget, and most of the time there is no one around that can tell you why certain areas are mowed the way they are. Can we eliminate sharp corners? Steep slopes? Obtain better separation between trees and shrubs, or alter the fairway definition, any or all of these to allow for more efficient mowing patterns and speeds? We can certainly eliminate much of the hand-trimming around trees, ball washers, shelters, and clubhouse grounds with the proper selection of herbicides, or growth control chemicals.

Have you really refined your management skills? For example, because of labor scheduling problems, have you set fixed mowing schedules, that is, mowing when it isn't always needed? Continuously observing growth rates is the best method to determine mowing frequency. To maintain the same frequency in the summer when turf is growing slowly as in the spring when turf is growing fast, is harmful luxury. During most of the golfing season, mowing roughs two or three times per week is unnecessary although it may speed play. If you think this is luxury, put a dollar figure on this extra cost and let the club officials determine what the management intensity should be.

(d) The fourth purpose of records is planning. Records should be used as a forward planning device for short and long term planning. Look at last year's soil test records - did they change the way you thought they would? Or, will more potash and lime need to be applied this year?

Have you measured the sizes of your greens, tees and fairways? If so, you should never have to do it again. That is a permanent record that can certainly help you in planning.

Do you know well enough in advance how much and what kind of fertilizer and pesticides you want to use next year? You should because you can very often get early season discounts. Last year's record can help you plan.

Is it in your mind, or is it on paper exactly what special jobs will be undertaken during off season? It should be on paper because it often takes resources and planning. It is easy to delay problems until the next season. Planning takes more than a quick idea or excuse.

If a capital improvement costs more maintenance money, put it on paper. When new sand traps are built, let the club officials know the additional hours required in maintenance of those traps. An assistant city manager recently said that the superintendent on the municipal golf course was not going to get additional equipment until he could justify it as good as could the fire chief justify a new fire engine, or the police chief justify new policemen. Today the superintendent is expected to be a professional.

Let's look at another example of forward planning which also has to do with our efficiency. We are becoming very equipment dependent. The capabilities and quality of the mechanic influences to a large degree the success of a superintendent. Maintenance requires planning. Proper equipment maintenance, preventative maintenance is a must for proper turf maintenance.

Purchasing should be planned. We have often tagged ourselves as individuals who will buy from anybody that will give us a free pen or pencil set. This is <u>on the spot</u> buying and is not efficient buying, and it is not planned buying.

In summary, we just may be able to use the economic slump as a blessing in disguise. Now may very well be the time to get across to our club officials just what would make our operation more efficient. We can tell them, for example, that 5 footprints in one trap may equal one gallon of gas. To mow those fairways three times per week as opposed to two times per week equals 1000 gals. of gas, plus 500 lbs. of fertilizer. The privilege of closing your golf course on Mondays equals, maybe, 10 hours per week of engine idle time. That a qualified and justly paid mechanic can save 10% of that 7,000 gals. per year petroleum budget. That the added cost to your maintenance budget for tournaments had averaged $4/participant, or $400/tournament day. Obviously, these particular figures are invalid, but do not discount the possibility of making valid estimates, going back to your records and methods. Don't keep records just in case you find a use for them - keep records with specific needs in mind.

- - - - - - - - - - - -

NEW RYEGRASSES

A. J. Turgeon, Dept. of Horticulture
University of Illinois, Urbana, Ill.

Common perennial ryegrass is a coarse-textured, gray-green, non-creeping grass that grows vigorously during cool seasons. Because of its tough vascular system, it has good wear tolerance, but poor mowing quality. The poor tolerance of perennial ryegrass to cold and heat stresses has limited its use as a permanent turfgrass.

Perennial ryegrasses have been used traditionally as nurse grasses in seed mixtures, or for establishing temporary lawns where and when conditions were unfavorable for planting Kentucky bluegrass. The use of perennial ryegrass seed mixtures was frequently discouraged because of its tendency to persist as unsightly clumps that reduce the uniformity and aesthetic value of the turf. Also, the rapid germination and vigorous seedling growth of perennial ryegrass make it highly competitive with other turfgrasses during establishment, and where it comprises a large portion of the seed mixture, it may become the dominant component in the resulting turf.

The development of new turf-type perennial ryegrass varieties has changed the traditional role of this grass in turfgrass culture. Many of the newer varieties are finer textured, more disease resistant, and more tolerant of temperature stresses than the common types. Also, the the mowing quality of the improved ryegrasses is better, but still not comparable to Kentucky bluegrass and other cool-season turfgrass species. Given the improved turfgrass quality of some new ryegrass varieties, their potential use extends beyond that of a nurse grass in seed mixtures. Although not entirely compatible with Kentucky bluegrass, the turf-type perennial ryegrasses can be seeded into deteriorated stands of Kentucky bluegrass to improve cover and playability.

Rapid germination and vigorous growth and development of the seedlings make perennial ryegrass a good "repair grass," and it is highly desirable for use on football fields, golf tees and other heavily trafficked turfs during periods of intensive use. Thus, perennial ryegrass provides the turfgrass manager with an important tool to be used to compensate for the weaknesses of a predominantly Kentucky bluegrass turf. It is the superior quality and greater persistence of the newer turf-type perennial ryegrasses that make them more acceptable for this use.

Another potential role for the turf-type perennial ryegrasses is in combatting the natural conversion of intensively cultured Kentucky bluegrass sports turfs to annual bluegrass. Perennial ryegrass tends to be more vigorous and competitive than Kentucky bluegrass under conditions which favor the aggressive growth of annual bluegrass. Thus, a ryegrass overseeding program on fairways during late summer may reduce the invasion by annual bluegrass and ultimately provide a turf that is easier to sustain during stress periods.

Finally, the dramatic deterioration of some Kentucky bluegrass turfs associated with the incidence of fusarium blight and other summer diseases may be effectively countered by overseeding with perennial ryegrass. The resulting turf may not be of the same quality as a dense sward of pure Kentucky bluegrass, but it would probably be preferable to a turf that is severely diseased each summer.

It is important to select perennial ryegrass varieties that are well adapted to local conditions. For example, two of the newer turf-type perennial ryegrass varieties that have been widely tested include Pennfine and Manhattan. Pennfine has performed well in central Illinois, especially during the summer when many ryegrasses, including Manhattan, substantially deteriorate under high temperature stress. In contrast, Pennfine is frequently injured severaly during the winter months in Michigan where Manhattan persists and is well adapted. Combining these two varieties in blends may reduce the impact of their respective weaknesses, and thus provide a turf with a broader range of climatic adaptation. Game, Citation and Yorktown are other new cultivars.

These proposed uses of the turf-type perennial ryegrasses require further testing before specific recommendations can be made. Golf course superintendents and other turfgrass managers who wish to implement these new ideas should do so on a limited scale initially before committing substantial resources for seed purchasing and planting. Only after careful testing under conditions at a specific site can be turfgrass manager be sure that the new turf-type perennial ryegrasses provide feasible solutions to problems at his facility.

- - - - - - - -

THE VARIETAL DILEMMA

A. J. Turgeon

Contemporary turfgrass research is conducted along two lines: the plant-oriented and environment-oriented approaches. The plant-oriented approach includes the development and evaluation of new turfgrass varieties that offer more disease resistance and better adaptation to environmental conditions at specific sites. The environment-oriented approach in research includes studies on turfgrass establishment, culture and pest management. These approaches may be pursued independently, or they may be regarded as complementary. Gains made through turfgrass breeding mean less dependence upon those cultural factors that are performed to compensate for specific weaknesses of a turfgrass. For example, high susceptibility to fusarium blight may necessitate: avoiding high nitrogen application rates in spring, more intensive irrigation in summer, and fungicide application. These cultural practices constitute an environment-oriented approach to the problem. Alternatively, planting a Kentucky bluegrass variety that is less susceptible to this disease enables the turfgrass manager to pursue a less restrictive cultural program.

The intraspecific variability of Kentucky bluegrass has allowed the development of many varieties and experimental selections that differ widely in their color, texture, density, environmental adaptation, disease susceptibility and other factors. There are 52 varieties, plus 10 blends and 4 mixtures from an April, 1972, planting under test at this station. Plots measure 6 x 8 ft. and each variety is replicated three times. Fertilizer is applied 4 times per year to supply a total of 4 lbs. nitrogen per 1,000 sq.ft., using a 10-6-4 analysis fertilizer. Mowing is performed 2 or 3 times per week at 1.5 inches. The turf is irrigated as needed to prevent wilt.

The diseases of principal importance in 1975 were Helminthosporium leafspot, Sclerotinia dollarspot, and Fusarium blight. (Table 1.) Those varieties showing the least injury from these diseases were: A-20, A-34, Adelphi, Baron, Bonnieblue, EVB-282, EVB-391, Galaxy, Glade, Kl-131, Kl-132, Kl-143, Kl-155, Majestic, MLM-18001, Monopoly, P-59, P-140, Parade, PSU-150, Sodco, Touchdown, Victa, and Windsor. The summer quality data reflect both disease incidence and summer stress tolerance. Thatch development varied from 0.71 to 1.91 cm thick, depending upon variety. There is reason to believe that thatch has an important effect on summer stress tolerance since Nugget typically declines as summer temperatures rise, while at the Belleville site in southern Illinois the absence of thatch in Nugget was associated with substantially better

summer quality.

The blends reflect disease and quality levels that represent compromises between the two component varieties. Considering the fact that no variety is perfect, blending superior varieties allows for incorporating the desirable features of each component while reducing the impact of a specific weakness on general turfgrass quality. The Kentucky bluegrass (Fylking)-fine fescue mixtures have not been good turfs due to the poor adaptation and high disease susceptibility of the fescues. The Fylking-Pennfine (perennial ryegrass) mixture is predominantly perennial ryegrass and its quality through the season is similar to that of Pennfine alone.

In 1973, 4-in plugs of 49 Kentucky bluegrasses were planted in a closely clipped annual bluegrass turf. Each variety was replicated four times in a randomized complete block design. After 14 months, the size of each plug was measured to determine the relative competitive ability of each variety with annual bluegrass (Table 2). Results showed wide variability among varieties in their competitive ability under the experimental conditions. The experimental selections: Ba 61-91, P-140 and RAM #1 ranked quite high on the competitive scale, while Park and Galaxy apparently lacked much competitive ability relative to annual bluegrass. This information is of importance in designing a program for controlling annual bluegrass; selection of a variety or blend of varieties that is best adapted to conditions in which annual bluegrass invasion is likely to occur is a critical first step in preventing take-over by annual bluegrass.

Solutions to nearly every problem encountered in turfgrass management can be solved or substantially reduced by switching to better-adapted turfgrass varieties. This may be accomplished during initial establishment of the turf, or through a carefully conducted program of overseeding. The selection of specific varieties should be based on a detailed analysis of the requirements of a specific turf.

For example, a golf tee turf should be: dense, adapted to close mowing (1/2-3/4 in.), wear-resistant, and extremely vigorous to facilitate recovery from injury. Based upon the data on thaching tendency in Table 1, the varieties Touchdown, RAM #1, P-140, Brunswick and Cheri are the most thatch-prone, and presumably the most vigorous under central Illinois conditions. In Table 2, these same varieties rank quite high on the competitive scale with annual bluegrass. In contrast, the low thatching tendency and low competitive ability of Park make it a poorly adapted grass for tees. However, Park may be adequate for use in roughs or low-maintenance turfs where a vigorous grass would not be desirable.

When the large reservoir of turfgrass varieties is subjected to all of the tests to determine their adaptation to specific sites, the selection of outstanding grasses is substantially reduced. Thus, the need for even more new varieties is clear. Future turfgrass research must include both breeding and comprehensive evaluation of new grasses. Through these programs turfgrass management is made simpler and higher turfgrass quality is obtainable with the availability of improved varieties.

Table 1. Performance of Kentucky bluegrass varieties, blends & mixtures in 1975.

Variety	Spring Green-up	Leafspot disease	Fusarium Blight	Dollar spot disease	Thatch depth	Quality[1] 7/11	8/15	10/9
	ratings: 1 best, 9 poorest				1 cm	1 - 9		
A-20 (seeded	3.3	2.0	1.0	1.0	1.39	2.7	2.0	3.7
A-20 (veg)	4.0	2.0	1.0	1.0	1.24	3.7	2.3	2.7
A 34	3.0	2.7	1.3	1.0	1.11	5.0	2.3	3.0
A-20-6	4.0	2.0	1.0	1.0	0.99	2.7	2.0	2.0
Adelphi	2.7	2.0	1.0	1.0	1.25	4.0	2.3	3.0
Ba 61-91	4.3	2.7	2.0	1.3	1.05	3.7	3.7	4.7
Ba 62-55	4.0	2.3	1.3	2.0	1.50	3.3	3.3	3.3
Baron	5.3	2.7	1.3	1.0	1.37	3.7	3.0	3.0
Bonnieblue	3.0	2.3	1.3	1.0	1.01	3.7	2.3	3.3
Brunswick	2.0	3.0	2.3	1.7	1.54	2.3	3.7	4.7
Campina	2.3	7.0	1.0	1.3	1.06	4.0	3.3	3.3
Cheri	3.3	3.0	1.3	1.0	1.58	3.7	2.7	2.7
Delft	2.3	3.7	5.0	1.0	1.04	3.7	5.7	6.3
EVB-282	3.3	3.0	1.0	1.0	1.14	2.7	2.7	3.0
EVB-305	4.7	2.0	4.3	1.3	1.52	5.3	4.3	5.7
EVB-307	3.7	2.0	2.0	1.7	1.19	4.0	4.0	4.3
EVB-391	5.7	2.7	1.3	1.0	1.26	4.0	3.0	3.0
Fylking	4.3	2.3	2.3	1.3	1.30	3.3	3.3	4.7
Galaxy	3.7	2.0	1.3	1.0	1.17	3.7	2.3	3.3
Geronimo	3.0	3.3	2.0	2.0	1.25	3.3	4.0	4.3
Glade	3.7	2.7	1.0	1.7	1.54	3.7	3.3	3.0
Kl-131	3.3	2.7	1.3	1.0	1.41	3.3	2.7	3.3
Kl-132	3.3	3.0	1.0	1.0	1.27	3.3	3.0	3.0
Kl-133	3.0	2.7	1.7	1.0	1.20	3.0	3.0	4.0
Kl-138	3.0	4.0	5.7	1.0	1.21	3.7	6.3	5.7
Kl-143	3.0	2.7	1.0	1.3	1.32	3.0	2.3	3.0
Kl-155	2.7	2.0	1.3	1.0	1.21	4.0	2.7	3.3
Kl-157	2.3	5.3	3.0	1.0	1.13	3.7	3.3	5.0
Kl-158	2.0	5.3	1.7	1.0	1.22	3.0	1.7	2.7
Kl-187	3.0	2.7	2.0	1.0	1.45	3.0	3.3	4.7
Kenblue	3.0	5.0	2.0	1.3	0.96	3.7	3.3	4.0
1L-3817	4.3	2.3	2.7	1.3	1.13	4.3	4.3	4.3
Majestic	2.7	2.0	1.0	1.0	1.41	4.0	2.3	2.7
Merion	3.0	2.0	1.7	1.3	1.02	2.3	3.0	4.0
Monopoly	2.7	2.7	1.0	1.0	1.06	2.3	2.0	2.7
Nugget	7.7	1.0	2.7	3.3	1.52	4.7	5.3	5.3
P-59	2.0	2.3	1.0	1.0	1.33	4.7	2.7	2.7
P-140	2.3	2.7	1.0	1.7	1.76	2.3	2.3	2.7
Parade	2.3	2.3	1.3	1.7	1.01	4.3	3.0	2.7
Park	2.3	5.3	2.0	1.0	0.71	2.7	3.3	5.0
Pennstar	4.0	2.0	2.0	1.0	1.22	3.3	3.3	4.0
Plush	3.7	3.0	1.7	1.0	1.33	2.3	2.3	3.7
PSU-150	3.3	2.0	1.0	1.0	1.17	3.0	3.3	3.7
PSU-169	3.0	2.3	1.7	1.0	1.13	4.3	3.3	4.0
PSU-190	3.7	2.7	1.7	1.0	1.29	3.0	3.3	4.0
PSU-197	3.7	2.7	2.7	1.0	0.97	3.0	4.0	5.3
RAM #1	4.3	2.7	1.3	2.7	1.68	3.7	3.7	3.7
RAM #2	3.0	2.7	3.0	1.3	1.37	3.7	4.3	4.3
Sodco	3.0	3.0	1.0	1.0	1.37	3.0	2.7	2.3
Sydsport	4.0	2.0	1.7	1.0	1.22	5.0	3.0	3.0

Table 1 (continued)

Variety	Spring Green-up	Leafspot disease	Fusarium Blight	Dollar spot disease	Thatch depth	Quality[1] 7/11	8/15	10/9
	ratings:	1 best,	9 poorest		1 cm		1 - 9	
Touchdown	3.3	2.3	1.0	1.0	1.91	4.3	3.0	2.7
Vantage	3.0	3.7	1.7	1.0	1.02	2.7	2.7	3.3
Victa	5.0	2.7	1.0	1.0	1.47	3.0	3.0	3.3
Windsor	3.0	3.0	1.0	1.0	1.22	2.7	2.0	3.0
			Blends					
Merion + Kenblue	3.0	3.0	1.7	1.0	1.22	3.0	3.3	4.3
Merion + Pennstar	2.3	2.0	1.0	1.0	1.19	2.3	3.0	4.0
Merion + Baron	3.3	2.3	2.0	1.0	1.30	3.7	3.3	4.0
Nugget + Pennstar	7.0	1.3	2.0	1.0	1.28	4.3	4.0	4.3
Nugget + Park	3.0	2.3	3.7	1.0	1.10	3.7	5.0	6.0
Nugget + Glade	4.7	2.0	1.3	1.0	1.42	3.7	2.7	3.7
Nugget + Adelphi	4.3	1.7	1.3	1.0	1.27	4.3	2.7	3.3
Victa + Vantage	3.7	2.7	1.7	1.0	1.40	3.3	3.0	3.3
P-59 + Brunswick	2.3	2.7	3.3	1.0	1.41	3.3	4.3	5.3
Blend 38	3.3	3.0	1.7	1.0	1.51	3.3	3.0	3.3
			Mixtures					
Fylking + Jamestown (RF)	4.0	2.3	5.0	1.0	1.36	4.7	4.3	6.0
Fylking + Pennlawn (RF)	3.3	2.3	5.3	1.0	1.24	3.7	5.7	6.0
Fylking + C-26 (HF)	3.7	2.0	3.3	1.3	1.31	3.7	4.3	5.7
Fylking + Pennfine (PR)	1.0	2.0	1.0	1.3	0.72	2.7	3.3	2.7

[1]Ratings were made using a scale with 1 representing best quality and 9 poorest quality; 1 representing no disease and 9 complete blighting of the turf.

Table 2. Competitive ability of Kentuckly bluegrass in 0.75 inch annual bluegrass turf.

Plug diameter (cm)	Cultivar
10	Ba 61-91
9.9 - 9.0	P-140, RAM #1
8.9 - 8.0	A-20, EVB-305 > P-59, Cheri > Touchdown, Parade, PSU-190 > Glade, Baron, Brunswick, PSU-169, PSU-150
7.9 - 7.0	Plush, Kenblue > A-34, Kl-132 > Adelphi, Sydsport > Evb-391
6.9 - 6.0	Kl-143 > Geronimo, Sodco, Kl-133, Kl-138 > Windsor, Nugget
5.9 - 5.0	Ba 62-55, Pennstar, RAM #2, EVB-282, Kl-155, IL-3817 > Victa > Bonnieblue, PSU-197
4.9 - 4.0	Kl-187 > Merion, Vantage > Fylking, EVB-307
3.9 - 3.0	Kl-131 > Majestic, Campina > Monopoly
2.9 - 2.0	Park > Galaxy

- - - - - - - - - - - -

OVERSEEDING - TECHNIQUES AND VARIETIES

Carl Schwartzkopf, Mid-Continent Agronomist,
Crystal Lake, Ill.

Turf may have become thin and weak as a result of disease activity, such as leafspot, Fusarium roseum, rust, powdery mildew, or any of half a dozen other pathogenic organisms that attack the grass plant.

Frequently, a turfgrass community will not provide the desired plant density required for a lawn, athletic field or fairway as a result of the grass plant's inability to endure physiological stress or extensive traffic and wear. This frequent thinning is noticeable during the summer stress months when it is difficult for the bluegrass plant to withstand the physiological stress placed upon it by the environmental factors. These environmental factors may include any one or a combination of the following: high temperature, inadequate moisture, or concentrated traffic. Frequently, many turfgrass areas have concentrated amounts of traffic. This heavy traffic causes considerable wear and damage, depending upon the degree of severity, it may be

necessary to overseed.

After the decision has been reached to overseed, it is important to determine when to overseed. Generally, it is desirable to overseed athletic fields and playgrounds, also fairways in the fall. However, with some football and other athletic fields receiving more use from other activities, such as marching band competitions, junior outings and events during the summer and continuing into the fall, it may be necessary to overseed in the spring. This spring overseeding is necessitated so that an adequate turfgrass cover is present during the summer and fall activities. After severe winter injury to a turfgrass area resulting from direct low temperature injury, snow mold disease or winter traffic, it may be necessary to overseed the area so that it will be suitable for use during the summer. On golf tees, it is possible, as some clubs do, to fill the divots with a seed and soil misture weekly.

Since it is difficult for a turfgrass seedling to mature and develop into a full grown plant as a result of the competition from the established turf cover in the ecosystem, it is only natural to expect optimum results from your overseeding efforts in the thin, sparse and low plant density areas.

After the decisions have been reached to overseed, the technique that will be used must be determined. There are several methods that may be used. These include coring the area with an aerator or aerifier, macerating the plugs with a vertical mower, followed by overseeding and matting the loose soil to cover the seed. Occasionally, some turf managers will spike the area several times, followed by overseeding. The two aforementioned methods are frequently used on putting greens as well as on larger areas. A method of overseeding commonly used on large areas, such as fairways, athletic fields and playgrounds, is directly introducing the seed into the soil with a disc-drill type seeder.

Another and very important decision concerning overseeding is to determine which variety or combination of varieties to select. For a putting green, the choice for overseeding is limited to three selections: the long-time standby Seaside or Penncross which was developed several years ago, and the latest release, Emerald. The performance of each of these bentgrass varieties depends upon the geographical location in which it is grown. Therefore, it is suggested that trial plots be established a year in advance, if possible, in order to reach an intelligent decision. Should it be impossible to establish plots due to time or space limitations, use the information available from the local turfgrass field days and agronomists in your area.

For overseeding a fairway, football field, lawn or playground, selection of the turfgrass species and varieties is critical. In determining your choice of a bluegrass blend or seed mixture, it is important to assess the particular characteristics of the individual turfgrasses based on your needs. It is essential to consider the following factors: growth habit, color, density, environmental and cultural adaptations, as well as pest problems, such as disease and insect susceptibility.

The uses of turfgrasses in large areas can be placed into three groups - ornamental, recreational and functional. The turfgrass species planned for ornamental purposes should possess a fine leaf texture, high shoot density, and good uniformity. Naturally, the better quality turfs are more expensive to maintain and require more intense cultural practices.

The us of turfgrasses for recreational purposes also requires certain characteristics. Turfgrasses used for recreation are subject to intense traffic, wear and damage. Therefore, they should be wear-tolerant and be able to recover quickly, or have a desirable recouperative potential.

Turfgrasses being used for functional purposes, such as erosion control, should have a deep root system and form good sod with minimal maintenance. Occasionally, a turfgrass area may encompass all three groups, ornamental, recreational and functional, so the careful selection of the proper species and varieties would be especially vital. Some compromise concerning the attributes of various turfgrasses may be necessary when a turfgrass area will be used for more than a single purpose.

Some turfgrass areas have a wide range of soil and environmental conditions. The conditions may vary from sandy loam to clay soil, from bright sunlight to dense shade, and from dry, droughty areas to those that are moist. When overseeding an area with such a variance in conditions, it is advisable to use a seed mixture containing two or more species. For example, one mixture may be of bluegrass and red fescue. The red fescue will dominate in the shaded area with sandy soil, whereas the bluegrass will dominate in sunny locations as well as those that are moist.

Another factor to consider when more than one species is used in a turfgrass area, it is important that they are compatible. Compatibility can be defined as the ability of the grass species to survive while growing in combination with each other. Factors of compatibility and quality to consider when selecting varieties include: color, texture, leaf width and growth habit.

Factors of turfgrass adaptability to consider when selecting varieties for overseeding or initial establishment are: heat tolerance, cold hardiness, drought resistance and survival under conditions of low light intensity (shade).

With hundreds of bluegrass varieties available, it is a monumental task to discuss them all at this time, as well as impossible due to space and time limitations. With the list of fine-leaved fescues continually increasing, it is also difficult to discuss each variety in detail. Recently the developers of fine-textured perennial ryegrasses have produced many new varieties, thereby adding to the confusion. However, after thoroughly researching, studying and observing the bluegrass, fescue and ryegrass varieties now available, it is comforting to know that the overseeding mixture or blend selected should outperform the older turfgrass stands if properly managed and maintained.

A partial list of some of the newer bluegrass varieties you may wish to select from follows: Adelphi, A-20, A-34, Aquila, Baron, Bonnieblue, Fylking, Majestic, Parade, Pennstar, Sodco, Touchdown and Victa.

Fine-leaved fescues include: Boreal, Cascade, Dawson, Highlight, Jamestown, Pennlawn and Ruby.

The fine-textured perennial ryegrasses which may be used for overseeding include: Pennfine, Manhattan, NK-200, Derby, Citation and Yorktown.

The lists of varieties are by no means complete. The mention of a variety does not constitute an endorsement or recommendation on my behalf or that of the USGA Green Section.

- - - - - - - - - - - -

BROADMOOR COUNTRY CLUB FUSARIUM BLIGHT EXPERIENCE

Oscar Miles, Supt., Broadmoor C.C.
Indianapolis, Ind.

The causal organism for Fusarium Blight is a fungus of the genus Fusarium roseum. f. sp. cerealis, and Fusarium trichinctum, f. sp. poae (1). "Disease symptoms" (for Indiana) are similar to dollarspot. Fusarium blight begins as scattered, circular light green patches of 2 to 6 inches in diameter. The grass in patches turns reddish brown, then tan and finally straw colored. The patches increase in size to 1 to 3 ft. in diameter. The patches may coalesce causing irregular killed areas. Centers may remain green, giving the characteristic "frog eye" or "doughtnut symptom."

Susceptible varieties in our area are Merion bluegrass, Fylking, and other common Kentcuky bluegrass varieties. "Disease symptoms appear when temperatures are 90° F. and above, with correspondingly high humidity."

At the 1975 Illinois Turf Foundation Conference, an excellent Fusarium blight symposium was held with some of the leading turf specialists from around the United States debating this problem. Dr. Houston B. Couch, from V.P.I. said, "A high nitrogen, low calcium level in the soil solution made the host more susceptible to Fusarium blight, --- there is an indirect effect from thatch accumulation, it should not exceed 1/2 inch in depth."

Dr. J. M. Vargas, Jr., Plant Pathologist, Michigan State University, discussed the "Fusarium blight to Nematode interaction in Turf." In Michigan, Dr. Vargas said, "They have found a reduction in root systems which predisposes grass to Fusarium blight caused by the Stunt and Ring species of Nematodes."

In California, Dr. R. M. Endo and Dr. P. F. Colbaugh are investigating the role of drought stress and triggering the saprophytic and parasitic activities of Fusarium blight. From their work they have found, "A direct relationship between the quanity of water applied to the plots and the incidence and severity of diseases. When a marginally adequate amount of water was applied the disease involved approximately 40% of the plot area and the infected plants usually died. When an intermediate amount of water was applied, 13% of the plot area was affected and when abundant water was applied, less than 1% of the plot area was affected." In California, Fusarium roseum usually infects the stem base and crown, not the foliage as it does in Indiana.

Other contributing causes which may weaken the turf for disease infection are soil compaction, mowing injury, other diseases and insect damage.

On Broadmoor's No. 14 fairway, approximately 200 yards from the

tee, we have the following soil and turf conditions:

1. The soil is a Crosby, medium gray to brown deep silt loam, somewhat poorly drained but has a good clay field drain tile system, having a medium textured surface and a moderately fine textured subsoil. The pH is 5.5, low in calcium, very ample in available phosphorus and potassium.

2. Thatch is dense, 3/4 to 1 inch thick, with a dark brown color.

3. Dr. B. G. Bergeson, Purdue University Nematologist, performed a nematode count on the samples we sent him last summer and found we had a moderate population of Stylet nematodes that may be doing some damage.

4. Turfgrass consists primarily of 75% Merion Kentucky bluegrass, which has been reseeded the past few years with improved bluegrass varieties. The remaining 25% is approximately 15% creeping bentgrass and 10% Poa annua.

5. The watering system is a manual, center-row system in good condition mechanically.

6. At the end of the 1950's and the first years of the 1960's, 3 applications of lead arsenate were applied to this fairway at the rate of 400 lbs./acre. This was used as a Poa annua eliminator when reseeding to Merion Kentucky bluegrass.

7. Approximately 700 lbs. of Chip-Cal Granular, 48% tri-calcium arsenate has been applied to this area in the last four or five years. Previous records were incomplete. This information was obtained from remarks solicited from the older crew members and previous green committee members. This herbicide was also used to control the "failure grass," Poa annua.

8. Turf maintenance standards have been high to produce a thick, lush, pest-free turf mowed frequently at 1 to 1¼ inch, depending upon the soil and weather conditions and season of year.

As you can see, our environmental conditions were well established for a serious Fusarium Blight disease as soon as the optimum temperature and humidity range were present for fungus activity.

Last summer we began to see symptoms of Fusarium Blight, small disease patches that looked like dollarspot on about June 18, 1975, so on June 26 we established our "show and tell" Fusarium Blight control experiment on the 14th hole.

We ran 7 plots, 21 ft. wide across the fairway. A pre-calibrated John Bean 100 gal. sprayer was mounted on a Cushman Truckster. A 21ft. rear-mounted boom was used to apply 30 gals. of water/acre at 5 mph. Mr. Doug Myers, Assistant superintendent, worked with me on this experiment. Doug measured and put into the spray tank 30 gals. of water and 5.5 lbs. of Dupont's Tersan 1991. With the above factors considered and from actual rough and fairway spraying experience, we knew that with each pass across the fairway we were applying 2 ozs. of Tersan 1991 per 1,000 sq.ft.

1. Plot A was sprayed twice to apply 4 ozs./1,000 sq.ft.
2. Plot B was sprayed 3 times to apply 6 ozs./1,000 sq.ft.
3. Plot C was sprayed 4 times to apply 8 ozs./1,000 sq.ft.
4. Plot D was sprayed 5 times to apply 10 ozs./1,000 sq.ft.

Between the four plots we had check plots 21 ft. wide running the fairway width. The spraying was done in the morning with a heavy dew present.

The night before this fairway had been watered to pre-moisten the thatch and top 2 inches of soil. Immediately following the systemic fungicide application the plots were watered to wash the chemical into the thatch and soil where it must be placed for proper root intake.

For the next few weeks we watched, evaluated and discussed the cost and benefits from this program with grounds committee members, a few board members that were inquisitive, the grounds crew, the golf professional and any other interested parties.

Dr. W. H. (Bill) Daniel, Purdue Agronomist, inspected and evaluated the plots six weeks after treatment. He gave us his professional estimate of diseased patches from Fusarium Blight.

1) Plot A - 4 oz./M rate, (11 lbs./A) had 43 diseased patches.
2) Plot B - 6 oz./M rate, (16.5 lbs./A) had 18 diseased patches
3) Plot C - 8 oz./M rate, (22 lbs./A) had 20 diseased patches
4) Plot D -10 oz./M rate, (27.5 lbs./A) had 8 diseased patches
5) The check strips - no treatment - had 200 diseased patches.

From this test I feel the 6 oz./1,000 sq.ft. (16.5 lbs./A) of Tersan 1991 gave us good control, but not complete cleanup of blighted turf.

The last week of July, 1975 we began to renovate and reseed all fairways to improved bluegrass varieties, using the Rodgers Aero-Seeder. On August 14, 1975 the fairway areas immediately on either side of the Fusarium Blight Control test plots were slit-seeded. For 21 days after slit-seeding we maintained the top one inch of thatch and soil in a moist condition by nightly watering and early morning short interval sprinkling. We hoped this would enhance the seed germination and survival. From this watering practice we got a direct side benefit, i.e., less or retarded Fusarium Blight activity.

Suggested solutions include:

1. Dr. Reed Funk, Rutgers University Geneticist, believes the way to go is improved varieties.

The University of Illinois, which is in the same climatic zone as Indianapolis, is recommending the following Kentucky bluegrass selections:

a. Warren's A-20	c. Glade	e. Touchdown
b. Adelphi	d. Majestic	f. Baron

According to Dr. A. J. Turgeon, Illinois Agronomist, "all of the above have good resistance to Fusarium Blight." It is recommended that a blend of these improved varieties be used. I would not put my complete trust in a single variety for fairway turf. Some day another disease may appear to live on that single variety.

2. Test your soil, lime if necessary to bring the pH up to 6.5 to 7.0.

3. Balance the fertilizer applications, avoid excesses. Fertilize in moderation. Dr. H. B. Couch, VPI Pathologist, at the Illinois

Fusarium Blight gymposium recommended, "a light nitrogen application 10 days after treating with a good systemic fungicide to encourage grass recovery."

4. Keep the thatch and soil moist. Keeping the thatch and soil moist will help lower the soil temperature and keep the turf from going into drought stress.

5. Aerify and verti-cut turf frequently to reduce thatch, maintain thatch under 1/2 in. in thickness. Restrict verti-cutting to cooler and damper periods when turf is not suffering from heat or drought stress. Water turf very soon after renovation to bring turf out of mechanical damage shock.

6. If you are sodding, use a sod that is grown on similar soil conditions. Avoid the use of muck or organic sods on mineral soils.

7. Check soil for nematodes in late May or early June. Take samples immediately outside the diseased areas. Have samples checked by state or university nematologist; treat accordingly.

8. Consider using one of the new turf-type perennial ryegrasses, such as Manhattan, Pennfine or Citation, when overseeding areas that have had Fusarium Blight. At Broadmoor on our No. 5 and 7 tee. Where the Merion bluegrass turf was badly damaged by Fusarium Blight we seeded a combination of Pennfine ryegrass and blended improved bluegrasses. The Pennfine came up in excellent condition, but the bluegrass germination was very poor or practically nil. This same result was found on areas where we expected either nematode problems, Fusarium Blight, or too much tri-calcium arsenate.

9. Try soil wetting agents where thatch and soil are difficult to wet.

10. Consider updating the irrigation system to automatic, double row, or center fairway single row, two-speed sprinklers to give complete control of watering.

11. Use one (or a combination of) the systemic fungicides that are now available for turf use and thoroughly water it in.

At the University of Illinois, Dr. M. C. Shurtleff and Dr. A. J. Turgeon tested several commercial fungicides last year. "The data confirmed that the three systemic fungicides used, Clery's 3336, Fungo (Mallinckrodt) and Tersan 1991 (DuPont) are effective in controlling Fusarium Blight. The 4 oz. rates were about as effective at the 8 oz. rates."

You may have to treat from 1 to 3 times at 4 to 6 week intervals to obtain satisfactory results, depending upon your particular situation and membership demands. I anticipate applying the 6 oz./1,000 sq.ft. rate either about June 15, 1976, or before if we have a night where temperatures do not fall below 70° F., I am going to spray the next day.

List of references:

(1) Scott, D. H., Part II, Turfgrass Disease Control, page 4,6.

(2) Endo, R. M. & Colbaugh, P. F. "Fusarium Blight of Kentucky Bluegrass in California." Proceedings of the Second International Turfgrass Research Conference, page 325-327.

(3) Shurtleff, M. C. & Turgeon, A.J., "Fusarium Blight Control Study." 1975 Turfgrass Research Summary, Univ. of Ill., Urbana, Ill.

- - - - - - - - - - -

I'D RATHER DO THE EXTRAS

Ray Knapp, Supt., Tuckaway C. C.,
Milwaukee, Wis.

This concept is based on the idea that the superintendent would directly supervise all jobs on the golf course. The type of jobs I am referring to is reconstruction of greens, tees and fairways. It would also include conversion to automatic irrigation, tree planting, drainage and maintenance of the golf cart fleet.

One of the main things that makes this idea work is the long term program. This program should be revised yearly. It should include all areas of the golf course, as well as the non-play areas. It should include anything the superintendent has responsibility over.

Another important factor necessary to get the job done is careful selection of Grounds Committee. The membership directory is carefully checked. Each member is chosen to help get the over-all job done. The long term program is kept in mind. Member (A) may be selected because he owns an excavation company. His equipment can be used by the club in the off-season. Member (B) is selected because he has a salvage business. He will make available materials that are needed. Member (C) is chosen because of his leaderhip ability. He can influence other people to help us get the work completed.

With the grounds department doing all the extra work, there can be many mutually beneficial results. The club can get the job done as good and normally cheaper than with outside contractors. By involving the membership it brings the club closer together. The extra work allows the superintendent to keep more year around help. This gives the club more experienced personnel. The superintendent benefits by being more valuable to the club, consequently his salary should increase.

- - - - - - - - - - -

MAINTAINING LARGE TURF AREAS

C. C. Counterman, Supt. of Grounds,
Argonne National Laboratory, Argonne, Ill.

Twenty-seven years ago I went to a 3,750 acre site, located 30 miles southwest of Chicago as their first Grounds Superintendent. The area was the permanent location of the Argonne National Laboratory, devoted to the peaceful uses of Atomic Energy. The Laboratory has recently been assigned additional duties in the fields of environmental and energy research.

My first assignments were to recruit a work crew, purchase grounds and engineering equipment, remove abandoned farm buildings, fences and debris from 149 separate farm sites, and to develop and execute a plan for 2,250 acres of abandoned farm fields and woodlots which would be outside of the research areas.

We decided to reforest this area by planting 1-3/4 million conifer seedlings in three (3) spring planting periods (1953 through 1955). These pines would provide an ecological climate for the eventual succession of oak trees, the dominant hardwood species in this area.

Today these pine trees are 25 to 30 ft. in height, an unusual site in the Chicagoland area. Already we can see thousands of small oak tree seedlings creeping in this reforested area.

As part of the reforestation program we installed 40 miles of 30 ft. wide fire lanes through the pines and adjacent to boundary lines and security fence lines. Woodland trails through woodlots near the major buildings have also been developed.

While the early clearing work and development was proceeding, contracting firms finished the first area of so-called "temporary" quonsut huts, which incidentally are still in use after 28 years for housing administrative and research areas. Construction was proceeding on other areas of permanent buildings. Construction and remodeling contracts have never stopped and a new phase of construction is in the planning stage.

Today the Grounds Section is responsible for the maintenance and development of the 1,500 acres which encompasses the land around 105 major buildings. We are also responsible for maintenance of 35 miles of roadways, 150 parking lots which cover 90 acres, 40 acres of service and material yards, 3 miles of walkways, 8 miles of security fencing, 700 acres of developed turf, a 30 acre Park, 2,250 acres of forested areas, snow and ice removal, rail car movements, rail spur maintenance, a sanitary landfill operation and all debris pick-up. Other work functions include heavy equipment operation, maintenance of our assigned equipment, fabrication and installation of signs, installation and maintenance of storm drainage systems, and planting and after-care of trees and shrubs.

The Grounds section has gone from a high of 40 men to today's roster of 20 men, (75% of whom have 25 years or more of seniority), 1 superintendent, 2 foremen, 11 groundsmen, 4 heavy equipment operators, 1 mechanic and 1 driver for the Dempster garbage trucks. All of these men, except staff, are unionized. Their average hourly wage is over

$7.00 per hour with overtime rates at from 1½ to 2 times their basic rate.

Summarizing, I am pleased to show 100 slides depicting our work and some of the equipment and methods we use to handle this herculean job with such a small crew. These emphasize pre-planning, re-thinking of every operation, more mechanization with the latest equipment, which must be available 12 months a year, more attention to scheduled preventive maintenance, more effective records, an adequate supply of spare parts, together with stand-by equipment, better use of less than perfect weather days and innovation, are points for your consideration in the maintenance of any size turf area.

- - - - - - - - - - -

THATCH - pH AND MANAGEMENT

Dr. Paul R. Henderlong, Dept. of Agronomy,
Ohio State University &
Ohio Agricultural Research & Development Center,
Columbus, Ohio

Thatch development in turf areas will occur when the accumulation of organic matter exceeds the rate of microbial decomposition. Any factor in the ecosystem that either produces material that is more resistant to decomposition or results in an environment that reduces microbial activity will enhance thatch. Major turf culturing factors that generally favor thatch accumulation have been suggested:

1. Vigorous growing turfgrass cultivars
2. Acidic conditions
3. Poor aeration
4. Excessive rate of nitrogen
5. Infrequent or excessively high cutting heights

The usual recommendations for reducing the thatch accumulation typically includes cultivation (dethatching, slicing, aerification, etc.), a light topdressing with soil, a light application of limestone and combinations of each of these. These techniques have generally been satisfactory for turf managers in the east and southern USA. In fact, the influence of management on actual thatch accumulation appears to vary considerably from one area to another.

Recent data from Ohio very vividly illustrates these differences (Table 1). The thatch samples were taken from nitrogen fertilizer study that was initiated at the two locations in 1969. The suggestion that nitrogen rates influenced thatch accumulation is difficult to justify based on the data obtained. However, there is a rather marked difference in thatch accumulation among the four grasses and between locations.

Table 1. Thatch accumulation for four turf species from two locations in Ohio under varying rates and times of nitrogen application (dry combustion weight loss in grams/4 sq.in.

N application lb./M rate	month	Total/ yr.	Ripley Merion	Ripley Kenblue	Ripley Pennlawn	Ripley Ky-31	Columbus Merion	Columbus Kenblue	Columbus Pennlawn	Columbus Ky-31
2 + 1	9, 4 6, 8	6	1.82	1.88	2.90	1.57	3.92	3.33	4.68	3.72
2 + 1	9 10, 11 12, 8	6	2.20	2.35	3.97	1.83	3.83	2.68	4.38	3.63
1 + ½	9 10, 11, 12, 8	3	2.42	2.72	3.05	1.73	4.17	3.32	4,23	4,72
½	9, 10, 11, 12, 4, 8	3	2.48	3.05	3.27	1.12	3.78	3.30	4.20	4.82
1	9, 10, 11 12, 4, 8	6	1.88	2.42	3.93	1.40	3.98	3.27	4.20	4.68
2	9, 10, 11, 12, 4, 8	12	2.13	2.87	3.07	2.10	4.08	3.35	4.33	3.60
2 + ½	9, 12, 8	3	1.80	2.62	3.18	1.95	4.50	2.97	4.15	4.88
3	9	3	2.22	2.90	2.78	1.50	3.87	2.83	4.02	3.67
Mean			2.12	2.60	3.27	1.65	4.02	3.13	4.28	4.22

The only major difference between the two locations, other than climatological aspects, is the soil and specifically soil pH. The average soil pH for the plots at Ripley ranged from 5.6 to 5.8, while those at Columbus ranged from 7.2 to 7.5.

How could soil pH possibly be related to increased thatch accumulation? One possible explanation relates to increased solubility of silica when the soil pH is in the range of 7.0 to 8.0+. It is well established that the solubility of silica is extremely low at pH's less than 6.0 but markedly increases with alkaline pH's. The reduction of forage digestibility with increases in silica content of cool season grasses has been well documented. Recent studies in our laboratory have shown that the silica content of turfgrasses increases greatly with increased levels of silica nutrition. A similar response was observed for the resulting thatch produced (Table 2).

Table 2. Silica content of thatch with increasing levels of soluble silica.

Soluble silica	Per cent silica in thatch	
	Kentucky bluegrass	Tall fescue
0	0.35	0.61
50 ppm	3.49	2.81
100 ppm	5.47	4.30

Although soluble silica levels were not determined from field areas, a similar response for increased silica content of turf clippings was observed with increased soil pH (Table 3).

The frequently observed lack of desirable thatch control on neutral and alkaline soils in the midwest with the commonly accepted cultural methods can now be better understood. The absence of a marked effect of liberal nitrogen fertilization on thatch accumulation under neutral or alkaline soil pH can likewise be at least partially explained. The prolonged use of acidifying nitrogen fertilizers should, with time, reduce the alkaline soil pH (7.0+).

Actual thatch accumulation will likely be decreased as the solubility of soil silica is reduced. In addition, the associated soil pH (6 to 6.5) approaches that which has been demonstrated to favor the activity of the soil microbes involved in thatch decomposition. The suggested light application of limestone after turf cultivation to enhance biological thatch decomposition would appear to be very questionable in turf cultured on neutral or alkaline soils.

The commonly suggested methods for controlling or reducing thatch accumulation for turf cultured on acid soils should be continued. However, the application of the same principle or methods on neutral or alkaline soils frequently found in the midwest and western regions of the U.S.A. may not always be valid.

Table 3. Silica content of Merion bluegrass clippings as influenced by N, soil pH, and location.

Annual N rate (lb./M)	Soil pH	Percent silica
	Wooster	
2.5	6.1	2.14
5.0	5.8	1.77
10.0	4.9	1.72
	Columbus	
3	7.5	3.06
6	7.5	2.61
12	7.5	2.20

- - - - - - -

THATCH TESTING

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

The loss of turf on fairways in 1975 was quite severe, so much so that we decided to ASK THE TURF, WHY?

One cannot afford fungicides on fairways on a competitive public golf course. But, we did apply a bit of ammonium-nitrate (33%N) to overcome an outbreak of dollarspot - less than 1 lb. of N/1,000 sq. ft. By August 15 one could either play a shot off of a brown mat, or look for a patch of grass to set the ball on.

It seemed that the more TLC (tender loving care) we gave our #3 fairway the worst it was for disease. Only God knew how many.

We recalled the work of Waksman and Starkey in the book, THE SOIL AND THE MICROBE, (1931). Even though this chart refers to the soil, we guessed that maybe the same or worse was happening to the thatch.

Influence of Cellulose upon the Numbers of Fungi in Soil (from Waksman and Starkey - The Soil and The Microbe)

Numbers per Gram of Soil

Nature of Soil	pH	$NaNO_3$ Added	No Cellulose	Cellulose
Unlimed	5.1	None	115,700	160,000
Unlimed	5.1	Yes	115,700	4,800,000
Limed	6.5	None	20,000	47,000
Limed	6.5	Yes	20,000	290,000
Unlimed	5.5	None	87,300	320,000
Unlimed	5.5	Yes	87,300	3,100,000

"When a fresh supply of nutrients is made available ----- there is a rapid sequence in the flareup of the various groups of fungi, the 'sugar' forms coming first and the 'lignin-decomposing' types last (Garrett)."

Nowhere in the literature did we find references to the pH of thatch and how it might affect the fungi population.

We recalled that during World War II when fungicides were scarce, we used to dust the greens with 2 lbs. of hydrated lime at dusk, then wash it off in the morning.

By accident (or using our head) we came up with a simple method of THATCH TESTING. We cut a piece of THATCH out of #3 fairway, KEPT OUR FINGERS OFF OF IT. Placed a Watman filter paper on a piece of CLEAN wax paper. Place the Thatch on filter paper. SLOWLY drip Acidity Reagent Special (Chlorophenol red) until it begins to show on the filter paper. Then compare this to the colors on the Acidity test chart. These materials are available from the Soil Test Laboratory, Purdue University, 1975 price was $4.00.

Our #3 fairway had a pH of 4.8. The fungi were having a marathon. No use to apply grass seed.

Procedure: Irrigate to 4". Aerify to full depth of tines, 3 times over. (Only soil above 6.5 pH will digest thatch). Then seed (a ryegrass mix). Applied 400 lbs. of 15-15-15 pelletized fertilizer. Applied 2 tons per acre of a ground limestone (80 through 100 mesh) with an Olympic drop spreader. Then turn on the water.

Did it work? By October 1 the 1½" layer of thatch was down to less than ½" in most places. The ryegrass is now giving us good cover. Yes, much of the Poa came back, but we have a satisfactory cover to offer our players.

P.S. Courses we have checked that seeded into an acid thatch wasted time, money and grass seed.

Conclusion: Neutralizing the thatch with lime, plus aerifying will decompose thatch.

- - - - - - - - -

PROGRAMMING NEW CONSTRUCTION

Paul Eldridge, The Wadsworth Co.,
Palatine, Ill.

The contractor's job in programming new construction is to use the architect's plans and specifications to get his ideas onto the ground in the best manner possible in a set time frame --- plus be flexible to make changes as desired by the architect without changing the time frame. It is also his professional responsibility to share with him the knowledge gained from past experience so as to give the owner the most value for his dollar spent.

As for Sand Creek, which was not a normal job, we had some unusually difficult site conditions to overcome, and we all (the Architect, Owner and Contractor) worked together to get the job done.

We made a plan at the beginning, and except for fitting in additional work and fighting the rain, we did our best to stay with the plan. There were three green areas that did not get seeded last fall. One green had to be redesigned. It developed an earth crack, and started slipping back into the lake. But in general, the areas were just plain soft and need time to stabilize. Piling was also used in some areas to keep the soil from slipping back into the lakes, plus the piling was used for aesthetic purposes.

Schedule:

1. The job started in late October of 1974, and was scheduled for completion on September 15, 1975.

2. First four operations were scheduled for winter work. There were two reasons for this:
   a. There was so much wet soil to move that there would be no way to move that type of soil in the spring and have it dry enough to do the other work on.
   b. We needed the frozen ground to get across many of the unstable areas to try and build a base to work on the next spring. You see the fill over matting operation was scheduled and done in two parts. The first layer of material stabilized enough to support the additional fill and a dozer.

The other operations were scheduled for the summer of '75 which turned out to be extremely wet. But, the schedule for each of the operations was determined by working from the finish date backwards to establish a start date. For example, we knew the greens drainage had to be completed by September 1, and we know from experience that we can install an average of 1,200 ft. of tile per day. We then divided the total footage by the 1,200 ft. per day which gives us the number of working days needed to do the job. We then added for rain days and down time to get the total working days needed to do the job and establish the starting date.

All of the materials needed for this job were then purchased to meet this schedule. Some, of course, didn't get installed immediately, but were on the job when we needed them. Other materials, such as trap sand

and cart path stone were purchased locally and brought to the site on an as needed basis.

The labor from the job was made up from three groups:

a. Our permanent people
b. Union people
c. Off the street help

At the peak of the job from June 15 until October 1, we had a coordinator and four superintendents on the job, plus the subcontractors had supervising people. During this same period we had about 45 workers on the job, plus the subcontractors had from 10 to 20. We felt the project was well staffed.

- - - - - - - - - - - -

A NEW PYTHIUM

Ken Quandt, Supt.,Glencoe G. Club,
Glencoe, Ill.

When Cliff Berhendt first called and asked me to be on the program today he said he had heard that Al Turgeon and I were working on a new kind of Pythium and he wanted to know if that was true. I said, "Well, Cliff, if you call losing five greens working on it, then yes, I'm working on it." That should give you a pretty good idea of the problem we faced this past summer. Let me give you a little background information on what happened to my greens.

a. On Tuesday, June 24, noticed greens going off color and thought they might be coming down with red leafspot. Temperatures at the time were in the 70's and 80's by day, and in the low 60's by night.

b. On Wednesday, June 25, sprayed with 8 ozs. Daconil and 2 ozs. Actidione TGF per 1,000 sq.ft.

c. On Thursday, they hadn't really improved any, but they didn't look any worse either. I thought I might have stopped whatever it was.

d. On Friday, it was obvious that I hadn't stopped the disease. Some of my greens turned almost completely yellow that day, and some areas began to die.
   1. Yellowing began at the leaf tips and progressed downward.
   2. Turf thinned rapidly, beginning in the low wet areas and progressing up the slopes. Looked very similar to red leafspot.
   3. There was no mycellial growth or grease spotting. In fact, there were no above ground disease symptoms.
   4. The greens had already been sprayed 11 times prior to this disease outbreak.

e. I called Al Turgeon and described the symptoms to him. He said that it sounded like the Pythium graminicolum that he had seen in other parts of the state. He recommended Tersan SP as a control.

f. We applied 6 ozs. Tersan SP on Friday evening and by Sunday morning the turf that was still alive was regaining its color. Much of the turf had already been killed, however. Some of the greens were nearly half destroyed.

g. The disease attacked again three more times during the year. The next attacks came on July 16, on August 20, and again on September 10 for the last time. I discovered later that any time I left Tersan SP out of the spray program for more than 14 to 16 days the disease returned.

h. The last outbreak of Pythium occurred on September 10, when night temperatures were in the low 50's and the day temperatures were in the upper 60's and low 70's.

i. The disease had no preference for any grass specie. It seemed equally happy whether munching on C-15, Penncross, Washington, or Poa annua. The only thing that it seemed to have a preference for is wet, poorly drained areas. The greens that were most severely affected were those most poorly drained.

j. In all, 38 ozs. of Tersan SP were applied per 1,000 sq.ft. between June 28 and September 11, 1975. We tried both the 6 oz. rate and the 4 oz. rate and could not tell any difference between them. Both rates gave complete control.

Once we felt that we had the disease under control, we began trying to get the greens to recover.

a. We first aerated the greens and removed the cores. We then fertilized them with 18-4 10 and seeded them with Penncross and Red Top at 3 to 4 lbs. seed per 1,000 sq.ft. They were then topdressed and watered. The following day we spiked them in three different directions to get the seed into better contact with the soil.

b. In about 6 days we began to see a green fuzz,,and within 10 days the dead areas were turning green. "Beautiful," I thought. "We're on our way to recovery." However, a few days later, much to my dismay, the seedlings began to shrivel and die. No amount of syringing or anything else would seem to help them.

c. In disgust we ripped out the dead areas and resodded them with some nice healthy Penncross sod that had just a little bit of crabgrass in it. The sod looked healthy for a few days and then began to slowly decline. The only thing that seemed to thrive was the crabgrass. Eventually approximately half the sod died, especially in the low wet areas.

d. The fact that we got 6" rain in July and 6½" in August, coupled with blazing heat, didn't do very much to help matters either.

e. Despite all the fertilizer we had applied (including water soluble types), and all the fungicides we had applied, we just couldn't seem to get any growth out of the greens. Not only were the seedlings and the new sod not growing, the grass that had survived the initial Pythium attack was also not growing. We were mowing some of the greens once or twice a week and getting very few clippings off of them. In addition, much of the turf, especially the Poa annua,

developed a severe discoloration of the leaf tips. Some even turned white.

Well, as you might well guess, by this time there were a number of baffling questions bothering me -

a. The first was, "Why me Lord?" Why did this happen to an All-American boy like me when it could have just as easily happened to someone who truly deserved it like Paul Voykin?"

b. Why was Pythium graminicolum, which is normally a saprophytic organism suddenly becoming such a powerful parasite on my turf?

c. Why was the recovery rate of the diseased greens so slow?
d. Why didn't the turf respond to fertilizer and other practices?
e. Why the hell didn't I get into some other line of work when I had the chance?

When we first began to have such terrible problems, I shipped soil and plant samples off to the University of Illinois. It was from these samples that they confirmed that the culprit was indeed Pythium graminicolum. That I expected, but about mid-August they came up with something that I had not expected. They found that my soils were infested with unbelievably high populations of nematodes - more nematodes, in fact, the University of Illinois Nematologist had ever seen before.

a. We found that we had 3 different kinds of parasitic nematodes present in our greens:
    1. Stunt nematodes (Tylenchorhynchus dubius)
    2. Spiral nematodes
    3. Root-knot nematodes
        a. The spiral nematodes were found in the greatest numbers, but the stunt nematodes were also found in quite large numbers. The root-knot nematodes were found in the smallest numbers, but they are the most pathogenic of the three.

b. Interestingly enough, the greens that were the most severaly damaged by the Pythium were also the ones that had the highest nematode counts.

c. This nematode thing fascinated me so, I decided to dig up some further information on them, especially as to how they might affect turf. What I found was extremely interesting -

    1. Plant growth is usually poor, especially during summer.
    2. Turf frequently thins out and does not respond to fertilizer or water applications.
    3. Root systems are generally shallow and individual roots are brownish in color.
    4. Plants slowly decline, with the above ground parts being stunted, yellowish, and exhibiting food deficiency symptoms.
    5. Nematodes cause ports of entry for soil borne diseases caused by fungi and bacteria.
        a. Penetration of plant cells during the feeding of the nematodes leaves millions of tiny openings.
        b. Feeding saps the strength from the plant, causing it to be more susceptible to diseases.

6. Weeds frequently thrive in nematode infested soils.
7. Leaf tips frequently become discolored and may even die back.

d. I then thought back to the past problems I had with my greens.
   1. Shallow root systems for the past several years.
   2. Lack of response to fertilizer.
      a. Attributed it to high soil pH's and lousy fertilizer.
      b. I had tried many different fertilizers and was not very happy with any of them. My thoughts about the people who had been selling me fertilizer were not very charitable at times.

e. When nematodes are injected into the equation everything suddenly begins to fall into place and make sense.

The question now was, how am I going to solve the problem?

a. First we set up test plots using Dasanit and Nemacur.
   1. Both are granular nematicides, used at 1½ to 3 lbs./1,000.
   2. Both very toxic.
      a. Dasanit LD50= 2.5 (oral) and 30 (dermal)
      b. Nemacur LD50= 66 " " 2000 "
         1. If 180 lb. man ingested .01 oz. has a 50% chance of living.

b. Applied Nemacur to five other greens.
   1. Seemed to notice improved growth, but can't be sure it was the result of the nematocides.
   2. Will have to reserve judgment until next season when all greens will be treated.

What to do if you think you may have a nematode problem?

a. Send sample to either Swift, U.S.S. Agrichemicals or Scotts, all have nematologists who will run samples for their customers.

c. Set up test plots and apply nematicides to your problem areas. If increased vigor and response can be detected you probably do have a nematode problem.

Jim Holmes vindicated -

a. USGA Greens Section Mid-Continent Director
b. Maintained that some day us Yankees would recognize nematodes as a serious problem on turf.
c. Most of us thought he had been out in the sun without a hat too long. Nicknamed him "Nematode Jim."
d. Well, Jim, wherever you are, you've made a believer out of me.
e. I sincerely belive that in the near future nematodes will be found to be serious pests on northern turf.
f. Not enough work has been done on nematodes in general, and practically no work has been done on turf nematodes in northern climates.

- - - - - - - - -

WET WILT

Richard Trevarthan, Supt. Prestwick C. C.,
Frankfort, Illinois

How did it happen? What caused it to happen? How are we going to prevent it from happening again?

Ball marks not healing, heavy spike marks around hole cups, and Triplex greenmower wear on the outside edges were some of the problems bothering our greens. After first trying a light topdressing with no results, I decided the greens were hungry, but why? They were fed 1.4 lbs. of N in the spring of IBDU type (24-4-12), and had been fed .2 of a lb. of 38-0-0 each week with our fungicide application, with the intent to reach 5-6 lbs. of N for the season. Having Penncross the amount of N in the summer months is played by ear, trying at all times to keep the turf tight and not creating a sudden explosion.

Having had a long wet and hot spring, it was decided the 1.4# of IBDU was used up. It is now the third week in July and we couldn't wait until fall for another application. OK, why not go with another application now. Put it on at a rate of 1 lb./1,000, watered it in immediately, mow the greens with no baskets, and in a couple of days it should be worked in. Fine, this procedure was followed, and the next day all footprints around hole cups on three greens showed large amounts of wilt.

Looking only like tip burn, it was decided to syringe the areas in the day and let the three greens stay on the regular night time watering schedule, thinking that in 4 or 5 days the greens would grow out of it. However, they worsened, whereby most of the plants that were injured died within four or five days. During this time the temperatures were high (90's), the humidity high, with very little daytime drying. Even with the weather conditions as such and the fertilizer being used (13.2% of total N being derived from NH_3, SO_4, NH_3, NO_3, ammonium phosphates) only this portion could have any salts that could cause any damage.

So, what is the matter? At this point fertilizer was still on my mind. I hadn't given wet wilt a thought. On the sixth day, which was a Saturday night, we received 1" of rainfall. Naturally we had watered the greens Friday night, prior to the rain. Sunday morning we decided to mow greens, whereas no surface water was present and thinking no damage can come from it. Monday morning every tire track from the Triplex mower showed large amounts of wilt present. Still thinking fertilizer is the problem, once again the fertilizer people were called and they wanted Dr. Daniel to take a look. Immediate observation told him it was wet wilt. We had, without knowing it, helped to set up conditions along with the present weather that would no longer allow the roots to take up oxygen, and had altered the evaporation-transpiration rate.

Now that we have it, what caused it? Factors mentioned here, in lieu of present weather conditions are: shallow roots, thatch and layering from our present topdressing methods the last two years. (grinding up aerifying plugs in the fall). My feeling is the decomposition of thatch is not fast enough and is causing too much compaction. We are low in potash and phosphorus, and high pH. However, pore space is

good, organic content good and exchange capacity good, then why do we have to live with shallow roots every August?

How are we going to prevent it? Break up the thatch layering by more verti-cutting, aerifying twice a year removing the plugs, and replacing with a topdressing with a higher content of humus, hoping that we can get a higher decomposition of thatch. We will lower the pH with Ag sulfur and bring up the K_2O and P_2O_5 as quickly as possible.

Yes, we had wet wilt, and yes, we had fertilizer burn. I just wonder if we would have had wet wilt if no fertilizer had been applied.

- - - - - - - - - - - - -

WET WILT - PLEASE UNDERSTAND

W. H. Daniel, Turf Specialist
Purdue University

Many of you are acquainted with the fact there can be dessication in late winter under snow and a period of suffocation that causes loss of fairways such as at Wilmington, Delaware in 1968. Also, you may have seen greens where because of extended ice cover there has been wintertime suffocation, as illustrated here in May of '68 and April of '73 in the Dayton, Ohio, area. That is not our subject today; however, that adversity is important at times to poorly drained golf greens, or poorly drained turf areas anywhere.

Some of you have seen a deficiency of iron and corrected as illustrated, where the raincoat was spread earlier, and the response of the darker chlorophyl responding to the iron spray illustrates another limitation on bentgrass - in this case, iron deficiency uptake.

A third illustration shows footprinting in Poa annua at the edge of a green on the apron in which the grass that is brown was yesterday's footprints, and obviously, that pressed down now is tomorrow's dead grass. The above is contrast and background.

Now, from my experiences six situations of wet wilt will be shown rather quickly. In July of '73 at Ashland, Ohio, 18 greens were on a Monday fertilized and watered, etc. It was a hot, humid, miserable day for working. During the week some of the greens looked perfectly alright; some had just a spot or two, then some showed damage just to one edge in lower areas, or where there was compaction, and others showed damage throughout the center that was lower and flatter. One green had considerable slope, but the water could be seen weeping across the surface after the rain an hour before I was there. When one cut through the surface you found the soil was wet to saturation. Why the variable? The newer greens, the one that had better infiltration, had no damage. The same crew treated all greens in a sequence that did not relate to the damage. Thus, it was clear that on 8 of the 16 greens they had caused a wet wilt condition. What do we mean by that?

When water is so saturated in the soil rootzone that there is very little oxygen but the temperatures are high, the bacteria are trying to work, oxyidation is occurring, so there is a need for oxygen for the bacteria, for the deterioration of organic matter, for the fixation of chemicals, and for the root to do its work in picking up water.

Let's move to another sequence. In this case, the golf course had rebuilt six greens. These six greens were two years old. One showed extensive damage with the portion near the cup cutters in the shade showing least damage. A cup cutter reveals the soil was a mixture of sand and soil, but on Father's Day, Sunday June 19, wherever play occurred on four of these greens there was extensive damage. One green was badly damaged on more than just the play pattern. Yet, one of the same greens built out in the open, facing south, with better drainage had no damage. What's wrong? Again, no oxygen at the roottip. So, insufficient water pickup by the plant. And, the loss was severe.

In Ohio a golf course had not aerified as usual, as had been his custom, and he had had a heavy growth of grass for two years. Along in June, excessive wet weather, and up to acres at a spot showed a loss of turf within two afternoons. It had been rainy, wet and humid. Only above the tile lines, or the vertical slit trenches, just not near but just <u>on</u> was the turf itself normal at that time.

Now, other things are related to this. Let's look at two application patterns. In 1975 applications were made to all greens, but four were done later than the other fourteen. The last four greens were treated during an unusually humid spell of mid-fall. These greens were known to have poor infiltration and poor water management. Under these conditions, because of excessive wetness and watering, again wet wilt was seen, to some extent by following the application pattern. You can see the spreader pattern back and forth. Why would the fourteen greens previously treated have escaped damage? and the four greens more recently treated have so much clear-cut damage? Again, compaction, excess water, no oxygen at the roottip.

Then we go to a golf course damaged earlier in Evansville in July '73. The green shows wetness around the perimeter. It quit raining an hour before. You see the excess water standing in the cup. The green had been damaged earlier; you notice the goosegrass coming in and the thinness of the bent. From such tedium, I feel strongly that one thing that can happen to turf, fairways sometimes, poorly drained greens more often, and there is a potential under hot, humid weather to produce what is called Wet Wilt, and its severity is such that in a very short time death can occur. Fortunately such experiences are not common, thus the discussion today.

- - - - - - - - - - -

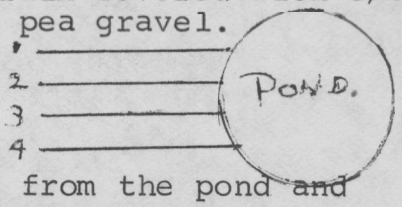
DRAINAGE IMPROVEMENT

Roger LaRochelle, Supt., Woodmar C. C.,
Hammond, Ind.

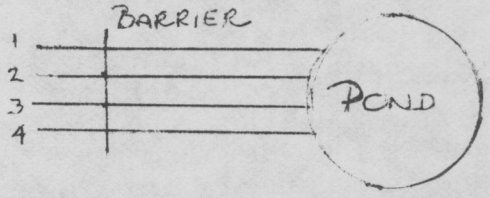
Flow rates of various slit trench constructions - Four different slit trenches were installed from a flat area and opening into a pond. All trenches were 15 in. deep and 40 ft. long.

The construction was as follows:

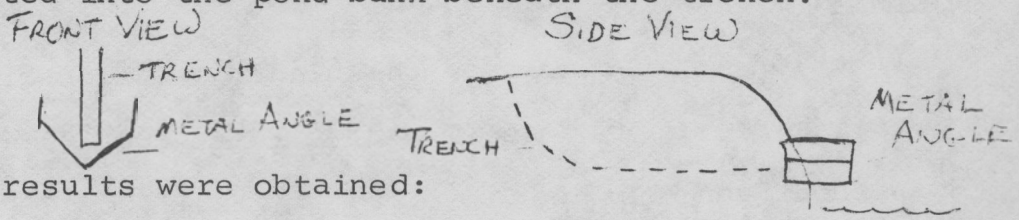
Trench 1	All pea gravel (1/4 in.)
Trench 2	12 in. 3/4 limestone capped with pea gravel
Trench 3	2 in. perforated plastic drain covered with pea gravel
Trench 4	2 in. perforated plastic drain covered with 3/4 limestone and capped with pea gravel.



A barrier was placed on the ground 25 ft. from the pond and the area behind the barrier flooded.



In order to capture all the water flowing from the trenches, a metal angle was inserted into the pond bank beneath the trench.



The following results were obtained:

Pea gravel	1.4 g.p.m.
3/4 stone - pea gravel	6.7 "
2 in. drain - pea gravel	13.3 "
2 in. drain - 3/4 stone - pea gravel	14.1 "

The results of the test are valid for our purposes, although there were some experimental errors.

1. In the trenches with the drain installed, the flow was too fast to catch accurately.

2. In the process of flooding, the water went around the barrier onto the pea gravel trench.

If these two errors were eliminated, the results would show an even greater difference in flow rates.

- - - - - - - - -

GRASS TALK - COMMUNICATING WITH PEOPLE

Jeff Lefton, Agronomist, Chem-Lawn Corp.
Carmel, Ind.

Customer communications can be difficult. The underlining principle is to talk with your customers as you would like for them to talk with you if the situation were reversed. Consider the following as guidelines:

1. Be courteous - it's hard to be polite at times
2. Be truthful - don't confuse the issue with inaccuracies
3. Understand the problems for a given time period of the year -- read and research these problem areas before each season so that you can project accurate facts.
4. Use pictures, diagrams, or visual aids as a means in explaining a problem
5. Do everything in making yourself confident enough about your products and programs so that you can naturally project a solid professional image.
6. For undefined problem areas, relate to realistic possibilities.
7. Use terms that the homeowner can understand.

As a foundation in understanding and relating problems to your customers, consider the normal growth habits and functions of a turf plant. Whether the problem area is well defined or not, the ultimate goal is to develop more green plants than brown plants. To predict and understand this concept, consider a normal turf plant.

Leaves:

Function - air-condition the plant; location of the food factory.

CO_2 (air) + H_2O (soil) $\xrightarrow{\text{sunlight}}$ FOOD

Without sunlight or water from the soil, or CO_2 from the air, the plant cannot make food for growth. Without water, additional nitrogen will not equal turf growth. This is a basic problem in the summer.

Leaves are not the most critical portion of a grass plant. To the customer the leaf blade is the most important thing. The importance is that the turf plant can produce new leaves as old ones die.

Roots:

Function - absorbs water and nutrients; storehouse for food; anchors the plant.

90% or more of a turf plant is underground. Without a root system you cannot grow healthy turf. A majority of the roots should be white or brown.

Crown:

Function - origin of new growing points (buds), i.e., roots, leaves

rhizomes, etc.; food storage area.

The key structure in developing new turf plants is the crown. A healthy crown will be white and greenish in color. Without viable crown tissue consider starting over.

Rhizomes/Stolons:

Functions - large storage areas for food reserves.

The rhizomes/stolons are important in filling in voids. One single bluegrass plant can fill in an area 8 - 10 inches in diameter.

From a problem analysis standpoint a good method in developing a basis for communicating with customers on problem areas is to understand the normal functioning of a turf plant. With this understanding you can relate to any abnormal lawn condition.

- - - - - - - - - - -

THE U.S. OPEN IN '75 - PEOPLE AND TURF

John Jackman, Supt., Medinah C. C.,
Medinah, Ill.

(Primarily a slide program)

Plans for the '75 Open started in April 1973 as soon as we knew we were to hold the tournament. We started preparing the golf course then, and made few changes.

Previous tournaments were held at Oakmont in '73, and Wingfoot in '74, and so we contacted those superintendents and watched the tournaments, plus see what they had done.

We stopped topdressing the greens approximately six months prior to the tournament.

All electric lines were installed during the months before the tournament.

Then the rains came just before the tournament. After the first day we used wood chips and straw to keep people out of the mud. We spread straw for 3 days in some areas. The course was normal moisture for only the last day.

Overseeding and reseeding through the fall. Slides of course during the tournament and what it looked like this past fall. Slides at intervals of a month and how well grass would come back alone without re-treatment.

- - - - - - - - - - -

TURFGRASSES THROUGH THE DECADES - A REVIEW

Dr. Ray A. Keen, Kansas State University
Manhattan, Kans.

Congratulations to the M.R.T.C. on attaining 40 years. Life begins!

It wouldn't be too difficult to tell of "Turfgrasses through the Centuries," but we were too busy "winning the west" here in America. So, our interest in sports and ornamental turf is more a matter of decades. With slides I would like to show you:

While our ancestors were wresting a living from virgin forest and prairie sod, the people of more populous Europe were enjoying leisure and recreation on turf and sward. For many decades "Cumberland sea washed turf" was the prestige grass on golf and bowling greens in England.

In this country the early greens were seeded with bentgrass seed from native stands in Germany, New Zealand, Oregon and elsewhere. Only the fittest survived. Many of these superior ecotypes were collected by the Green Section of the U.S.G.A. and distributed widely for testing. The Kansas Agricultural Experiment Station started turf variety trials in 1924 with 19 of these U.S.G.A. bentgrass clones and sources. Bluegrasses and buffalograss were added in 1925. The effects of several fertilizers and height of mowing on clipping yield and weed invasion were carefully recorded. (4)

Plot work was resumed in 1951, again with Green Section cooperation, and co-sponsored by the Central Plains Turfgrass Foundation, 25 grasses and mixtures including 'U-3' bermudagrass, 'Meyer' zoysia, 'Merion' bluegrass and 'Arlington' bentgrass were included. One half inch, one and one half, and three inch mowing heights were imposed. It was concluded that better grasses for the "Transition Zone" were needed and a breeding program was started. 'Midway' and 'Midiron' bermudagrasses that are very winter-hardy, have been released. Others will follow. Testing has expanded to the Branch Experiment Stations and fields.

With better grasses from many sources other problems have been identified and researched. Sandy mediums, fertilizers, herbicides, pesticides, thatch and traffic problems have all had careful attention, as we have learned to grow the increasing number of "improved" grasses.

Other states have demonstrated the same pattern of activity, some earlier, some later. Arizona has become the main source of bermudagrass seed with improved uniformity. Dr. Kneebone is testing bentgrasses for heat tolerance with the Southern Region group.

Dr. King in Arkansas is screening many grasses and researching subirrigation. The state has many microclimates and soils problems to reconcile.

Florida has been the source of numerous warm season grasses from both industry and the Experiment Station.

Outstanding in release of improved grasses for greens and fine turf has been the program of Dr. Glen Burton of the Coastal Plain Station at Tifton, Georgia. 'Tiffine', 'Tifgreen', 'Tifdwarf', 'Tiflawn' and other segregates have come from this source. Winter hardiness does not exceed that of 'U-3' bermudagrass.

In addition to limited release of bentgrasses, Iowa State has provided an excellent test for winter hardiness of marginal warm season grasses. 'Ugandagrass', 'Burning tree', 'Royal Cape', 'Midiron', 'Midway', and several Kansas numbers were well tested there.

Purdue has released 'Evansville' bentgrass and 'Sodco' bluegrass while testing most available cool season grasses. Their warm season grass tests have been in the St. Louis area.

At Beltsville the late Dr. Felix Juska released Belturf and endorsed Ky-31 fescue for cool season lawns in the transition zone. He recommended 'Midiron' for tolerance to winter traffic.

From Pennsylvania has come a series of improved grasses: 'Penncross' bentgrass, the most widely planted for greens. 'Pennfine' ryegrass has the least disease in Kansas summer heat of any ryegrass. 'Pennlawn' fescue and several bluegrasses with others to follow from their sound program of breeding and testing.

New Jersey's extensive breeding program has recently resulted in several superior bluegrasses and the widely planted, fine-textured 'Manhattan' ryegrass.

Oklahoma's Dr. Wayne Huffine has collected bermudagrass germ plasm from around the world. We have great hopes from this program. They have released 'Oklawn' centipedegrass that is quite winter-hardy at Manhattan, Kans.

From Alaska comes 'Nugget' bluegrass with some heat tolerance in some Southern Regional trials.

Ohio has had 'Windsor', 'Victa' and others released by Scotts, but their 'Garfield' that performed best in early K.S.U. trials was never marketed.

A bermudagrass tolerant of smog and PAN was released by California with the name 'Santa Anna' - this was not hardy in the transition zone.

Tennessee has released a 'Tennessee Hardy' centipedegrass that is much taller than 'Oklawn'.

Texas did a study on Saint Augustine grass from seed source, but I'm unaware of any release. Their bermudagrasses 'Texturf 10' and 'Texturf 1-F' were as hardy in our trials as 'U-3'.

Time does not suffice to mention the flood of cultivars from Europe, which has had variety protection laws several years longer than the U.S. The mounting number of cultivars will soon make it necessary to charge for testing, similar to the problem of excess pesticides before EPA.

The future also holds promise of re-evaluation of many grasses for superior performance at reduced or minimum maintenance levels. This is commonly observed abroad and can be achieved here if necessary.

The role of industry in providing improved tools to cultivate through the sod and harvest, and remove the crop residue of "Thatch" should be mentioned. Without the machinery, chemicals, pesticides and fertilizers many of the "improved" grasses could not have been grown in recent decades. At low nitrogen levels many grasses are quite ordinary.

The future also holds a meeting of the International Turfgrass Research Conference in Germany in July 1977. Dr. Peter Bocker is our host.

Additional Information

[1]Beard, J.B. 1973 Turfgrass Science and Culture. Prentice-Hall, Englewood Cliffs, New Jersey.

[2]Huffine, W.W., and F. V. Grau. History of Turf Usage, in Turfgrass Science, American Society of Agronomy. Monograph No. 14.

[3]Madison, J. H. 1971 Practical Turfgrass Management. Van Nostrand Reinhold Co., New York.

[4]Zahnley, J.W., and F. L. Duley. 1934 Effect of Nitrogenous Fertilizers on the Growth of Lawn Grasses. Journal American Society of Agronomy 26: 231-234.

[5]Zahnley, J.W., and L. R. Quinlan. 1934 Lawns in Kansas. Bulletin 267 Kansas Agricultural Experiment Station.

- - - - - - - - - - -

STUDENT TRAINING AND PLACEMENT

W. H. Daniel, Placement, Turf Option
Agronomy Department, Purdue University

This audience is well acquainted with the Midwest Regional Turf Foundation which has been in operation since 1945. You know about, and are now attending one of the annual Midwest Conferences. Over 700 have attended for the last seven years. And, one product of this has been the annual Proceedings which gets new information to you in record time.

Our student training started in 1952 with one turf student. In the 50's it gradually expanded with students such as Clemans, Frazier, Trevarthan and Gilman, or Tadge, Freeborg, Graves, Chenoweth and Habenicht, or Beard, Johanningsmeier, West and Hodges. Through the 60's we further expanded, so began to have larger groups out to the Daniel's house for picnics, more student wives for visiting and getting acquainted. And, we were able to take trips to Huber Sod Farm, to Purdue Golf Courses, or to Meridian Hills C.C. with Steve Frazier.

There is a thrill in seeing an older person, such as Bob Dunning, share with a younger person, such as Dave Bingaman, who got his Master's at Purdue. Thus, information does move from generation to generation.

We have over 150 graduates in turf at all levels up through 1975. I would comment on the new program where we are asking former graduates to contribute to a fund that supports student labor. We have had as many as fourteen working at one time on an hourly basis as their class schedules permit, and sometimes there are far less than fourteen working. But, in the twenty-five years since our first turf student we have always said, "Yes, you may work", to any turf major, almost any day and almost any time, for we have thought it part of our privilege to have these young people work in our training programs so that they get the experimental and research concepts, as well as the broadening experience of accomplishing things while they are here.

The former students have contributed well to this program, and I thank them for that. It is, to me, a rich experience, better than giving a scholarship, to give them an opportunity to work.

We have gone from that first student in 1952 on a gradual upswing with a strong increase in the early 70's. Today at Purdue we have over 10% of the four-year turf majors in the U.S. There are 76 currently enrolled this semester with 17 graduating in May.

Along this line, we have put up a bulletin board at the registration desk area, and on it have placed some references, brochures and names so that you, if you need personnel or are considering personnel, please stop by, take a look, leave a message, and help us help these boys, for we are in the position at the University of accepting all who come to us for training, and under this condition we cannot regulate the number coming. Just like Animal Science, or Psychology, or any other field, so we have the privilege of educating those who come, and we want to do the best job possible, for they are a great bunch of young men, and it's a privilege to share with them. Thank you.

- - - - - - - - - - - -

UNDERSTANDING FERTILIZER VALUES

W. H. Daniel, Turf Specialist
Purdue University

How does one assay the value of an offered package of fertilizer? Oh, three hundred dollars per ton, or my bag is cheaper than your bag, or if you buy big tonnage you get a special deal.

Now, generally you purchase from the fertilizer company at least three elements, and with secondary and minors, up to ten elements. Now, how do you assay the value of each of the ten elements?

One way is to determine the cost of the material when purchased alone. For example, one company quotes muriate of potash so that a pound of K_2O as Kel is worth about ten cents. Now, if you calculate a

complete fertilizer from that same company, let's say 10-10-10, they offer that fertilizer at 7.7 cents per pound. OK. By comparison, it's cheaper to buy a complete fertilizer than to buy straight potash from that company for some reason.

Another comparison. That same company offers 10-10-10 and 12-12-12. The one costs $122 per ton, the other $150 per ton. Actually you pay $2.00 more based on the nutrients in the 12-12-12, but you have less freight, less bag, less work, less storage, so it's a better buy - it figures out 7.8¢ per pound.

Over the years I've worked out a formula based on the value of X as equivalent to per pound of K_2O. In comparing today's prices, potash seemed to cost from near 8¢ to near 11¢ per pound, in straight goods or commercial farm-type mix. Now, on that base, we back up and determine the value of phosphorus, iron, sulphur, magnesium, manganese, copper, zinc, calcium.

There is a truism in turf fertilizers: since the biggest demand for turf is nitrogen, it is also the biggest cost of turf fertilizers. Under these conditions then it is imperative to assay the value of the nitrogen available for turf use.

One company offers UF nitrogen as nitroform in a five ton lot so that the value of the nitrogen is calculated to 80¢ per pound of N in the slow release portion. In contrast, IBDU, when offered at $460 per ton calculates to 75¢ per pound for the slow release nitrogen it contains. Now, if you can buy slow release nitrogen at 80¢ per pound in 5 ton lots, what's the cost in mixed goods? That you have to calculate.

Generally, since slow release N is merchandisable in the original form, there is no hope of getting it cheaper in a mix than it would be straight form. Every reason of re-packaging, re-labeling, re-advertising, re-storing, more distance in freight, adds to the cost of the material. Yet, we realize that it is a great convenience to have a complete formulation, and the fertilizer companies have given you much useful material in some of their special mixes.

For example, you can buy soluble fertilizer, standard grades I mentioned earlier, for less than 8¢ a pound for X. But, to buy that soluble fertilizer in 25 lb. bags with a special label can cost over 3 times as much, like 25¢ for X. So, what's the confusion? The confusion is that by sitting down and calculating the comparative values of the components included in a fertilizer blend or straight goods, you can determine what is the most economical source based on your values for X. Then, you can add your special considerations for quality and value, and determine the better buy, or the preferred purchase for your conditions with the added information on quality. If you wish, change the values, depending on your demand and your situation. If you wish to compare between company A and B and C, then this type of calculation permits that to be done to the extent you wish to employ it.

Trust this will help.

W. H. Daniel
Purdue University
revised 12 Ap 76

Fertilizer Calculations

Historically the soluble nutrients in fertilizer have been about 3x-2x-1x in price. Today costs have shifted some of these values.

		Daniel's Comparative Values	Set in Your Values
Consider the base value to be for one pound of.....	K_2O	= 1x	
By comparison in markets then.....	P_2O_5	= 2x	
N was 3x but recently more. CWS....Cold Water Soluble	N	= 5x	
The slow release N. HWS.....Hot Water Soluble	N	= 10x	
Question of release,very slow. HWI.Hot Water Insoluble	N	= 5x	
Other additives, often called Minors, including..Iron	Fe	= 3x	
About compares to phos. in cost.....Sulphur	S	= 2x	
Very low conc. are ample.....Zn & Mn		= 3x	
Just to identify Ca or Magnesium.....	Ca & Mg	= 1x	

Anyone could set his value base if different facts.

Based on these values any fertilizer can be calculated to comparative cost of x.

Then, based on your preference for salesman, distributor, program or products, your selection can be made.

Example: 18-4-10 -- with 10% Ureaform source plus minors

Content	Nitrogen Sol.	HWS	HWIS	P_2O_5	K_2O	Fe	S	Mg	Mn	
% in Fert.	8	6.7	3.3	4	10	1	6	1	.5	
Values	5x	10x	5x	2x	1x	3x	2x	1x	3x	
Total x	40	67	17	8	10	3	12	1	1.5	= 160x/100 lbs. 20 in ton 3200 in ton

So, 3200x if $400.00 ton delivered, then x = 12.5¢

Example: IBDU is 31-0-0, so all nitrogen

3 28
5x 10x
15x 280x = 295x x 20 = 5900x/$460.00 = 7.8x sp HWS N = 10x or 78¢ 1b. for slow release N

Calculate your fertilizer here:

	5x	10x	5x	2x	1x	3x	2x	1x	3x	
% in Fert.										
Total x										___/100 lbs. 20 in ton x in ton

STARTING A PROFESSION - MY STORY

Randy Bellinger, Turf Major,
Purdue University

My story includes some experiences as a non-student and as a student here at Purdue.

I was born and raised on a 120 acre farm in Illinois. I gained my first golf course experience the first summer out of high school. I was inspired so decided to attend Danville Junior College,and two years later received an associate degree in Applied Science in Turf Management. I then became an assistant superintendent at a public course, I stayed there for one and a half years.

At the private course I worked for a superintendent in his late 50's who was very set in his ways and opposed to any type of improvement. I ran into difficulties because I was anxious to improve things and use my recently acquired knowledge. However, any suggestions that were made for improvements were vetoed immediately. I was hired by the Greens and Grounds Committee, which later made working conditions less than optimum. I learned two things from this experience:

1. Never become an assistant superintendent unless you are hired by the superintendent, and
2. I learned what not to do as a superintendent.

Because of the unfriendly atmosphere and unpleasant working conditions, I became motivated to go back to school and chose Purdue. I don't want any of you to think that college is just a four-year vacation where all the students do is party and go out on dates, and never open a book. This may be true at some colleges, but certainly it is not true of Purdue. Purdue has the best agriculture school in the nation, and one of the top turf schools in the nation. These ratings were not achieved by parties, but by students with high goals and have worked hard to achieve them.

Purdue is a conservative school. Major schools are: Agriculture, Engineering, Pharmacy, Home Economics - primarily majors which require much work and which attract the more conservative students. Probably the most important thingI have learned while at Purdue is discipline. Discipline is important in three areas - time, money, life in general. Turf is probably the hardest curriculum in Agronomy, with courses consisting of four semesters of chemistry, microbiology, physics, math, so at the beginning a turf student has to buckle down and spend much of his time studying.

But, college is made up not only of books, but of organizations. Organizations help you to discipline your time and your life in general. They help you to learn responsibility and leadership. They help to train our lives by becoming more organized. I am presently the president of the Purdue Agronomy Club, and have gained much self-satisfaction in helping to run the organization. Organizations also help you find out who and what your competition will be in regard to future employment.

Sometimes one spends more time with an organization than he should. Here again, discipline is important to be able to realize

when you are using your time on the wrong activities. We are all faced with responsibilities outside of school work, and I have found myself using personal time quite often in order to keep things running smoothly. I have learned that if you take too much from your personal time it's not good.

A student must also learn how to discipline his life in general. Purdue provides much cultural opportunity for its students, such as plays, movies, concerts, the Co-Rec and intramural teams.

Many students are married, or like myself, seriously thinking about it, so this adds to the conservative attitude. This conservation also creates an atmosphere in which drug culture is not prevalent.... due in part also to strict campus policies.

Money is hard to come by for many students, and thanks to Dr. Daniel for the work-study program which is available to his students. It has helped me pay many bills. The three months during summer is the only time a student has to make any kind of money. I have worked for Dr. Daniel full time during the summer, plus taking care of four lawns, two of which have putting greens. I have had great need to discipline my time, money and life in general.

My college education has been both enjoyable and a beneficial learning experience through books, organizations and people. A student's life is not an easy one, but it is a good life, and probably what I will later call "the best days of my life."

What we as students, (and you as non-students) must always keep in mind when papers are due and deadlines draw near, and weather conditions are not in our favor, is not to lose our heads, but to keep our cool, and most of all, don't worry.

- - - - - - - - - - -

HELICOPTER APPLICATION OF PESTICIDES TO TURF

Dave Fearis, Supt., C. C. of Peoria,Ill.
Steve Derrick, Professional Turf Specialties
Bloomington, Ill.

Aerial application of pesticides has been a common practice throughout the agricultural community, but has just recently gained momentum in turf. The use of helicopters in applying commonly used turf products has proven to be beneficial and economical for parks, golf courses, sod growers, and other turf managers.

Procedure:

The helicopter is normally transported to the application site on a special trailer behind a pickup truck. A minimum - approximately 10,000 sq.ft. - is required for a take-off, and mixing area.

Materials are mixed in a 55 gal. drum and pumped into the spray

tanks. This allows on-site mixing and flexibility. By using this procedure, you can spray a herbicide-fungicide mixture for fairways, and spray only a herbicide on rough areas. Also, a variation in rates may be desired and can easily be custom-mixed with this procedure.

Different equipment can be utilized. However, Professional Turf Specialties uses a Bell 47G2 helicopter with a 32 ft. boom. The spray nozzles are Spraying Systems No. 45 core tips with a number 8 oriface. This allows an application rate of 10 gal./acre of solution applied at 35 mph. Normal rates for aerial application average around 5 gals. of solution per acre. This could work as well; however, to insure good coverage 10 gallons is used.

Cost Comparison:

Costs can vary according to who is doing the application and what area of the country it is in. For the 1976 season, the cost per acre was figured at $5.50/acre, plus the cost of materials used. At the Country Club of Peoria, Superintendent Dave Fearis figured it takes one man eight hours to spray his 36 acres of fairways by ground. At an average salary of $4 per hour, costs compare as follows:

Ground Application		Aerial Application	
Material	$ 1108.90	Material & app.	$36/acre
Labor	32.00		
Total cost	$ 1140.80	Total cost	$1296.00

In many cases, the difficulty and size of the area to be sprayed has altered the figures to show that aerial application would be more economical than ground application.

Advantages:

Any form of spraying that accomplishes uniform coverage at the desired rate is a good method. Aerial application, however, affords certain advantages that cannot be gained by other accepted methods.

1. Involves no use of golf course labor
2. There is a minimum of wear to the course
3. Reduces interference with play
4. Allows chemical application when ground is wet, so schedules can be maintained
5. Eliminates over-stocking of chemicals
6. More accurate application.

As more turf managers take advantages of custom application by air, more uses will be discovered. Currently it appears that the application of granular herbicides, such as Balan, and fairway fertilization, is just around the corner.

- - - - - - - - -

PURR-WICK - TEN YEARS

W. H. Daniel, Turf Research
Purdue University

At Purdue University we have worked with many things including peat to the soil trying to improve moisture retention and drouth tolerance. We have worked with the calcined aggregates, as well as working with the chemical soil conditioners, such as Krilium, in the early 60's. The USGA has sponsored research and led to the intimate mix above a perched water table, a specific system of building. It has worked well and been used in many states since its research and introduction in about 1958. It involves a gravel layer, a break in the tension, a perched water table in a mix above a layer of gravel.

Many golf courses have had wet wilt occur in the summer. What a tragedy when it occurs! The reason is that the root itself cannot get oxygen, so it cannot pick up water, and so the leaf wilts, and the entire plant is dessicated very rapidly.

Often we see golf greens where even an hour after a rain there is too much water standing in the cups. Obviously this means poor drainage down below, and when that is extenuated by extended wetness, we can see wet wilt occur in low areas of golf greens so that there is a complete loss of turf in a matter of minutes - much less than an hour. The winter opposite is the winter desiccation, where water can accumulate on the surface during the winter as ice and snow and freeze, and stay there so long that the crown of the plant is dehydrated and is lost. Generally, greensairing helps. Sometimes we see chemicals applied to turf areas and subsequent watering would cause damage.

We have done work, as have other places including Sweden, with a sand bed above soil with internal drainage, a shallow system of layers, a sand bed method, and it does work well except that it often shows moisture stress and depends upon frequent, uniform irrigation.

At Purdue we have worked with the Purr-Wick rootzone system, using slitted pipe and a barrier to make compartments to hold the moisture and give us maximum moisture uniformity. These involve a wick action in which water can only move up or out the side through an access. By stopping the water movement down, which can be a constant thing - day after day and minute after minute - you can conserve much of the water that's applied and as needed deliver it to the roottip. In the Midwest much of our soil contains more silt than clay, so when these soils are mixed with sand they often make almost concrete in density, and the use of washed sand in the Purr-Wick system is a definite departure from soil materials. In Arizona, Dr. Gordon Johnson has done considerable work, and he has found that from three weeks to three months the water supply can be put on in one application depending on the weather.

At Purdue we have put in 81 rootzones, have found that many of them vary wick action. We have also found in one season we could carry them so wet that the sand would turn blue and smell like a sewer. Obviously that's not good management. Those that have good wick action are the ones we prefer. And washed sand is rather good in this category. It gives you a uniformity, and it gives you plenty of oxygen at roottip

unless you keep the water table excessively high. So, year after year we see the same wicks making good moisture response. And, those that convey the water readily are definitely preferred.

We have seen times when the whole green would look uniform and then after a day or two those areas not having the Purr-Wick action would need irrigation as illustrated by the dew pattern.

Our first green was built at Louisville in 1968. The truck dumped the sand direct. Another was built in 1969 at Columbus, Ohio, and the barrier was formed over soil dividers. We found that at the edge we had to bring the plastic to the surface otherwise the soil at the side was excessively wet. At that point we also knew that our divider system needed to be higher than four inches because the water would weep across the barrier by slow capillary siphoning action.

On this particular green the green is level, but has been irrigated twelve hours before and excessive water draining out twelve hours after irrigation makes a spring of the system, which illustrates it was definitely overwatered.

Even at Belle Meade in Nashville, Tennessee we were encouraged to make our dividers higher. The lowest drain in the green should not show any more water dispersal than the upper levels with an ideal system. We have built some Purr-Wick beds along houses. We find that these work very well for growing flowers or vegetables, and are easy to manage from the water management standpoint.

At Purdue campus we put one Purr-Wick above a heat tunnel as a means of isolating it from the heat tunnel and also setting up a beautiful spot.

On roof gardens we have found that we can use light weight aggregate with the Purr-Wick system and have phenomonally good water retention for shrubs and thus require minimal demands.

The early 70's we were recommending the use of baffles ten, twelve inches high, just below the cutting depth of cup cutters. Also, we found that outside the flanges we could use the solid Turfflow pipe (without slits) and make extensions of the control system to any of the pits.

At Evansville 38 greens were built using sand from the Ohio River. Ball marks have been very good on this green under all kinds of weather conditions. In the construction of tees we find that the outside perimeter beyond the tees need much more water than the tee itself.

At Cleveland we used fine foundry sand which needed leaching before it was put into greens. However, greens and tees have worked when built with direct dumping.

At Birmingham one green was built, then three years later 3 other greens are being built to the same specifications. At Mobile, Alabama, Supt., Shull Vance is using Purr-Wick with bermudagrass, and the roots were down 22 inches deep. In Vancouver, Dr. Taylor is using Purr-Wicks for studies related to snow mold. He finds the water penetration and management quite easy. In Kansas City, Larry Runyon has encouraged and built more Purr-Wicks than any other person. There

are about 45 Purr-Wick greens and about an equal number of flower beds in the city parks.

Our new development is a pre-formed barrier designed, formed with baffles and delivered to the site ready for unrolling and filling. It is a special procedure, but does allow the architect to prescribe, and then it is delivered and fitted as installed.

In North Carolina fine sand was available. In this case it took 600 tons of sand to make a 5000 sq.ft. green. Out in Los Angeles a trial 100 sq.ft. experiment was conducted by two turf students under Wayne Morgan. This led to acceptibility by Don Parsons who has built a 10,000 sq.ft. practice green adjacent to the clubhouse. This involved working around many features of irrigation, and in that case, asphalt caulking, plus extra sheets of plastic and considerable tedium of hand work was required to be sure of individual seals around individual irrigation exits and entries.

Also at Los Angeles we put in a subsurface watering system, using the float valves from septic tanks from toilet commodes and combining this with vertical risers so that the pit can be at the edge of the green and give both subirrigation and outflow wastage and exact depth observation.

We have found at Purdue that the Purr-Wick has required not more than four waterings per year, whereas the adjacent soil has required watering over 40 times per year. In irrigation we know of the manual sprinkler, the pop-up, the automatic time clocks, but soil sensing, the Purr-Wick barrier, and the suction of the PAT system are 3 additional water management programs, which can contribute to better turf management also.

Sand, ideally, may be up to 44%pore space, and if it is quite variable in sizes it can be as low as 26%, when all sizes of sand are present. Generally sands run about 30% pore space if they are washed mortar-type sands.

There are numerous experts working with sand, and there is good agreement now that the finer sands are the preferred portions. We have gone past the coarse sand and even the use of fine gravel hoping by texture to achieve a miracle. Sometimes we find that native occurring sand in dunes is very good. Sometimes in creeks there is a reasonably good sand, and there can be some special sands made, such as mortar sands and glass sands in that they are very uniform.

Dr. John Madison of California has proposed that there be a repeat light topdressing with sand. We have tested this procedure in prior years and agree that if you know what you are doing, and will do what you know repeatedly and on a long-term program, a sand topdressing is a preferred way of management - remember - done repeatedly, lightly and with efficiency.

In summary, Purr-Wick during ten years has seen much advancement. There are over 300 greens, over 200 tees, and over 200 flower beds and roof garden installations. With this background of experience scattered over more than thirty states and Canada, there is an increasing interest and now a credibility. Purr-Wick is a Rootzone System that illustrates advancing turf technology.

CHOICES OF COMMUNICATION

Louis E. Miller, Supt., Louisville C. C.,
Louisville, Ky

Five years ago, the concept of two-way communication via radio in the turfgrass and related industries was considered a luxury. Today, however, the concept of two-way radio communication must be considered an integral part of any turfgrass operation. The need for two-way communication has been established. The purpose of this paper is to present to you the various options that are available in two-way radio communication.

The most basic mode of two-way communication available is the pocket pager. It is quite small, can be carried in a shirt or coat pocket, and is powered by a rechargeable battery. The "electric leash" as it is sometimes referred to, is capable of receiving a radio signal that is activated by dialing a specific telephone number. This, in turn, causes the pager to emit a beeping sound and/or a vocal message which instructs you to call your answering service. It does have its place, however, direct communication is somewhat restricted. The range is approximately 20 miles, and the cost runs between $19 and $25 per month. They are available on a lease plan only.

The most basic of the two-way communication systems available is the hand-held 1/2 watt walkie-talkie system. Actually, it is nothing more than a toy and has a very limited range. Powered by a nine volt battery, its range of transmission rarely exceeds 300 to 400 yards. It has little flexibility, and should be considered for little more than a tool to check out the irrigation system with. It is quite inexpensive, costing between $65 and $85 per unit.

The next step up in two-way communication is the citizens band radio. The CB as we know it has reached unlimited popularity today. The very number of these radios in use today limit it somewhat as a business tool. With proper use, however, it can be quite efficient. According to FCC laws, the wattage of the CB units, both base station and mobile must be limited to five watts. Efficient two-way communication can be achieved to distances of ten miles or more. The only problem is that there is so much traffic on the 23 channels that are available that getting on and off the air with your own transmission often proves futile. Within a limited operating range, say two to three miles, it is quite possible to control the "squealch"(transmission distortion) which greatly limits the amount of outside transmission and allows you good, limited transmission with little interference.

The cost factor is one of the most attractive aspects of the CB radio. A five watt base station with antanna should not exceed $250, and a five-watt mobile with antenna will cost between $125 and $175. A good system comprised of a base and four mobiles can be purchased for around $1,000. A system of this type will more than pay for itself in the first year of operation.

The next step up in two-way communication, in both range and efficiency, is the AM Business Band radio. These units are offered in five and fifteen watt mobiles, and fifteen watt base units.

According to FCC laws, the AM Business Band units, both mobile and base, may be increased to 100 watts of transmission power. One of the main advantages of the AM type of equipment is that they are set on a fixed frequency and you have little to no outside interference. The range of this type of communication equipment often exceeds 20 miles. The 5 watt mobile units run between $185 and $210. The 15 watt base unit with antenna will cost between $260 and $280. The power boosters to increase the transmission wattage will cost around $300. A very efficient two-way communication system can be purchased for between $1500 and $1700. This type of system will also more than pay for itself in the first year of operation.

With all of the traffic on all phases of AM radio today, the most efficient type of two-way radio equipment available is the FM Business Band. It is virtually silent except when you are transmitting or receiving. Outside traffic is practically nil due to very limited number on each assigned frequency. The efficiency of FM equipment is rapidly displacing AM equipment in most areas. The FM equipment will run from 10 to 100 watts on both mobile and base units. The 10 watt mobile and base unit has a communication distance of 15 to 20 miles. The cost of the 10 watt mobile unit runs around $400, and the base unit will run between $600 and $700.

One of the strongest features of the FM equipment is that its transmission distance can be greatly increased by the use of a repeater station. The way that this works is that all transmissions go directly to the repeater, which is located usually at the highest elevation in your area, from there the signal is repeated in transmission power to whomever the message was intended. Such repeater systems can often send a two-way radio transmission a distance of over 50 miles. Depending upon the need for transmission range in your particular operation, the repeater is an excellent way of increasing the flexibility of your two-way radio system. The cost of using a repeater runs around $20 per month for each piece of radio equipment that uses it.

The FM equipment also offers piece of two-way communication equipment that permits anyone using the two-way radio equipment to talk with anyone using a telephone. This system is designed to allow direct communication with the individual unit via telephone, and does not require a base or special radio to do so. All calls go through an operator, who, in turn, will connect the radio with any telephone number desired. Anyone desiring to talk to the mobile unit can call the operator, and the telephone caller is then connected with the mobile two-way unit. The range for such a unit is around 30 to 40 miles, depending upon terrain and atmospheric conditions. The cost of the unit is around $40 per month rental, with a 1 to 3 year lease.

All of the types of two-way communications that I have mentioned have a place in one phase of the turfgrass industry. It is up to the individual to determine just which type will best suit his needs. The whole concept of using radio equipment is that of closer management. Used effectively and efficiently the two-way radio will allow the turfgrass manager better control of his operation, which will reflect in time and dollars saved in the operation, which will more than pay for the system in a short period of time.

- - - - - - - - - -

ORGANIZATION -- A KEY TO SUCCESS OR, S.O.P. vs. CHAOS

O. G. Miles, Cook County Forest Pres. Dist.,
River Forest, Ill

This key can be acquired and chaos avoided by taking 4 "Easy" Steps.Whether you are taking a new job or a tenure superintendent, our first thoughts should be on our, "Purpose for Being." Therefore, our FIRST STEP is to define objectives. In our particular case, the objective was to upgrade existing courses towards acceptable standards in order to:

A. Satisfy public golfers
B. Increase play and revenue
C. Accredit manager and supervisor status
D. Improve F.P.D. golf courses image

Do we want criticism, or do we want compliments? Each and every individual is certainly seeking some type of recognition.

The next chain of thought that should go through our mind is, How do we attain these objectives? By organizing and deploying standard operating procedures and programs, which brings us to STEP II.

STEP II - PUTTING THE HOUSE IN ORDER

The first phase of Step II is:

A. Clean up and organize - the office, shop, garage, storage rooms and maintenance yard. How many of you have visited other courses and have seen a maintenance area that looks like a junk yard? It doesn't make a favorable impression on others and by cleaning up these areas gives you a thorough orientation of things that you have to work with, and it is a real sign of personal pride and true professionalism.

The second phase of step II is:

B. Inventory. By taking inventory of all materials, equipment and tools;

Example II. - Inventory - Ag Materials

Golf Course - Burnham Date: 2/29/75

Fertilizer	Units	Quantity
6-3-0	50 bags	2500 lbs.
5-10-5	46 "	2300 "
21-0-0	7 "	350 "
45-0-0	10 "	710 "
10-10-10	6 "	300 "
0-0-60	2 "	100 "
Fungicides:		
Chromate	1 can	10 lbs.
Velsicol 2-1	4 drums	100 "
Puraturf (20% cadmium)	4 "	100 "
Semasan (25% mercury)	½ "	50 "

Inventory continued:

Insecticides:	Units	Quantity
Chlordane	1/4 bag	12 lbs.
Lead arsenate	2 bags	100 "
Herbicides:		
2,4-D	1/2 drum	30 gal.
Surfactants:		
W. agent (Aqua-Gro)	5 cans	25 "

A lot of surplus materials were uncovered that we were able to utilize in either a trade, or possibly for future use. These materials that were actually sitting idle represent a lot of money--over $1,000 in each one of those 100 lb. quantities. Also, notice the fertilizers that were being used, the 5-10-5 for example, not many of you would probably recommend this material to be used on the greens. However, that was its purpose. Obviously there just was not enough fertilizer available to do an adequate job of fertilizing.

The real purpose here is to give you an insight into the past practices of the previous superintendents or managers, reveals surpluses, helps you to utilize the stock you have on hand, pinpoints deficiences and priorities, and will certainly serve as a guide in future purchasing.

The third phase of Step II is:

C. Specific Area analysis. To establish a specific area analysis is to go out and actually estimate and make sure that you tabulate the areas of all greens, tees, fairways, aprons, etc.

Example III - Component Area Analysis
7 - F.P.D. Courses

Description	Approx.area/course	Total area
Greens & aprons	100 M	600M+
Aprons & approaches	6 A	36 A
Teeing surface	-	4 A
Tee banks	2 A	12 A
Traps		
Green	-	-
Fairway		
Bunkers, Fairway	-	-
Fairways	40 A	240 A
Lakes	-	-
Streams	-	-
Clubhouse & Maint.area	Varies	22 A
Parking lots,roadways,paths		-
Roughs, maintainable	60 A	360 A
Misc. areas	-	-

This is a summary of the general area that is involved in the operation of the seven Forest Preserve Courses. This is a must in formulating programs where computation of rates, quantities, time, etc., are important in estimating budget costs and maintenance standards.

The fourth phase of Step II is:

D. Jobs Pending Outline. Walk the course and list the things you would like to overcome as far as getting the course in shape. This is strictly a listing of all jobs of a maintenance repair nature. (Not one of capital improvements) compiling this list is going to help you get the course in shape by eliminating any problems of "neglect" by way of priorities and progressive work scheduling.

Example IV - Jobs Pending Outline

Golf Course - Edgebrook - Date: 11/1/72

Job Description	Dept.	Start	Finish
Tree work	Forestry		
Prune out deadwood			
Remove deadheads			
Rout stumps & cleanup			
Tree Work	Golf		
Fill & seed stump excavations			
Prune interferring branches			
Deweed greens			
Plug out weed patches	Golf		
Root prune	Golf		
Around greens #3 & 9			
" tees			
Install P.G.	Golf		
Penncross bent			
Establish nursery	Golf		
Bent sod, C-15 & Seaside			
Overseeding detail	Golf		
Flood plains			
Around trees			
Sodding detail	Golf		
Traffic area #14 ravine, #6 tee & #9 green			
All other spots - appraisal forthcoming			
Misc.	Golf		
Fill potholes - #2 tee &			
Sterilize fenceline #7 green			

Only after completing the preceeding preliminaries are we prepared for the next step.

STEP III - SORTING IT OUT

A. Revise Maintenance Standard. All of these things basically are involved in making the golf course more pleasureable for the golfers and that is the name of the game.

Example V- Results - Procedures & Recommendations

Revise Maintenance Standards

Greens

Reduce cutting height from 3/8" to 1/4"
Increase mowing frequency to 5 times/ week minimum
Drag dew when unable to mow
Establish collars
Use C.D.G.A. system in changing cups
Repair ball marks regularly
Check turf condition daily - disease & wilt

Fairways

Increase mowing frequency to 3 times/week minimum

Mow @ 1¼ - 1-3/8"
Cross-cut occasionally

Rough

Establish where feasible to facilitate maintenance
Mow twice per week when possible
Mow @ 2 - 2½" cutting height
Clean up debris as required (spring cleanup, storm aftermath, fall leaf removal)

B. Formulating Ag. Programs.- A formulation of fertilization and spraying schedules and cultural practices as a plan.

Example VI - Fertilizer Program - '75 - Greens

Objective: Apply 6 - 8 lbs. Nitrogen/M
1 - 2 " Phosphorus/M
4 - 6 " Potash/M
1 - 2 " Sulphur/M
25 -30 " Lime/M

Approximate Schedule of Applications

Date	Material	Rate/M	Setting	#N	#P	#K	#S
3/24 - 4/4	38-0-0-	4lbs.	3-4	1.52	-	-	-
4/7 - 4/11	0-0-50	4 "	3-4	-	-	2.00	.68
4/28 - 5/2	6-2-0	10 "	9	.60	.20	-	-
5/19 - 5/23	38-0-0	4 "	3-4	1.52	-	-	-
5/26 - 5/30	0-0-50	4 "	3-4	-	-	2.00	.68
6/23 - 6/27	6-2-0	10 "	9	.60	.20	-	-
7/14 - 7/18	6-2-0	10 "	9	.60	.20	-	-
8/4 - 8/8	6-2-0	10 "	9	.60	.20	-	-
8/25 - 8/29	6-2-0	10 "	9	.60	.20	-	-
9/8 - 9/12	38-0-0	4"	3-4	1.52	-	-	-
9/15 - 9/19	0-0-50	4 "	3-4	-	-	2.00	.68
10/6 - 10/10	6-2-0	10 "	9	.60	.20	-	-
Total nutrients applied.....				8.16	1.20	6.00	2.04

Note: All applications are single coverage
0-0-50 may burn - should be watered in.

Green Spraying Program - 75

Objective: Maintain a prevantative schedule of weekly and bi-monthly fungicide applications for broad spectrum control of turf diseases and periodical applications of insecticides for curative control of insect pests. Also control of annual weedgrasses, relief of wilting stress and chlorotic symptoms.

MATERIALS USED

Daconil	-	Contact fungicide
Thiram	-	" "
Koban	-	" "
PMA	-	" " & wilt retardant
W. Agent	-	Surfactant
Chlordane	-	Contact insecticide
Lead arsenate	-	Ingested insecticide
Malathion	-	Contact insecticide
Iron sulphate	-	Minor nutrient
Iron chelate	-	" "
	-	Systemic insecticide

It's just not a matter of saying we have this much fertilizer and chemical, but I don't know when we're going to put it on or do it. We should at least have a basic idea from past experience how long fertilizers are going to last, when they will peak and when we will need more.

The fifth phase of Step II is:

E. Management Review. It is time to think about the areas needing improvement and possible changes of maintenance standards and programs. An important point here is: after having been a superintendent of or being associated with 13 golf courses so far in my career, I have only been at one golf course where there were records. How many of you in taking a new job have had the same experience? Then, had to rely on information from unqualified crew members or others. Why not a duplicate set of records, one for you and one for your employer? Shouldn't this be a standard of professionalism, a required practice and the right of your employer to know what has been applied and done to their property? What if at the bank its time for an audit, and when the C.P.A. auditor arrives the accountant says to the auditor, :I'm sorry sir, I wish you a lot of luck on your audit, but we do not keep any records."

C. Maintenance Budget Prep. Preparation of a proposed maintenance budget outline as a guide to the amount of fertilizer, chemicals, seed and equipment required to achieve results via a comprehensive maintenance program. How often have we seen unlimited funds allocated for new construction of buildings or grounds and then, due to inadequate funds for maintenance, the full appreciation of the improvement is lost to deterioration? "We shall overcome" - the negative connotation associated with the word "maintenance."

SUMMARY

I. Define Objectives

A. Satisfy golfers

B. Increase Play

C. Accredit status

D. Improve images

II. PUT HOUSE IN ORDER

A. Clean up and organize

B. Inventory

C. Area analysis

D. Outline jobs pending

E. Management review

III. SORTING IT OUT

A. Improve maintenance standards

B. Formulate Ag programs

C. Maintenance Budget Prep

HAVE A GAME PLAN AND YOU WILL HAVE A SUCCESSFUL 1976

IV. Being the Boss Man - that's another story.

The Green Phantom

INTRODUCTION AND MAINTENANCE OF ZOYSIA

James Manka, Supt., Old Warson C. C.
St. Louis, Missouri

Successful growth and maintenance of fine turfgrass areas is a goal of most people present. In the process, many turgrass selections, for different reasons,have appeared successful, only to become failures later. This is especially true of different grass strains in the so-called transition zone.

The search continues for a desirable fairway grass in the goosegrass-crabgrass infested areas of our country. In the last few years we have observed an increased interest, acceptance, and usage of the Meyer zoysiagrass selection.

Meyer zoysia is a plant selection made at Arlington Farms in 1940. This particular grass spreads by an intergradation of stolons and rhizomes to form a tight, tough, prostrate turf with upright leaves. Its outstanding characteristics are (1) drought resistance, (2) low and high temperature hardiness, and (3) the ability to survive close mowing - three quarters of an inch. These make it an excellent grass for fairways in the transition zone. Only in areas of heavy shade does the survival of zoysia become questionable.

Why, with all the aforementioned positive characteristics is the use of Meyer zoysia as a fairway turfgrass still so limited today? Some people have been critical of zoysia as a fairway turf for the following reasons: (1) vegetative propagation restricts planting techniques, (2) the plant is slow to spread, (3) dormant winter color, (4) builds up an excessive heavy thatch.

Perhaps a brief review of the critics' viewpoints is necessary, and in the end it may produce a re-evaluation of zoysia as a fairway turfgrass.

Propagation of Meyer zoysia is restricted to the use of vegetative material in the form of sprigs, plugs, strips, or sod. This grass may be planted in any of these forms at the first sign of spring greenup and continue until late summer. In the last few years newly developed plug planting machines, as well as new hydro-mulching techniques have hastened the use of zoysia as a fairway grass selection.

How rapidly zoysia will spread or cover from the planting techniques utilized will be governed by temperature, other plant competition, watering and fertility practices. A minimum soil temperature of sixty degrees is required for shoot growth. Elimination of all other plant material in the area of establishement will greatly enhance, as much as one full season, the spread from sprigs to suitable golfing turf. The same practice applies to the removal of other vegetation when using strip or plug planting methods. Daily and weekly applications of nitrogen are essential to stimulate growth during the early stages of sod development. Once zoysia has been lifted as sod an annual regrowth of movable sod is possible by applying adequate nitrogen followed with daily watering. Therefore, proper management becomes the true key of production. To those who reproach the dormant winter color of zoysia, two avenues of escape are possible. First, success may enable you to spend the winter in the deep south until after spring greenup , or secondly, the use of colorants may produce a desirable shade of green. The practice of overseeding to change winter color remains debatable and expensive. In a more serious vein, we should apply that sill very valid axiom attributed to Dr. Fred Grau who said, "You play golf off the grass and not off the color."

In review of the final criticism that zoysia produces a heavy thatch, in reality is a reflection of management practices. Through frequent mowing, close cutting, low levels

of fertility (no more than two pounds nitrogen per year), and proper use of verticutting, mower thatch buildup is no longer a problem.

Many problems of zoysia management are those created by man and not the grass. Today most of the faults that discouraged the use of zoysia as a fairway turfgrass have been corrected by man and equipment.

One problem that arises in zoysia management on the golf course is that of winter injury during the dormant period. Cart traffic at golf clubs with heavy winter play has injured turf on approaches or where cart operations are restricted to a limited area. In Japan, many clubs have alternate greens of cool season grasses that are played when the zoysia is dormant. We know we can manage the grass, but the golfer remains a problem.

Meyer zoysia should be mowed with a reel type mower at a height not exceeding 3/4 inch. This will produce a desirable turf and reduce excessive thatching. A cutting frequency of three times a week is recommended during its active growing period. Mowing patterns should include cross cutting weekly with alternate clock and counter clockwise cuts. This will avoid tracking and wear problems in addition to decreasing grain. A cut in excess of 3/4 inch will create many other problems.

As with other warm season grasses vertical mowing is very important. Sufficient and efficient equipment is necessary to maintain good zoysia fairways. Spring greenup by the grass and warm temperatures serve as timing guides to commence verticut operations. Late fall verticutting which does not permit the grass to recover fully will invite invasion by Poa annua. Severe verticutting of established zoysia should be necessary every three or four years if other good management practices are adhered to. Disposal of verticut clippings is a problem in some areas of the country, but you must verticut to maintain good turf.

Proper or necessary levels of nitrogen are still subject to review. I feel two pounds of N per 1000 sq.ft. will maintain a good playable turf. A split application of one pound N applied during spring greenup and the second no later than August 10 has proved sufficient. Application of nitrogen at a later date may not allow the plant to harden off, and it may be damaged in event of an early frost. Over-fertilization promotes thatch buildup and produces excessive clippings.

The tight growth habit characteristic of zoysia inhibits the growth of many weeds. Still, the darlings of the weed world in the transition zone, Poa annua, crabgrass and goosegrass continue to exist in established zoysia. Chemical control measures are available to eradicate the aforementioned weeds, but selection and caution are uppermost in their usage.

Poa annua may be controlled effectively by application of Paraquat or Kerb. Paraquat may be applied at the rate of one quart per acre but only while the plant is dormant. Thus February application is ideal in many areas. If plant greenup has commenced the use of Paraquat will damage the zoysia. Kerb has proven effective to control Poa annua in zoysia. The rate of application is determined by the maturity of the Poa. This chemical will kill bluegrass if it is washed into these areas.

Combinations of Daconate, AMA, and 2-4,D have proven effective to control goose and crabgrass. When an oil emulsion base of these materials is used a temporary discoloration of five to seven days occurs on zoysia. Heavy application of dacthal and balan has also proven effective to control these weeds. It has been observed that the use of these

chemicals on bare ground when the zoysia is spreading may result in a bridging action of the runners.

Earlier we spoke of eliminating other grasses and weeds to hasten the spread of zoysia. Atrazine and simazine will give a total kill of all vegetation except zoysia. Application rates will vary as to effectiveness depending on temperature and sunlight. Rates of 1/2 pound 80% wettable powder formulation and 90° are very effective in contrast to 2 pounds in early spring. Again, if the material washes it will kill everything it comes in contact with. Management of chemical usage is very important in a sound zoysia program.

We have all heard of the fine drought resistant hardiness of zoysia. The leaves will roll so tight as to resemble fescue during periods of moisture stress but will respond almost immediately to water. It has been my experience that frequent irrigation will promote better growth even in mature zoysia than anything else.

The use of zoysia as a turfgrass has become a reality at many clubs in the transistion zone today and will be for many more tomorrow.