PROCEEDINGS OF THE 1982

SOUTHWEST TURFGRASS CONFERENCE

October 21-22, 1982

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El Paso, Texas

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SOUTHWEST TURFGRASS CONFERENCE

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Welcome and an Overview of the Rio Grande Basin

by

Howard L. Malstrom
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The commercial agriculture of Far West Texas and the urban agriculture of the City of El Paso present a unique situation. Water is the most precious commodity as is true of all irrigated areas of the western states. Production agriculture in the Rio Grande Basin obtains all water from the river or ultimately the Elephant Butte storage reservoir. The city gets practically all water from bolsons far underground. The future security of water from both sources is uncertain. This necessitates an orientation of any agricultural research in this West Texas area directed toward water conservation.

Agriculture of the Rio Grande Basin has evolved away from field crops such as cotton, forages and small grains. Cost of land has made it imperative that high income cash crops be grown. This has resulted in large increases in acreages of vegetables and pecans in the past 10 years.

The Texas A&M Center in El Paso and New Mexico State University both concentrate research on the problems of this valley. Soil and water, soil fertility, horticulture, entomology, and plant physiology are some of the research areas which are being pursued. New Mexico State is also providing work in agricultural engineering and animal science. We welcome the members of the Southwest Turfgrass Conference to the El Paso Center. It is our pleasure to be able to host this group and we plan to make your stay pleasurable as well as educational.

THE FUTURE OF TURFGRASS

J.R. Watson

In the future, near future, the pressure to produce more food and fiber will intensify much beyond that of recent years. As developing nations demand their fair allocation of the world's food and fiber those nations like the United States, Canada, and Australia will be called upon to divert more and more of their resources to support research and development in that area. Nevertheless, I am optimistic with respect to the future of turfgrass. For, turfgrass plays a very key role in our lives. It provides a site for healthy recreational activities; when incorporated into the landscape and properly maintained, it provides aesthetic appeal and contributes to the economic well being of a community. Functionally, turfgrass areas control both wind and water erosion, minimize glare and help to abate the build up of heat, break the impact of wind and provide safe areas for our children to play. For these and other reasons I remain optimistic with respect to the future of turfgrass; however, I see the future as a period of great challenge to all involved with turfgrass -- the researcher, the extension agent, the manager and the suppliers of equipment and materials.

We in the turfgrass field must learn to articulate our position; we must learn to speak out in support of our turfgrass areas; we must

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encourage public officials to support green belts; in short, we must promote and sell our commodity! And, we must do this within the constraints of the pressure for increased production of food and fiber. We must be practical in our requests; we must be firm in our position with respect to the value of landscaped sites; we must be realistic in our approach to ensure our fair allocation of water and fertilizer; we must encourage conservation of water, of plant food; and also, encourage conservation lands -- coping in all our endeavors. And, most importantly, we must support research efforts whole goals and objectives lead to superior plants, better cultural practices and more wide spread acceptance and use of the results developed.

As we look ahead we must necessarily evaluate and build on the past, we must set objectives and goals for the near and long term, and we must develop the plans needed to implement and to ensure accomplishment of those goals. And, we must develop alternate plans that can be put into effect when the ifs become actualities.

The turfgrass industry -- all facets of turfgrass -- has a proud record of accomplishment. The achievements of the past quarter century include new warm and cool season turfgrasses, new fertilizers, new pesticides (fungicides, insecticides, and herbicides), new equipment and new cultural techniques. These are some of the material accomplishments. What about the achievements of the individual? This well may be the area in which the greatest progress has been made. Great achievements, have been made in the role played by today's professional turfgrass manager, the certified golf course superintendent and others who direct and guide the activities of the many and varied turf facilities that collectively represent the turfgrass industry today.

Yet, the turfgrass manager well may face the greatest challenge in the near term. For, he must plan his operational programs, develop alterate plans in the event of budget curtailment, and implement existing procedures. He, also, must keep abreast of and implement programs based on current and future research results. This may be his greatest challenge!

In the future, as now, there are a number of areas that represent major challenges for those of us in the turfgrass field. Among them are (1) the ability to disseminate the information developed from research programs and to have it accepted and applied by the end user and (2) obtaining support for much needed basic research in the areas of grass breeding and cultural practices. Let me use these areas to illustrate two of the major challenges facing the future turfgrass industry.

We have a great deal of research information "on the shelf". Information that is either not communicated, or if disseminated, is not used effectively. An excellent example is water management. Let me quote from a PhD dissertation with which I am quite familiar.

1. Moisture levels exert a greater influence on turf quality than does soil compaction.

2. The moderate use of supplemental irrigation is necessary to product high quality playing turf that will remain green throughout the growing season.

3. Unwatered plots were brown and in poor condition for play over an extended period of time.

4. Moderate usage of supplemental irrigation on intensively managed turf will favor development of bentgrass at the expense of the slower growing species, so that, eventually the turf will consist largely of bentgrass.

5. Supplemental irrigation in quantities great enough to maintain a soil at approximately field capacity is unnecessary and encourages disease, and the subsequent invasion of crabgrass and clover.

6. Excessive watering creates a soggy soil condition, promotes shallow rooting of the turf, encourages disease and the invasion of crabgrass and clover -- and, if Poa annua had been present or the height of cut lower, I am confident it too would have increased.

That information was published in 1950 -- 32 years ago. It was from my thesis at Penn State University, which as many of you know, was sponsored by the United States Golf Association, Green Section.

Since that time others have investigated other aspects of water, its application and use on golf course turfgrass. Have we made progress?

Yes -- we've made a great deal of progress in all phases of turfgrass management these past 30-35 years. One of the reasons is that aside from agriculture, nothing that grows has received as much attention as turfgrass, especially golf course turfgrass. Research -- private, industrial, and university -- and extension activity have helped the industry make enormous strides. Knowledge, technology, and management techniques relating to turfgrass have all advanced dramatically. But despite those gains, water and water related problems are still with us.

As an example, let me quote from an article by Dr. Jack Hall of V.P.I., published in the 1978 proceedings of the Rocky Mountain Turfgrass Conference.

"We killed more golf greens in Virginia in 1977 with improper irrigation than any other management factor." Jack went on to say that too often greens were irrigated when the intent was to syringe and when this happens at 90^{o}F temperatures, damage is likely to occur. Automatic irrigation systems offer many advantages, but too few have the capability to "mist" water. Only a limited number of manufacturers have equipment capable of properly syringing (misting) and <u>too few systems designs</u> incorporate this feature -- it does cost extra but there are costs involved in replacing greens! (For each gm of water vaporized, 540 calories of heat are dissipated.) Dr. Ralph Engle at Rutgers has shown the beneficial effects of misting as opposed to drenching on bentgrass root growth -- both in the greenhouse and in the field. A slide will show these results.

There obviously is a gap between what we know and what we practice. Sometimes I think it's a chasm. To date, we seem to have been incapable -- at least unsuccessful -- in bridging that gap. Why? Perhaps it's an economic factor, perhaps improper dissemination of information, perhaps resistance to change, and probably some of all these reasons plus others.

Certainly, I don't have an answer. But I firmly believe that one of the major challenges facing our industry in the next few years is to find a way to narrow this gap -- we simply must find a solution to this problem. We need to learn more about such things as drought tolerance and rooting characteristics of grasses, water requirements, watering techniques -- water application and efficiency -- water conservation, soil-air-water relationships, leaching and weeds and their ecological relationship in the turfgrass environment. And, then, we must communicate the information, accept it and implement programs based upon it.

Also, we must find ways to avoid pollution and to use recycled water. We have not learned to use water with the kind of efficiency that we must if we are going to play a significant role to help keep this planet from running out of water. And, we must do so!

This brings me to my second point. Support of Research. In addition to recommending that we find a solution to the information gap, I should like also to suggest that we -- you, me, all of us here -- do everything we can to generate more knowledge -- more new information, better technology, better products, better equipment -- so that turfgrass management will continue to advance. The future of turfgrass may be at stake. Certainly, advancement is dependent upon the quality and the amount of research we will support in the near term. We have a great resource in the workers at our experiment stations and in our industry. But, they, especially the University personnel, must be funded. And that funding well may have to come from the private sector. Public funding of research will, in all likelihood, be diverted to production of food and fiber, not turfgrass. With appropriate support (lobbying) we may be able to retain our research personnel at our local grant colleges; but, we, the private sector, may have to generate the funds to support future turfgrass research.

SUMMARY

The future of turfgrass is one of challenge. Challenge to meet and to accept the changes that are occurring and that will occur. We must welcome change as a potential for progress, not fear it as a threat to our stability. Our world is changing --- are we changing with it? That is the real challenge we must meet. We must learn new techniques, new procedures; we must probe for the truth --- for the facts --- for the basic principle. We must broaden our horizons to meet and to accept the challenges that new life styles, or shortages, or increased government control, or new modes of communication, or dwindling natural resources have brought. Our turfgrass facilities are an integral part of our present and of our future life style and

future needs. They are a vital and a necessary part of our way of life. They must be preserved; they must be maintained properly; they demand a concerted research effort, funded by the private sector; and they cry out for an even greater effort to communicate and utilize results of research. The future of turfgrass --- it's in your hands.

Prepared for:

Southwest Turfgrass Conference
El Paso, Texas
October 21-22, 1982

ESTIMATES OF TURFGRASS DEMAND

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Research on turfgrass demand has proceeded on along two different lines. The first line of research was to examine the psychological basis for the demand for turfgrass and of other environmental modifiers such as shrubbery. A survey was conducted in five climatologically different areas of the state: Las Cruces, Roswell, Hobbs, Albuquerque and Santa Fe. This research revealed statistically significant psychological differences in the determinants of demand for turf and other environmental modifiers between the different locations within the state.

A second line of research examined the demand for sod. Data on sod production and sod sales were obtained from all the sod producers in the state of New Mexico. In addition, data was obtained from enterprises operating in adjacent states for comparison purposes. This production and sales data was statistically evaluated in relationship to a number of business conditions indicators which were thought to have some bearing on the demand for sod. This data is the subject of on-going evaluations, however preliminary indications suggest that the existence of unsaturated markets may make empirically derived demand projections somewhat suspect.

FUTURE TURFGRASSES FOR THE SOUTHWEST

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Turfs were developed by modern man to improve the environment in which he lives, works and plays (Beard 1973). The specific role of turfs varies from soil conservation, to environmental pollution control, safety, and aesthetic appeal. The role of future turfs will be similiar to those recognized today. However, the cultivars used in fulfilling those roles will be dramatically changed.

Present-day turf-type cultivars were generally developed under an economic philosophy of 'cheap' water and energy. Many of these cultivars are poorly adapted to hot, dry summers and cold, damp winters typical of the south and arid southwest. Consequently, they tend to require intensive cultural practices and high management levels to sustain turf quality in an acceptable condition. To coin a phrase "TO MODIFY THE ENVIRONMENT TO MATCH THE CULTIVAR".

According to Ward (1969), turfgrass species and cultivars are limited to a given region by a number of environmental variables, the more influential being climatic, edaphic, geographic, and biotic in nature. Climatic factors such as temperature, moisture, light, and wind are considered the most important for influencing the adaptability of a particular species or cultivar to a region.

REGION 1. The area of best adaptation to natural environmental conditions. Region 1 could readily be equated to the species center-of-origin and may be the most restricted in relative size. An example would be buffalograss in the Great Plains, or bermudagrass in the southern United States.

REGION 2. In this area, the cultivar is adapted, however certain management practices may be required periodically to compensate for some environmental limitation, such as a higher cutting height than normal, i.e. Tall fescue in north Texas.

REGION 3. The cultivar is considered at the extremes of its region of adaptation and will require a rather extensive and continuous maintenance program to compensate for environmental limitations. i.e. Bentgrass in southern United States which requires soil modification, syringing and frequent irrigation.

REGION 4. Climatic conditions in this regions are outside the area of adaptation of the species in question, i.e. St. Augustinegrass in Colorado.

In addition to the regions of adaptation, turfs may also be categorized into three major use areas which I have identified as: Speciality, Domestic, and Industrial turfs.

SPECIALITY turfs include areas of high activity and of high economic value such as golf greens and tees, and football and soccer fields and is some instances ornamental gardens. In order to maintain the playing surface of high quality and uniformity under heavy traffic, more intensive cultural practices will be required to maintain the plant community in an active state of growth. A dormant or stressed turf surface will not persist under heavy traffic and compaction, and similiarly, the playing surface will rapidly deteriorate and loss its quality and uniformity. Such turf areas will require turfgrasses similiar to our present day cultivars in terms of performance. Added agronomic characteristics will include improved heat and drought tolerance, faster recovery, and shade, wear and salt tolerance.

DOMESTIC turfs are the most important category in our society due to their influence on nearly every man, women, and child. Such turfs include public parks and recreational areas, and home lawns. Golf course fairways in general would also fall into this category based on preceived management levels needed to sustain quality turf. A broad spectrum of agronomic attributes must be considered for future domestic turfs. Minimal resource expenditures especially of water is of paramount importance in the arid southwest. Demands on water supplies are predicted to increase by 33% over the next 20 years (Carter 1980). The municipal water demands will increase even more dramatically as we continue toward urbanization. At the present time over 60% of the municipal water supply is being applied to the landscape. Anticipated water shortages and water use restrictions will severely limit water availability for turf.

INDUSTRIAL turf areas are exemplified by golf course roughs, road sides, airport runways, and industrial grounds around factories and warehouses. They will generally receive as minimal attention necessary to maintain ground cover. The primary function of the industrial turfs include soil conservation, dust control, and safety. Infrequent mowing with little or no supplemental irrigation or fertilization following establishment. Presently, locally adapted species and cultivars are utilized in the arid southwest. These include yellow bluestem, the gramagrasses and buffalograss. No cultivars have been developed specifically for industrial areas.

Future turfgrasses developed for Texas and the arid southwest must possess agronomic characteristics compatible with our natural environmental conditions. The first step in developing these grasses will be the reassessment of the natural genetic diversity within the species presently in use. Attributes of introduced and indigenous grass species having turf potential are listed in Table 1. The total number of cultivars commercially available identifies the species most intensively utilized at the present time. In addition, each species is rated for its performance on selected agronomic characteristics. Based on information available from on going breeding programs, the USDA Plant Introduction publications, and the Germplasm Resource Institute, each species was also rated according to the relative level of genetic diversity available. Due to the limited number of turf breeding programs in the United States, the objectives must be directed toward areas with the highest probability of success in the shortest period of time. The relative risk and priority of emphasis is a personal assessment based on: 1) general adaptation (regionalization) of the species for the south and arid southwest, 2) the genetic diversity available in our germplasm pools, and 3) the anticipated utility of the species for speciality, domestic and industrial turfs.

In native species such as buffalograss, a rather extensive collection of germplasm will be necessary to insure greater success. However, buffalograss being indigenous to the arid southwest already possess the biological mechanisms for adaptationas supported by the performance of the 'Common' and improved forage-type cultivars on unmanaged turf sites. Selection within this species would be centered primarily on characteristics related directly to turf. Genetic diversity expressed among approximately 150 accessions from throughout the central plains of the United States (unpublished data, Engelke) would suggest improvements can be made for spring green-up, color retention during drought and fall dormancy, mite resistance, rate of spread and turf density.

The inherent diversity of our germ plasm resources of many of these species have not been adequately assessed, manipulated or exploited for use in the southwest. A basic objective will be to identify plants with improved heat and drought tolerance, and which are more efficient users of available water resources, including brackish and effluent waters (which may require improved salt tolerance). In addition to agronomic parameters concerning the efficient use of water resources, numerous turf characteristics must also be considered: shade and wear tolerance, disease and insect resistance, density, color, and quality with minimal supplemental irrigation, fertility requirements, as well as interspecies compatibility with other landscape plants.

Intensive interaction of the major academic disciplines, of plant pathology, entomology, physiology, and genetics will result in identification and assemblage of the best genetic resources into well adapted high quality, resource efficient turfgrass cultivars. They will be developed under the philosophy of "MODIFYING THE SPECIES TO MATCH THE ENVIRONMENT", which in turn will reduce the maintenance input and yet acheive the goal of "Quality and Integrity with minimal resource expenditure".

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Table 1: Agronomic attributes of introduced and indigenous grass species having turf potential.

		Agronomic Charecteristics (1-9, 9=best)									Research	
	No.				Tolerance to							
Species	Cultivars Available	Quality	Vigor	Winter-Hardiness	Drought	Shade	Salt	Heat	Wear	Germplasm Resources	Risk	Priority 1 = Highest
Introduced												
Bermudagrass	19	8	6	6	4	1	6	8	6	9	5	5
St. Augustinegrass	4	6	5	2	4	3	4	6	3	5	3	4
Zoysiagrass	5	8	2	7	8	5	9	9	9	9	9	1
Paspalum	1	6	?	1	?	?	9	8	?	3	2	-
Bentgrass	23	9	7	9	5	4	2	3	2	9	4	6
Centipedegrass	1	7	3	3	8	?	?	8	?	2	1	-
Tall Fesuce	22+	7	7	9	7	7	6	5	7	9	8	3
Bluegrasses	51+	8	7	9	3	7	?	2	5	9	2	-
Indigenous												
Buffalograss	2	5	5	9	9	?	8	9	7	5	9	2
Inland Saltgrass	-	3	6	?	9	?	9	?	?	1	3	7
Gramagrasses	-	?	7	7	9	?	8	?	?	1	3	7
Curly Mesquite	-	?	5	7	9	?	8	?	?	1	3	7
Texas bluegrass	-	?	2	9	9	?	8	?	?	1	3	7
Seashore Dropseed	-	?	8	7	9	?	9	?	?	1	3	7

Management for Performance

by

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Managers have always been concerned about performance. With the advent of the factory system some two hundred years ago, managers were concerned with the output of the people working there. In order to improve performance, managers took the view that workers were commodities that could be used until they were no longer of benefit and then replaced. At that time managers also took the view that workers were primarily economic creatures, hungry for money and willing to do anything for it. Another common view of workers historically was that of machines. This meant that workers were thought to be rational beings who behaved according to laws of nature and of reason.

These three historical views of workers as machines, as commodities and as economic creatures are part of the heritage that we as managers have adopted today. I may begin this discussion this morning by saying that this heritage is indeed part of the performance problem we face today. Let me offer a conclusion and then work backwards from the conclusion to justify what it is I mean. The problems of productivity today are in large measure attributed to the attitudes and the beliefs held by managers in the work place. To be sure, at one time the view that workers are commodities, or machines, or rational economic creatures carried some merit. They were partially true.

Let's examine for a moment the climate within which these views emerged. We don't have to go back hundreds of years in American history; we can go back to the turn of this century, 1900. And what we see at that point in time are workers who are primarily uneducated. The American education philosophy of free education for all had not yet taken effect. Those people who were educated were the fortunate ones. In addition, the nature of the work that most of us did was menial in nature, requiring little or no skill, little or no talent other than one's physical strength. Furthermore, our understanding of the nature of human beings in the 1900's was very, very basic. What we knew about human behavior was only that which could be learned from our senses, what we could observe. For example, we could observe that people were anxious to have money. And if money was dangled in front of them like the proverbial carrot, then people would move towards obtaining that money. And why were people so economically motivated in the 1900's? In 1900 we had no social net to catch individuals if they fell on their faces economically. There were no support systems except for the extended family, and the value of the extended family in 1900 was dwindling for we no longer needed as many people on the farm. At the turn of the century, 50% of us were on the farm. Today it's 2.7%.

There was no unemployment compensation, there was no welfare net and I use the word here in a non-prejorative way because every advanced industrial society today has some form of social welfare to assist people when they are out of work. None of that was available in 1900. The basic existence might be characterized as survival, and the way you survive is to obtain money so that you buy food and shelter. These characteristics of no protect net if we fall, the paramount need for money, the low education level and skill level of the work force constitute our management heritage today.

Today, in study after study of management's view toward workers, we still find workers viewed as being primarily motivated by money. However, if we ask workers why is it they are working, money is of course important but it takes a fourth or fifth position in a ranking of variables almost every time. What I'm suggesting to you is that there is a conflict inherent in the management-worker relationships today. Managers think people are working for money and people report that they are working for reasons <u>in addition</u> to money. Reasons such as interesting work, such as a challenge to the nature of the work they are doing, such as the ability to use the training and education that they have. We'll return to that in a moment.

As I've indicated, the way in which we behave in the present is often times influenced significantly by past experiences and by a tradition. The traditional view by management of workers is narrow, a view that was at one time valid, a view that was at one time accurate. But times they are changing and today that view is invalid. To continue to try and manage people in the work place today with our traditional views towards the worker has led to the performance problems we are currently experiencing as a nation.

Let me be more specific to the kinds of performance problems we are facing today, particularly in reference to productivity. In the years between 1948 and 1965, a seventeen year period, the output per worker in the United States increased on the average at a rate of 3.37 per annum. In the years 1965 to 1973, the same figure was 2.46. And in 1973 to 1978, the average annual rate of growth of output per worker was 1.29. So we go from 1948 to 1965 at an annual growth rate of 3.37, and then from 1965 to 1973 at an annual growth rate of 2.49, and from 1973 to 1978 at an annual growth rate of 1.29. During those same three periods, the quality per worker hour fell from .76 in 1948 to 1965, to .75 in 1965 to 1973, and to .21 in 1973 to 1978.

Some equally depressing statistics arise when we compare the output per hour in manufacturing activities among the western industrialized societies (of course we must lump Japan in here even though it's not western). If we do that ranking and compare ten countries we find that the United States is ranked 7th ahead of Sweden, the United Kingdom, and Belgium with an average output per hour in manufacturing growth rate of 1.7 per annum. Compared to the top of the list which is West Germany with 5.1% average rate of growth, followed by France, 4.8, Denmark, 4.7, Japan, 3.5, Italy, 2.6, Canada, 2.5, and the United States, 1.7. So indeed ladies and gentlemen, we do have a problem in productivity in this society. It has been around now for some years.

We know that productivity is a function of several factors. It is a function of the degree to which organizations spend money on R & D. It is a function of the cost of the money that is spent on R & D. And last but not least it is a function of the nature and the philosophy of the management of human beings within organizations.

The basic recommendation I have is that we need to change our focus. At the onset of this talk I indicated to you that the traditional focus that management has towards employees has been on the economic welfare of the worker. Is that important to workers today? The answer is yes. Is that all there is in terms of managing people today? The answer is no, that is not all there is. It is a mistaken assumption to assume that the only reason people are working today is for money. Well, let's then provide nice physical arrangements for workers in hopes of improving their productivity. Let's provide them with a nice office, air conditioning, adequate heating, fine furniture, carpet, adequate equipment and let's send the supervisor off to human relations training programs so that they can learn how to communicate with their employees and treat them better. And let's provide avenues for the people in the work place to interact with one another so that there's worker cooperation and friendliness among employees. And for goodness sake let's don't leave out fringe benefits. Let's provide fringe benefits that will provide them with subsidized life insurance and subsidized medical insurance, and perhaps a dental plan, certainly retirement, more and more time away from work, let's do all of these things. Is that sufficient? The answer is no, it's not sufficient today. You might say that we've been doing all of these things adequately, maybe we need to do more of them. Well let me answer that by saying that the rate of growth in wages over time is considerably larger than the rate of growth in productivity. The gap between what we are paying people and the dollar value of the products and services they are producing is known as inflation and certainly we have been through just such a period, it's not over yet.

Fringe benefits fifteen years ago cost 25% of the wage dollar. Today 40% of the total wage costs goes into fringe benefits. In addition, the amount of time we spend away from work has been on the rise for some decades and continues to rise. Today it's over three weeks off on the average of vacation time per year per worker. We are treating people well by traditional standards. Why then aren't we getting the productivity we want and need? Some people think it's because people no longer have the work ethic, the classic work ethic of doing what you are told from morning until night. I answer that by saying that we still have the work ethic, it has only been modified. People's expectations have changed, no longer are we willing to comply with the wishes of the management unilaterally, irrespective of what it is they want us to do. So why aren't we productive? We are treating people well, we are paying them well, they have a good working environment, their supervisors are trained in human relations--why? The answer, ladies and gentlemen has to do with the nature of the work that people are doing, the nature of the work itself. Thirty percent of the American labor force is underemployed, which means that their skills, their education, their training is not being used in the context of work. Workers' expectations have changed much faster than the nature of the work that they are expected to do.

Let's focus our attention on the job for a moment and see if we can identify some very elementary ideas that you can take back to the workplace and implement.

Every job from the lowest in the organization to the highest has certain characteristics that managers can focus on to improve the performance of the individual doing that job. The characteristics I am speaking of are such uniquely human characteristics as decision making, responsibility, problem solving, control over one's work, and recognition for work well done. As we become more and more educated as a nation and as we become more aware of and financially able to take advantage of alternatives, jobs without these characteristics will not be performed very well.

As you know, in this society the kind of work a person does is related to the person's self-esteem, to how they feel about themselves, their lives, and their lives in general. If the job extracts a person's humanness and lends itself more to the performance of a machine than to a human being, then the human beings doing that job are not likely to do it with much commitment. As I said earlier, management's attention historically has been upon environmental factors related to the job with little concern for the nature of the work a person was asked to do. Once again, the nature of the job itself must receive management's attention. Environmental factors surrounding jobs are indispensible, but they are not sufficient for leading an individual to high performance.

So our focus as managers is two-fold: One is to focus on the factors related to work, such as pay and fringe benefits, a decent supervisor and adequate working conditions. These are important. And secondly, to focus on the quality of the activities the individual is asked to do. Are those activities compatible with the needs of an increasingly refined brain? If the answer to that question is no, then the job must be changed, redesigned if you will, to provide for the human intellect.

Now I know that many of you and the jobs that you are responsible for are service jobs. In service-type jobs the potential for adding the characteristics I've mentioned such as responsibility, decision making, control over the job and so on is ripe. Obviously if a person is attached to an assembly line, the line dictates the person's performance. But in service-related jobs the potential for altering those jobs to better accommodate the increasingly well-educated individuals doing those jobs is enormous. What it takes is a little will power from management.

Enough about what should be done. If your're seriously interested in improving the performance of the individuals working for you, then I suggest the following steps as an approach.

First, you and another manager should identify those individuals you feel are not reaching their performance potential. Make a list of their jobs. Secondly, take each job and discuss how the job can be changed to allow for increased responsibility, increased decision making, increased recognition when the job is performed well, recognition either through pay or non-monetary forms of recognition. Perhaps a pat on the back is all that's needed. In some cases you may run across a job that you may not feel lends itself to much change. Skip it and go on to one that does.

After you have identified three or four jobs that you feel are ripe for change sit down with the job incumbent and discuss how the job can be changed to add the factors I've just mentioned. Two things are accomplished by this act: One, you are getting input from the persons doing the job, and they intend to know how to do the job better than anyone else. And two, it provides a sense of responsibility on the part of the person doing the job when they are allowed the opportunity to recommend ways of changing it.

The third and final step will be to gradually but systematically start implementing the changes that you have proposed. Keep tabs on how well the person is doing, and if possible measure the differences before the changes were implemented and after the changes were implemented so that you can get some measure of the success of your job designed program. As progress is made with these three or four jobs, then the cycle can start anew, sit down, go through the list of jobs again, identify other jobs that have the potential for change, talk with the job incumbent to generate change ideas and then implement them.

In summary, I would like to say that part of the performance problems we have in this country today is due to ineffectual management. Management's focus had been couched in tradition, yet the rapidly changing environment we find ourselves in today is no longer amenable to traditional management approaches. It is important to pay people well, it is important to have pleasant working conditions, it is important to have a supervisor who is sympathetic and understanding, all of these things are important today. But they are not sufficient conditions for performance. So I'm suggesting here that we focus our attention on the nature of work that people do in addition to these other factors. Only through changing the nature of work in hopes of making it more compatible with the increasingly sophisticated and aware person that is asked to do the work, are performance improvements likely. Thank you for the opportunity for being here today.

Computer Applications in Golf Management
"Practically" Here

James G. Prusa
CGCS

Over the past several decades the business of golf has undergone tremendous increases in the complexity of both management and financial operations. With an exponential explosion of information available and necessary to manage golf courses coupled with the increasing scarcity of capital, better information management and cost control are no longer options--they are requirements.

Throughout our society and various industries more and more people are looking to computers to assist in meeting these challenges. Computerization of the golf industry has become increasingly imminent as the costs of computers have dropped to within the reach of clubs and the superintendents who manage the courses. The common use of Electronic Data Processing (EDP) is about to develop within your (complex) world of golf course management.

There are those who might suggest they see little application for computers in the growing and managing of a golf course. Of course, there were also those who saw little value in replacing the horse with an internal combustion engine or in replacing belts, chains and pulleys with hydraulic motors for propulsion.

As with any other tool made by mankind, there are things computers can do and things they can't do--at least right now. There are many aspects of computerization which will be explored in this magazine, both now and in future issues, but what is important is how we can make computers work for us and not hinder us.

Computers can help by providing the accurate information you need instead of data you don't. Computers can help make you a more informed and confident decision maker--as those who have had experience with EDP can testify. Some of the specific ways computers can be put to use in golf course management are:

Workhour Accounting

How many times have you been challenged by a board of directors, green committee or others questioning where all the labor goes on the golf course? You can hardly blame people for wanting to scrutinize workhour consumption when you consider that golf course maintenance can require 1,500 or more workhours every month. The total dollars involved are frightening when these monthly workhours are multiplied by the average hourly wage paid golf course workers. If you're like most golf course managers, the area of accounting for labor costs is a constant challenge and an area quick to catch the attention of budget cutters.

There have been those golf course superintendents who have attempted documentation of workhours on a manual basis. However, manual accounting is time consuming, cumbersome and data is difficult to retrieve. Because of all this hassle, keeping track of where the labor goes is usually not worth the effort. But with computers and EDP it becomes a very simple task.

Imagine being able to account for exactly how many hours were spent each day, week, month and year for the mowing of greens, tees, fairways, and roughs. And how many hours were precisely spent raking sand bunkers, trimming trees, spraying greens or even the hours involved in repairing equipment--versus doing preventative maintenance. A computer can easily keep track of this for you while you concentrate on more critical aspects of golf course management.

It will enable you to factually demonstrate the labor savings when a new mower is added to your inventory. EDP will give you exact breakdowns of the number of maintenance hours spent on greens, fairways, golf car paths, parking lots, tennis courts, pools, roads and grounds. When you're asked where all of this money goes, you'll have the exact answers.

Budget Control

With many annual golf course management budgets running between $150,000 to $2 million for 18 holes and with the average floating around $300,000, it requires extensive effort by management to keep expenses in line with budget plans. This tremendous burden can be eased while, at the same time, improving the control of expenses by the utilization of an inexpensive and simple-to-use computer system. Besides, it takes little insight to recognize how the price of a computer can quickly be paid back by the savings achieved through eliminating budget overruns--especially when one considers the size of today's golf course management budgets.

EDP offers the benefit of enormous cost control potential even before the money is spent. With the assistance of a computer, budget status and expenditures can now be kept track of on a daily basis--almost without any real effort. Accurate expense records can be kept down to the minutest detail. A golf course manager using a small computer never has to guess where actual expenses are in relationship to the planned budget, because each purchase can be accrued into accounts payable on a daily basis.

Budgeting has traditionally been a challenge to every manager. Computers can reduce the difficulty of this management responsibility.

How does your equipment manager or mechanic currently keep track of the work done on each individual item of equipment? Do you have records of all the preventative and repair maintenance performed on equipment? Do you know how much money has been spent for maintenance on each piece of equipment? Do you have ready, fast access to information on the depreciation status of a machine or how many total hours it has been worked? The important question is, how difficult is it to access (retrieve) that information?

The obvious value of the computer in equipment management is really fourfold. First, the speed at which equipment management information can be retrieved makes this information easily usable. Secondly, and probably for the first time, management will have data and information to justify purchases of new equipment. Thirdly, computers can be programmed to serve as tickler files which will not only keep track of what has been done to equipment, but also to remind the mechanic when and what needs to be done in scheduled preventative maintenance. Fourthly, computers can be easily programmed to assist the mechanic in the actual troubleshooting of equipment.

Speed of information access is critical. In the past such information was not kept because the cost of gathering, maintaining and retrieving information was prohibitive. The costs outweighed the benefits. That is not to say that such management information was of no benefit--it just couldn't be justified by the time and effort involved in analyzing it and putting it on paper. So managers became accustomed to winging it. The reverse is now true--the benefits do outweigh the costs--and management no longer has to fly by the seat of the pants. The advent of computers has made availability of information cheap and nearly effortless. Although intuitive business judgment will always be necessary, the guessing games about equipment cost accounting can be put aside.

Of course, there will be a few who will ask what good all this information is. That question can quickly be answered by considering, for a moment, how often they have been challenged on their requests for new maintenance equipment. Those challenges from member boards or corporate officers will keep coming and the computer will enable you to respond to every such challenge.

For the first time you'll be able to back up statements such as "It is costing more to repair the equipment than it would to purchase a new machine and amortise the cost." You'll have the proof.

It is not unusual for golf courses to have nearly a million dollars worth of maintenance equipment in their capital inventory. Yet, many golf course operations either expect the overworked mechanic to keep track of the enormous burden of equipment record-keeping manually, or the keeping of records is simply ignored.

Nearly every golf course equipment manufacturer publishes an extensive maintenance and repair manual for each piece of equipment. These manuals contain specific, recommended preventative maintenance schedules that must be adherred to in order to keep the machine running and lasting as long as it should. This schedule of preventative care plays the same role with golf course equipment that the various mileage checkups play with a new automobile. However, all too often, these manuals are only opened when equipment breaks down and needs repair. One can usually find dozens of these equipment manuals sitting on the mechanic's work bench--gathering dust. You can hardly blame the poor mechanics for avoiding these many manuals. After all, who would want to thumb through numerous, thick repair manuals to see what preventative maintenance was scheduled on 50 or more individual pieces of equipment? Few sane people would.

EDP allows a golf course equipment manager or mechanic to collect and input into the computer individual maintenance schedules of every mower, tractor, pump, truck or other equipment into one, all encompassing master, preventative equipment maintenance schedule. Such a master schedule would certainly make the mechanic's job more realistic and give the superintendent the means to monitor equipment management.

It certainly can't be far into the future before equipment manufacturers discover that they can develop a computer program which takes a mechanic step by step through a troubleshooting sequence for repairing equipment. This kind of a program would be "user-friendly" communicating with the mechanic by way of a simple keyboard and television (CRT) screen. Of course, the language could just as easily be Spanish or Japanese.

Such an equipment troubleshooting program would ask the mechanic logical troubleshooting questions and analyze the equipment malfunction. The computer would then explain the best way to go about the repair and follow the process through with the mechanic. As equipment becomes increasingly complex and sophisticated, computer-assisted troubleshooting would be invaluable (if not mandatory) for mechanics.

Irrigation Management

As the costs of irrigation in both energy and water continues to skyrocket, increased efficiency in the application of water becomes urgent. As water scarcity develops further, the computer will become ever more important as a tool to keep tabs on water usage and control its application to turf. A number of manufacturers have already entered this arena with the introduction of microprocessors dedicated as central programmers on irrigation systems. However, this is only the first step in applying EDP to irrigation systems.

The concept of integration of the irrigation system microprocessor into a larger computer Central Processing Unit (CPU) has real value. With such an integrated system, the superintendent as a manager will not only control the irrigation system, but will also know exactly how much water is costing and what pumping costs are being accrued daily. This kind of useful information, when evaluated in relation to weather and climatic factors, will allow the superintendent to immediately gauge water use in relation to actual need. The golf course manager will be able to develop an accurate model of how much water a course should be using and apply this as a bench mark against how much water is actually being applied.

With computers, it is possible to keep maintenance records for each individual sprinkler head and pipe on the golf course. Computers can even indicate if a sprinkler head has been repaired too often and when it would be cheaper to replace it than to repair it. It also can suggest to the irrigation repairperson that the problem is something besides the sprinkler.

Imagine having an entire as-built irrigation blueprint on a computer. It could help locate lost valves or control wires. A computer could actually indicate which valves to shut off to repair a particular head, and could further warn of natural gas lines buried nearby. In an emergency, for example, if a six-inch irrigation mainline blows on a Saturday afternoon, the computer could advise an assistant golf professional how to temporarily remedy the problem until a maintenance repairperson could arrive. Diverting major damage that could result from such an emergency situation in itself could pay for the average minicomputer.

Golf Car Management

The practical application of computerization in the area of golf car management has values similar to those explained in equipment management. The computer's usefulness in golf car operations increases as the size of the fleet increases. With 50 or more golf cars, it becomes very difficult and expensive to manually keep track of all the maintenance, repair, costs, parts and usage without the aid of EDP.

However, with a computer it becomes a relatively simple and inexpensive function to gather and recall these types of information. It is possible to know exactly how much each car costs to maintain and service, relative to how much revenue it brings in.

As with course maintenance equipment, computers can assist the golf car mechanic in troubleshooting malfunctions with a golf car.

Scheduling Calendar

In a business as complicated as the operation of a golf course or golf club, computers can help in the planning and scheduling of all the operations' functions. With the assistance of a computer program there will be no more conflicts between necessary golf course maintenance functions and golfing events. In fact, all major maintenance can accurately be scheduled years in advance to harmonize with golf activities and club events such as invitational tournaments or outside golf tournaments. The computer will let you know when the pool must be painted in order to open it for the season and when the parking lots must be restripped to avoid conflicting with the wedding reception for the daughter of the club president and so forth. A computer can even keep accurate track of golf and tennis starting times and warn members of maintenance activities. That's service, and service is the name of our business.

The computer can easily project the activity of each day years into the future, or the history of what took place years into the past. Both kinds of information are going to make your job of planning considerably less difficult.

Pest Control

In the area of potential pest control management EDP and computers excel. This application is already being used extensively in areas of agriculture to track and accurately predict insect pest outbreaks. It has been found that by recording daily temperatures, the number of days in the growing season and the histories of past insect pest occurrences, future occurrences of the pest can be determined by keeping track of the daily temperatures and number of growing days. Such a degree/day concept would be invaluable when applied to a pest such as mole crickets or sod webworms. This results from a pest management system known as Integrated Pest Management (IPM) which requires definition of economic damage thresholds to better time the application of insecticides. It is doubtful that such a technical approach to pest management will be workable for golf course managers without the aid of computers.

The computer will also enable you to keep extremely accurate records of disease occurrence and history by individual green or other area. When these data begin to accumulate in the industry, researchers will have an entirely new base of information to draw upon for answers to our turf disease problems.

Accessing Existing Data Bases

Nearly any computer system can access already commercially available data bases around the country. This is accomplished by hooking your computer terminal to a remote data base by way of your telephone and a special interfacing device called a modem.

An example of this is a data base known as The Source which is owned by Reader's Digest. You can receive a code number to access The Source and you'll pay an annual fee and an hourly on line charge much as you are charged for a long distance telephone call. This will permit you to have the data base computer search its memory for information on innumerable subjects and print out these data on your computer output device (CRT screen or printer).

The State of Nebraska is developing a data base system to assist their farm advisers and agricultural extension personnel in the field. It won't be long before growers will have access to this system and a great many others that are being developed. There is even a move in the works about to develop a data base for turfgrass researchers.

Other Applications

Of course, there are other areas of the golf operation besides golf course maintenance where computers can be usefully applied. There are the standard accounting functions of payroll, accounts payable, accounts receivable and billings. Also, software is available for general ledger accounting functions, profit/loss statements, budget comparison and even graphic representations of all the above. Computers can be used to keep track of membership or golfer demographics and the various activity demographics such as pool usage, tennis play, rounds played by day, week, month and so on. This is all necessary information when you're trying to justify expenses. When rounds played and the use of facilities goes up, so does the wear and tear on the facility and consequently, necessary maintenance expense. The computer will readily aid you in tracking and demonstrating all of this.

The Future Applications

With the future will come a great increase in our use of computers. From our homes to our offices the computer will give us time to do other things. But that is only if you want it to happen. Computers don't make mistakes, people do. If you put garbage into a compter system, the computer will return garbage back to you.

It won't be long before data base networks will develop through which a member of GCSAA can access information by way of a small computer and the phone lines. Such a system will develop into a communications link with the membership which will permit access to the latest information on golf course management. Through the establishment of a data base it will be possible to accomplish modeling of golf course budgets based on industry standards.

One of the most significant near-term developments will be the assistance you'll be receiving in this technology from GCSAA. Your association plans to become actively involved in the development of computerization for golf course management so as to help you better deal with all the challenges we know you face. GCSAA also intends to provide you the continuing education opportunities you'll need to deal with computers. This will be evident by the time we all gather at the Atlanta Conference next February.

Those who will benefit from computerization are those who are willing to work towards applying computer technology to golf management. It will require some new thinking, vision and the acceptance of some "Flash Gordon" concepts. But take a look around you. Your own children, or your neighbors', are using computers at school like we used the pencil sharpener. Computers are in use at the grocery store, as T.V. games, as overnight bank tellers, the telephone, in automobiles, airplanes and space rockets. The dreams of the 1930's Flash Gordon movies are already the realities of yesterday. The one thing that is constant in the universe is change and you can be assured that tomorrow will be here--with the speed of light.

Stay tuned!.

Turf Fertilization-Irradiated Sewage Sludge

B. D. McCaslin

The use of waste Cesium-137 as a gamma-radiation source for the reduction of pathogens is being examined at Sandia Laboratories, Albuquerque, New Mexico. Working under a cooperative agreement, the United States Department of Energy, Sandia Laboratories and New Mexico State University are examining the utilization of sewage sludge given irradiation treatment. Recent findings on the irradiation process are discussed in the "National Symposium on the Use of Cesium-137 to Process Sludge for the Further Reduction of Pathogens" Sandia National Laboratories, Albuquerque, New Mexico 87185, USA, SAND80-2744.

The overall research program at New Mexico State University includes assessment of microorganism growth, assessment of nutritive value of sewage solids when recycled directly as ruminant animal feedstuffs, and agronomic aspects related to usage of sludge products as a nutrient source on calcareous soil. The objective of the segment of the research presented herein was to examine the potential fertilizer value of the sludge on turf when grown on calcareous soil.

The initial turf experiment was established at bullhead park in Albuquerque, New Mexico, August 19, 1981. The experiment was planted to the Albuquerque park mix consisting approximately of 35% K31 Tall Fescue, 35% Red Fescue, and 30% Kentucky Bluegrass. There were nine treatments included in the experiment in three replications. The treatments were as follows:

1. Check - nothing added
2. Best management - 100-40-80 (40-40-80 applied in March; 20-0-0 applied in June; 40-0-0 applied in September)
3. ½ Best management - 50-20-40 applied in March
4. 5 tons sewage sludge
5. 10 tons/acre sewage sludge
6. ½ Best management + 5 tons/acre sewage sludge
7. ½ Best management + 10 tons/acre sewage sludge
8. Best management + 5 tons/acre sewage sludge
9. Best management + 10 tons/acre sewage sludge

Average clipping weights of the fourth and fifth cuttings are given in Figure 1. Visual density scores taken 8-5-82 are given in Table 1. The ten ton per acre treatment and the 5 ton per acre + ½ BM, treatments gave good density with moderate clipping weight.

Table 1. Bullhead park turfgrass density* scores (8/5/82).

		Rep/Score					
Treatment	1	2	3	4	5	6	X
1 (check)	1	2	1	2	2	1	1.5b**
2 (½ best management)	3	4	3	5	4	3	3.7e
3 (best management)	6	4	6	5	6	5	5.3cd
4 (5 T/A sludge)	5	4	4	4	4	3	4.0de
5 (10 T/A sludge)	8	7	8	7	8	6	7.3ab
6 (½ best management 5 T/A)	7	6	7	7	7	5	6.5bc
7 (½ best management T/A)	9	8	8	8	9	8	8.3*
8 (best management + 5 T/A)	7	9	7	6	5	7	6.8bc
9 (best management + 10 T/A)	9	8	9	9	9	9	8.8a

*Density: 1 = least dense
9 = most dense
X = average density scores

**Average density values having a common letter are not significantly different at the 5% level of significance by Duncan's multiple range test.

The response of plants to zinc and iron in sewage sludge has been shown to be dramatic by McCaslin et al. 1. Much of the response of the turf compared to fertilizer could be due to iron and zinc. Turf species more sensitive to iron and zinc deficiencies would be expected to respond more. The data do show that as sludge becomes available it could be considered in a turf management system.

References

1. McCaslin, B. D. and G. A. O'Connor. 1982. Potential fertilizer value of gamma-irradiated sewage sludge on calcareous soils. New Mexico State University, Agricultural Experiment Station Bulletin 692.

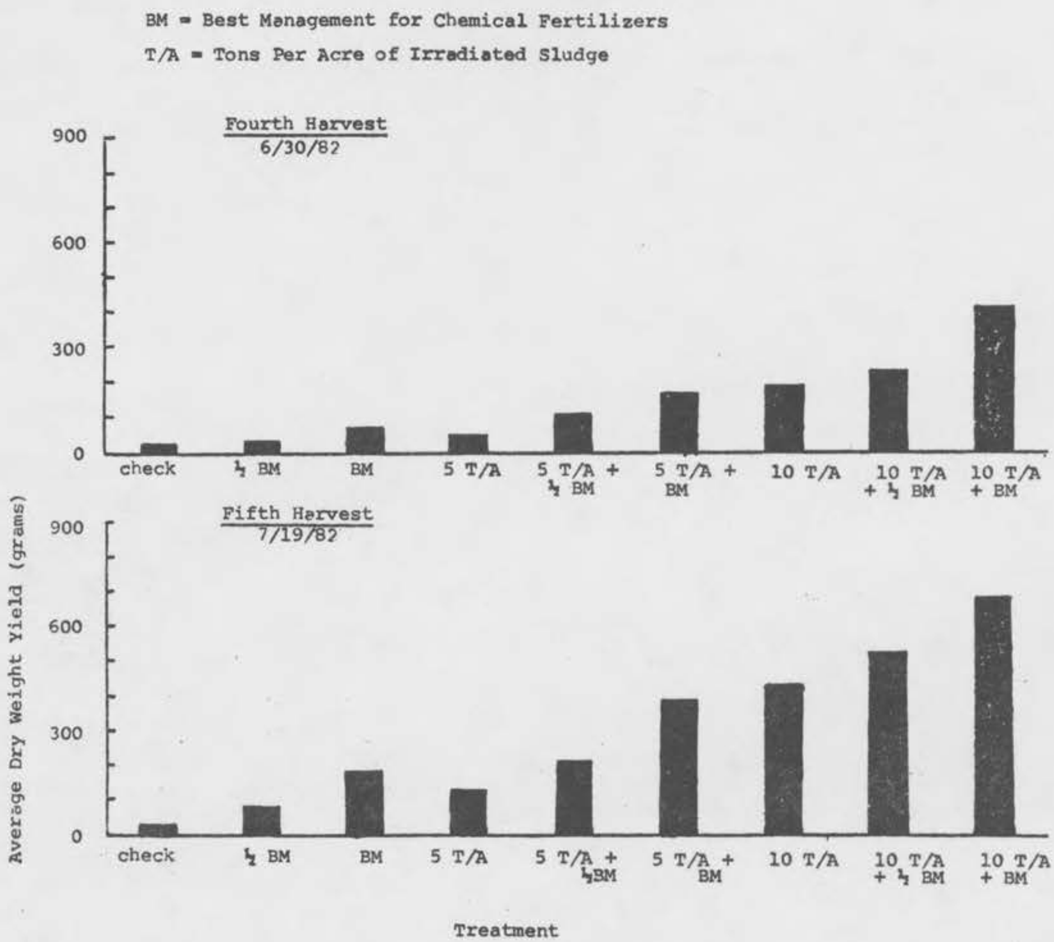

Figure 1. Bullhead Park Turfgrass Average Dry Weight Yields vs. Treatments (Harvested area per sample was $9.1m^2$).

Fresa Clover - Low Management Ground Cover

Roch Gaussoin and A. A. Baltensperger

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Department of Crop and Soil Sciences

Strawberry clover, Trifolium fragiferum, is a self-pollinated, low growing, perennial legume which spreads vegetatively by stolons and has the capacity to fix large amounts of atmospheric nitrogen. Flower color is predominantly pink, with an occasional plant exhibiting white flowers. The seed is slightly larger than white clover and grades from yellow to brown.

Fresa strawberry clover was released by the New Mexico Agricultural Experiment Station and New Mexico State University Department of Crop and Soil Science in November of 1981. This cultivar is a population of selected plants from an introduction from Turkey. Mass selection was the breeding method utilized. Plants were selected primarily for low dense growth.

Fresa was variety tested with three other strawberry clovers - Salina, Palestine and O'Connor's - and common white clover for ground cover attributes.

Plant height was one of the attributes considered in the variety evaluation. The means for plant height in inches broke out as shown in Table 1. Fresa and O'Connor's had the lowest height in the fall and Salina had the highest. White Clover was not included in the test for the fall and spring evaluation. Summer heights found Fresa once again with the lowest height and white clover exhibited the highest. If the

Table 1. Means for plant height in inches, Strawberry Clover variety test. Values within columns followed by different letters are significantly different at the .05 level.

Entry	Fall	Spring	Summer
Fresa	3.0a	3.5	3.0a
Palestine	4.8b	4.5	4.2b
O'Connor's	3.5ab	4.3	5.9c
Salina	7.0c	5.3	6.0c
White clover	--	--	7.2d

means are ranked, Fresa had the lowest height for fall, spring and summer.

Plots were harvested in the summer and the means in grams/plot broke out as shown in Table 2. Fresa exhibited an extremely low mean when compared to the other entries. This low yield, coupled with Fresa's low plant height indicated its potential for use as a ground cover.

Other attributes need to be considered before a ground cover can be acceptable. Color is probably one of the most important of these other attributes. Color was evaluated using an ocular estimate based on a scale of one to nine. A plot exhibiting the most green color was scored 9. Fresa compared favorably with most varieties in the summer with Salina having the best summer color. In the winter Fresa was intermediate in color with Salina once again having the best color (Table 3).

The variety test also included evaluations for uniformity, seed heads and cold hardiness. Fresa compared favorably with the other varieties in these evaluations.

Table 2. Means for clipping weights in gms/plot, Strawberry Clover variety test - Summer evaluation. Values followed by different letters are significantly different at the .05 level.

Entry	Clippings
Fresa	32.9a
Palestine	206.7b
O'Connor's	279.5c
Salina	374.7d
White Clover	438.3e

Table 3. Means for color based on visual score of 1 to 9, 9 indicating a plot with the most green color. Strawberry Clover variety test. Values within columns followed by different letters are significantly different at the .05 level.

Entry	Summer	Winter
Fresa	6.8b	6.5bc
Palestine	6.0b	8.0ab
O'Connor's	6.6b	6.0c
Saline	8.1a	8.8a
White Clover	6.0b	5.8c

From the results of the variety test the conclusion can be drawn that Fresa has the potential for use as a ground cover in areas where minimal mowing and, due to its nitrogen fixing capabilities, minimal fertilization is desired.

Another potential use that is currently being investigated is the use of Fresa in mixtures with turfgrasses for low maintenance areas. This is not a new idea, as early as the 1930's white clover was included in lawn seed mixes. A study was initiated to investigate this possibility.

Fresa was seeded in a monostand and in polystands with Adelphi Kentucky bluegrass, Kentucky-31 tall fescue, and Common bermudagrass. The mono stands were seeded at the following rates:

Fresa - 1 lb/1000 ft^2

Common bermudagrass - 2 lbs/1000 ft^2

Adelphi Kentucky bluegrass - 2 lbs/1000 ft^2

K-31 tall fescue - 10 lbs/1000 ft^2

The polystands received 50% of the clover rate plus 50% by weight of the rate for the appropriate turfgrass. The treatments on the entries were two cutting heights, 1½" and 3" and two cutting frequencies, weekly and bi-monthly. The test received only 1½ lbs nitrogen/1000 ft^2 as a blanket application at the seedling stage. No additional nitrogen was applied.

Summer notes were taken for general appearance and color, with significant differences among entries for general appearance in May and July and color in July and a significant height difference for general appearance in May (Table 4). This would indicate that clipping at the lower frequency would still maintain acceptable turf. For general appearance in May all entries were equal except the monostand of bermudagrass which rated much lower. In July for general appearance, bermudagrass once again exhibited the lowest rating with the polystand of bermudagrass and Fresa ranking highest followed closely by the monostand of Fresa and the polystand of Fresa and Kentucky bluegrass. The results

Table 4. Analysis of variance for color and general appearance (G.A.), Polystand test - Summer evaluation. Values followed by NS, * or ** are non-significant, significantly different at the .05 level or significantly different at the .01 level respectively.

	G.A. (May)	G.A. (July)	Color (July)
Entries	**	**	**
Frequency (F)	NS	NS	NS
Height (H)	*	NS	NS
EXF	NS	NS	NS
EXH	NS	NS	NS
FXH	NS	NS	NS

for color found Fresa and Fresa with bermudagrass ranking highest with the monostand of bermuda ranking lowest (Table 5). So Fresa, either in a monostand or in a polystand with bermudagrass or Kentucky bluegrass gives acceptable appearance in the summer at both clipping frequencies, under the conditions of this experiment. One thing that was noted during this experiment is that Fresa, when seeded with tall fescue, did not establish well. Apparently the tall fescue shaded out the clover and did not allow it to become established.

Winter results were extremely similar. Probably the most striking result was the contrast of the dormant bermudagrass which rated the lowest to the polystand of bermudagrass and Fresa which ranked extremely high. So if a low maintenance bermudagrass turf with some winter color is desired, this might be an appropriate practice.

Table 5. Means for color and general appearance, Polystand test - Summer evaluation. Values within columns followed by different letters are significantly different at the .05 level.

Entry	General Appearance		Color
	May	July	July
Fresa	7.9a	7.0ab	7.9a
Fresa/Bermudagrass	7.8a	7.5a	7.9a
Fresa/Kentucky Bluegrass	7.9a	7.0ab	7.8ab
Kentucky Bluegrass	7.8a	6.1c	7.0bc
Tall Fescue	7.3a	5.9c	6.5cd
Fresa/Tall Fescue	7.2a	6.2bc	6.8cd
Bermudagrass	3.4b	4.9d	6.2d

In summary, some of the advantages of Fresa are:

1) Needs little or no nitrogen fertilization

2) Requires infrequent mowing

3) Once established, provides thick, lush cover

Unfortunately, nothing is without its disadvantages. Some of the disadvantages of Fresa are:

1) Is slow to establish

2) Attracts bees

3) Low wear tolerance

4) Susceptible to clover mite

International seeds was awarded the exclusive release of Fresa and commercial seed should be available by 1983.

TURF PROBLEMS AND ANSWERS

Emroy L. Shannon, Extension Plant Pathologist
New Mexico State University

Parks, playgrounds, football fields, golf courses, and other public areas all have their problems. Insects, diseases, unusual weather conditions, vandalsim, etc., all take their toll every year. The panel members have helped answer numerous questions about these common problems.

I have observed numerous disease problems in the El Paso, Texas -- New Mexico area over the years. Most of the disease problems that I have observed are not directly associated with parasitic diseases, however. These problems are very basic ones; i.e. poor aeriation, poor drainage, poor watering practices (usually lack of water), inadequate fertilizer, etc.

Certain disease organsims can, however, invade turf even though it has had good care. Fungicides are frequently helpful in controlling these diseases.

Whenever you encounter diseases that cause large, dead spots, and a microscopic diagnosis cannot be made, you should select a broad spectrum fungicide whose label states that it will control brown patch, Helminthosporium diseases, and Fusarium diseases.

Rust, stripe smut, and powdery mildew can usually be diagnosed without a microscopic examination, which makes it easier to select a suitable fungicide.

In areas, such as golf courses, where diseases are prevalent do not rely on just one fungicide. Mixing two or more or alternating between two or more fungicides will give broader control, help prevent resistant fungi from developing and help avoid the sudden development of disease organisms.

MAINTENANCE PROBLEMS IN PUBLIC PARKS

PETE TURPIN
PARK MANAGEMENT SUPERVISOR
CITY OF ALBUQUERQUE

Problems in maintaining public parks is nothing new, as I'm sure most of you know. As Park Management Supervisor, for the City of Albuquerque, I have experienced many problems, which must be dealt with day by day. I would like to discuss what I feel are the three major problems in our park system, and how we deal with them. They are: 1. excessive use, 2. communication between management, the public and the work force, and 3. vandalism.

The management and maintenance of public parks is becoming more and more complex. Parks are no longer just the neighborhood oasis that is used for a family picnic, a relaxing lunch break or a peaceful setting for a couple in love. Parks, of course, are still used extensively for these types of activities. But they also turn into a game field several hours per day, covered with hundreds of youngsters and adults competing in softball, soccer, football, etc. Because of these activities, the demand for use of the parks is greatly increased year by year. This, of course, creates several additional problems and challenges for the Park Manager.

The expanded use of parks for athletic fields has probably added the greatest challenge. The wear and tear of the turf in parks has been greatly increased because of this use. Today most sports no longer have just one season. Soccer leagues have had both fall and spring seasons for the last few years. Part of this, I feel has come from the increase in gasoline prices, causing people to look closer to home for their recreation. In the City of Albuqerque, there are almost as many teams on a waiting list as there are teams now participating. This means there will be no end to the excessive use of parks in the near future, even with the addition of many new parks.

The main maintenance problems caused by this use, are compaction and the actual wearing away of the turf areas. We have found that the most effective way to deal with these problems is to improve and have better control of our turf cultural practices. We have increased fertilization and aeration of these turf areas, from two times a year to as many as five times per year. Aeration two to three times during the season helps eliminate compaction and also is very beneficial to water absorption and drainage. Fertilization of fields a few weeks before the season and once during the season, keeps the turf growing. This helps the turf to fill back in, as the wear and tear occurs. The control of moisture for these turf areas is also very important. Turf that is too wet tears up very easily and can be destroyed within a few hours play. On the other hand, there needs to be sufficient moisture to keep turf growing vigorously. We are also experimenting with the use of Enkamat in the turf areas that receive the heaviest wear, mainly in front of soccer goals. Enkamat is a plastic fiber, woven into a mat. This is placed just under the thatch area of the turf. As the top of the turf wears away the roots stay protected.

The communication between management, the public and the work force, is also providing some stiff challenges. With recent budget cuts, we are required to do more work with less personnel and equipment, with high standards still expected. Employees are asked to do more work, with more efficiency. The public still wants the beauiful well groomed parks, as well as the use of parks for the more strenuous sports and activities. We as, managers, are required to have more efficient schedules, have better communication and we hope to use the best public reactions in accomplishing these goals.

Vandalism is a problem we are all faced with today. Not only is this problem discouraging, it also upsets planning and scheduling more than anything else. This is because it is always unexpected and usually has to be dealt with immediately.

The maintenance problems I have discussed here are just a few of the problems we deal with in public parks. I'm sure that Golf Courses, Public Schools and other park systems have similar problems, as well as, some that might be unique to their own area. Conferences, such as this one, give us the opportunity to share our knowledge and experience with each other. Hopefully making us all better managers and making the challenge of problem solving much easier.

WHITE GRUB MANAGEMENT IN SOUTHWESTERN TURF

Robert L. Crocker
Texas A&M University
Research & Extension Center at Dallas

White grubs are by far the most damaging turf arthropods in the Southwest. No measurements are available of the overall economic impact of white grubs in the Southwest. However, one major lawn care company with about 4% of the potential local market estimated that it lost $50,000 to $60,000 directly (having to replace destroyed turf) and another $100,000 to 150,000 indirectly (lost customers, etc.) in a single year due to white grub damage it was unable to control in the Dallas- Fort Worth area . If even the most conservative of those figures ($50,000) is used as the basis of an extrapolation, an estimated $58,000,000 worth of turfgrass was destroyed in Texas that year by white grubs. That figure does not include the millions of dollars more spent on pesticides and on hiring professionals to treat for white grubs. In all, the total annual impact of white grubs in Texas turf may be a minimum of $100,000,000. The purposes of the present paper are (1) to briefly characterize the various roles of different white grubs, (2) to review historical means of control, and (3) to outline how the Pest Management theory may be applied to the control of white grubs in turf.

ROLES OF WHITE GRUBS

White grubs are the larvae of scarab beetles. These larvae closely resemble those of related lucanids (Stag beetles) and passalids (Bess beetles) both in form and ecology. Lucanid, passalid, and many species of scarab larvae preform beneficial functions in the food chain. They consume decaying plant and in some cases animal material in moist, protected habitats such as logs, corpses, or the soil. In Australia, the absence of native dung-feeding scarabs adapted to feeding on cow manure created a severe problem in ranching areas. Dung accumulation in pastures was brought under control only after a massive international research effort succeeded in establishing coprophagous species from other parts of the world in Australia.

Thus, it can be seen that destructive feeding on turf, ornamentals, and many crop plants is characteristic of only a few subdivisions of a much larger group. Even within a subfamily, some genera may be harmful while others are not. Although root feeding by larvae is the primary cause of damage in most cases, leaf feeding by species such as the Japanese beetle can also be a problem. The Southwest supports a diverse array of native pest white grubs, ranging from huge Grape Pelidnota to various sizes of June beetles and other leaf chafers. Texas alone supports approximately 96 species of June beetle (Reinhard 1950).

SOURCES OF CONTROL

Natural enemies. Prior to the end of World War II, control of white grubs in turf depended almost exclusively on the activities of natural enemies (predators, parasites, and pathogens). Davis (1919) and Steinkraus and Tashiro (1969) cover most of the known members of the natural enemy complex. Crocker et al. (1982) summarizes several natural enemies found on white grubs in recent years in Texas.

Chemical controls. In 1945, a new era in the history of white grub control was introduced with the discovery of chlordane. This material is a member of the cyclodiene group of chlorinated hydorcarbon insecticides, a group characterized by stability in soil and in sunlight. Until chlordane was banned as a white grub treatment, it enjoyed great popularity due to the several years of control a single application of it provided. Unfortunately, it is so persistant that it can become an environmental pollutant (Ware 1975).

Following the banning of chlordane, an even newer class of materials, the organophosphate insecticides, has come into use. These insecticides tend to have much shorter life spans in the soil than did chlordane (especially under alkaline conditions). They also have a strong tendency to become bound to the thatch layer, where they are useless against white grubs. Diazinon (Spectracide) and chlorpyrifos (Dursban) are the most important members of this group for white grub control. Trichlorfon (Dylox, Proxol) is used to some extent, but its extreme sensitivity to pH and its generally shorter half-life tend to reduce its usefulness. The efficacy of diazinon and chlorpyrifos is dependent (1) on synchronizing their application with the hatching of new grubs and (2) on irrigating the treated area promptly with enough water to carry the insecticide down into the soil. Mixing a wetting agent with the treatment material also seems to be helpful.

A new organophasphate insecticide, isofenphos (Oftanol), has recently received a 24(C) state label for use against white grubs in several states including Texas. The manufacturer states that isofenphos has a relatively long half-life in turf and that the labeled 5% granular formulation does not readily become bound to thatch. Although only limited field data are available to date, in most cases isofenphos has yielded very acceptable levels of control.

APPLYING PEST MANAGEMENT PRINCIPLES

The cost and environmental impact of pesticides make it imperative that good judgment and valid criteria be used in deciding when and where treatments should be applied. All too often, however, insecticides are applied merely when it is convenient, in response to a rigid schedule, or because the applicator is worried that insects might be present. Because such treatment programs frequently depend on multiple applications of pesticides to improve their chances of success, they often are referred to as "Wash Day" or "Shotgun" approaches.

Modern entomology has developed an alternative set of criteria for use in deciding when and where to apply pesticides; it is called the Pest Management approach. The Pest Management approach is based on the concept that if you can monitor when and where a pest is present in damaging numbers, you can avoid useless pesticlde application while achieving superior levels of plant protection. The Pest Management approach saved cotton as a crop from what had developed into a pesticide abuse nightmare. It has produced great production savings in agricultural crops, and we presently are modifying it for use in turf.

A simple Pest Management program is practical even at this point, and is adaptable to either professional or homeowner use. Adult flight activity (an indicator that egg laying is in progress) is monitored throughout the flight season either by use of a black light trap or by noting adult June beetles flocking about lights at night (Fig. 1). A peak in flight activity is followed in 2-4 weeks by egg hatch. In most years, a cluster of peaks in flight activity occur over a period of a few weeks in June-August. The exact timing of flights is heavily influenced by weather, with major flights tending to occur shortly after rain. Once time has been allowed for eggs deposited in the last major flight period to hatch, it is desirable to determine if a dangerous white grub infestation exists at the site under consideration. For a modest sized urban lawn, such a determination can be made by digging up and carefully examining 1 to 2 square feet of soil to a depth of ca. 6 inches. Such samples will be more representative of overall conditions in the turf if several smaller samples (say 10 samples, each 0.1 square foot) are taken in place of a single large sample (say 1 square foot). Smaller samples also produce less noticable, faster healing damage to the turf. A golf cup-cutter is readily available to most professional turf managers and is an ideal tool, taking a 0.1 square foot sample. Four to six white gurbs per square foot is commonly accepted as enough to justify pesticide application to a turf, although the species of grass involved and the cultural system the turf receives certainly will affect how many larvae can be tolerated safely. This Pest Management system, which is relatively simple, should considerably improve one's chances of applying treatments only where and when they are needed.

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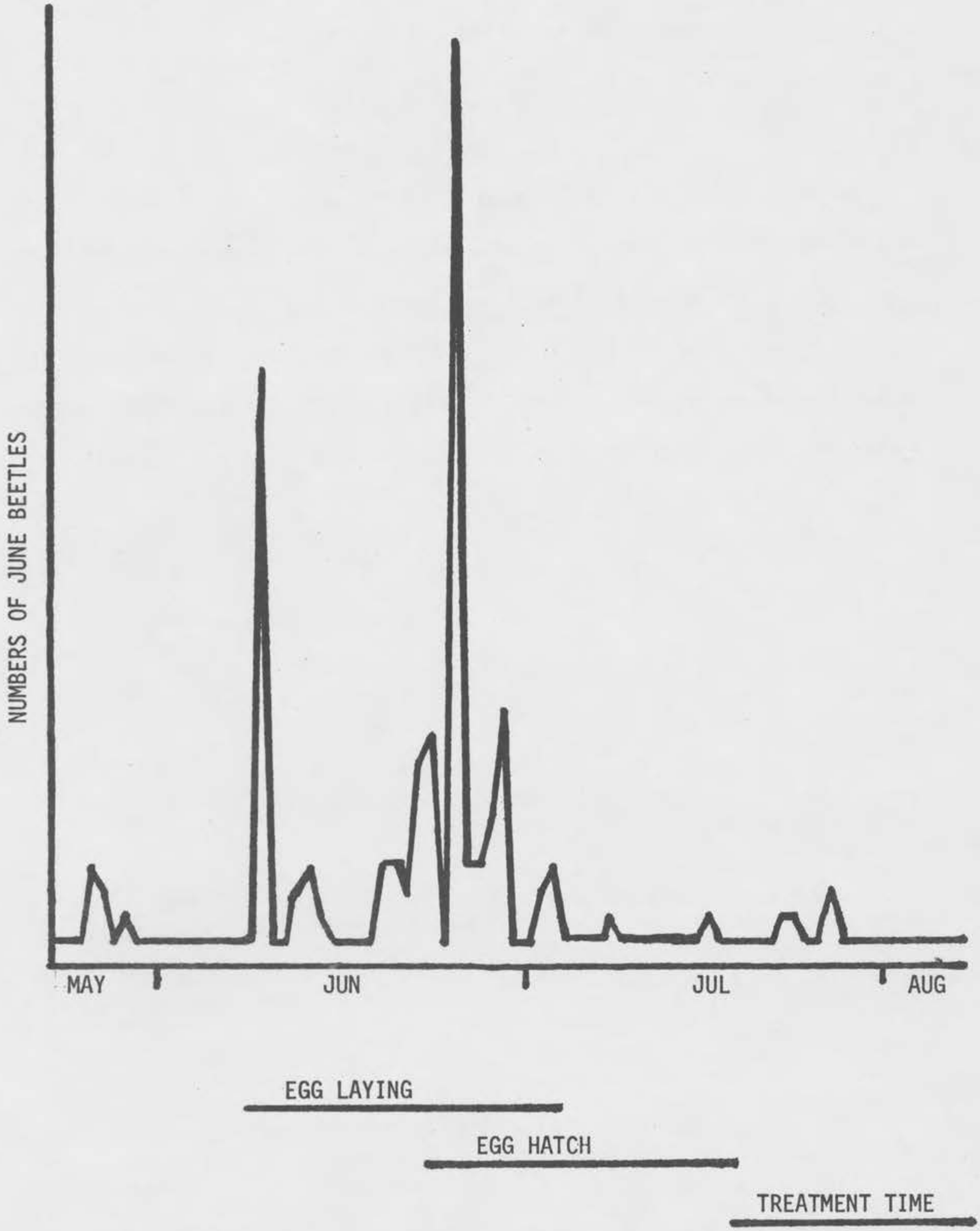


Fig. 1. Numbers of June beetles caught per night in black-light insect trap. Periods of egg laying and egg hatch associated with the flights and the time treatments should be applied for control of newly-hatched larvae are indicated.

Use of White Clover for Ground Cover

Lewis Lawrence

Casa Verde Nursery

We have found that white clover can be maintained at high or low levels depending on needs. In some areas we have used a weed eater or mower about every other week with good results.

In other areas the clover was not mowed for two full seasons where taller growth was not objectionable. Scalping of tall growth can present a problem. Some other problems are grubs and snails.

Poa Annua Control at Inn of Mountain Gods Golf Course

Ted Martinez, Superintendent

(Certified CGCS)

Poa has been observed on the greens since the spring of 1980. Heavier stands were noted in the spring of 1981 and much heavier stands in spring of 1982.

We continued applications of pre-emerge control measures and started spot applications in the fall of 1980 using Endothol. In the spring of 1981 we used Roundup and in the spring of 1982 used a mixture of Pre-San and Roundup.

All spot applications were done by hand using a 16 oz. hand sprayer. Results of these treatments have resulted in about a 98% control of poa annua.

OUTLINE OF TREE CARE PROBLEMS IN THE EL PASO AREA

Carson McCoy

Arborist

Carson McCoy Tree Service

Contributing Factors:

I. Incompetency and lack of ethics

II. Landscapers

- Use of black plastic
- Planting too deep
- Overplanting an area
- Planting of unsuitable species
- Soil sterilants

III. Pruners

- Polarding--clients misconception of judging a job by amount brush hauled away
- City ordinances--effecting the quality of tree pruning

GUIDELINES FOR THE MAINTENANCE OF ATHLETIC FIELDS

by

Dr. William E. Knoop
Extension Turfgrass Specialist
Texas Agricultural Extension Service
Dallas

There is no magic about the maintenance of athletic fields. Adherence to the tried and true basic turfgrass maintenance principles discussed in this guide will, if followed, produce a superior field that is not only high in its aesthetic value but also may be a safer field for the conduct of athletic events.

MOWING

Height-of-Cut - Each of the turfgrasses has an ideal height-of-cut. Since most athletic fields are either common bermudagrass or one of the "named" bermudagrass varieties, there are really only two different heights-of-cut to consider. The best cutting height for common bermudagrass is about 1-1/2 inches. All the others such as Tifway (419), Tifgreen (328) or Texturf-10 should be cut in the 1 to 1-1/2 inch range.

Generally, if these grasses are cut below the recommended height they will tend to thin out and be less prone to stand up under heavy use. At cutting heights that are very much above the suggested heights, bermudagrass tends to become stemmy. All the leaves are produced near the end of the upright stem and the turf becomes very susceptible to scalping.

Mowing Frequency - The failure to mow a turf at proper intervals can be one of the most abused aspects of turfgrass maintenance. Ideally a field should be cut at a point so that no more than 1/3 of the leaf surface is removed at any one mowing. For a common bermudagrass field, this would mean that it should be cut at 1-1/2 inches each time it reaches about 2 to 2-1/4 inches in height. The "named" bermudas should be cut at 1 inch each time they are about 1-1/2 inches high. Generally, this means a field should be cut about twice a week.

Mowing Equipment - It is generally considered that reel type mowers offer the best cut in terms of quality followed by rotary and then flail type mowers. Regardless of the type of mower, it should be kept sharp.

IRRIGATION

It would be extremely difficult to maintain an athletic field without irrigation. Many athletic fields are constructed on soils that contain high amounts of a clay that shrinks when it is dry and expands when it is wet. During dry periods, many of these fields may develop soil cracks that are several inches across and many inches deep. These non-irrigated fields may not be safe for play.

The frequency and duration of irrigation is dependent on many environmental factors as well as those limitations imposed by design of the irrigation system. Ideally the system should be able to provide enough water over a reasonable time period to wet the soil to a depth of 4-6 inches. The soil should then be allowed to become nearly dry before the next irrigation. Since many fields are constructed from high clay soils, it may not be possible to get on enough water in one irrigation to wet the soil that deep before water begins to run off the fields. When runoff occurs, stop irrigating and let the water soak into the field. It may be necessary to repeat this type of a cycle several times before irrigation is complete.

It is very important to allow the surface of the field to dry out between irrigations and not to irrigate until it is absolutely necessary. The first visual sign that a turf needs water is what is commonly called "footprinting". When the turf plant has a low water content, it does not tend to bounce back after it has been stepped on or driven over. In other words, after you walk or drive across it, you can easily see where you have been. That's the time to irrigate.

If a turf is irrigated too frequently and the surface stays wet for an extended period, it tends to be more susceptible to disease, accumulate thatch and tends to become more shallow-rooted.

AERIFICATION

The roots of the turfgrass plant take in oxygen (O_2) and give off carbon dioxide (CO_2). An average soil contains about 45% mineral, 5% organic matter, 25% water and 25% air. When a soil receives an abnormally high amount of traffic, as do many athletic fields, the amount of air space in the soil is slowly reduced. This results in a gradual thinning of the turf because the soil has been compacted.

The centers of football fields and the areas near the soccer goal are good examples of areas that are prone to soil compaction. Soils vary in their susceptibility for compaction. As the sand content of a given soil increases, it becomes less subject to compaction. Reversely, as the clay content of a soil increases, it becomes more easily compacted. Since most athletic field soils have a fairly high clay content, it becomes very important to consider the turfgrass maintenance procedure designed to counteract soil compaction - aerification, or as it is sometimes called, coring.

This process involves the use of a machine that inserts a hollow metal tine into the soil to a depth of 2 or 3 inches. A core of soil is displaced and discarded on the surface where it will slowly decompose. The hole left by this process will allow greater amounts of oxygen to reach the root system and greater amounts of carbon dioxide to escape from the root system. These holes also allow freer movement of water, nutrients and pesticides into the soil. Aerification is the only way a soil can be tilled without seriously disturbing the turf.

Every athletic field should be aerified at least once a year. Those that are used more than others and that have a thin turf may need to be aerified once a month during the growing season. Once a month aerification is not too often for fields that have a high clay soil.

FERTILIZATION

A good fertilizer applied at the right time is an important part of any athletic field maintenance program. For most fields, a 3-1-1 or 4-1-2 ratio of N-P-K will do a good job. The following are a few fertilizer programs that might be considered:

Fertilizer Analysis	Nitrogen Source	Application Date	lbs. N 1000 ft.	lbs. Fert. 1000 ft.	lbs. Fert. Football Field*
15-5-10	soluble	April 15	1.3	8.7	500
		June 1	1.3	8.7	500
		July 15	1.3	8.7	500
		Sept. 1	1.3	8.7	500
		Total	5.2		2000
15-5-10	50 or 100% S.C.U.**	April 15	1.6	10.7	600
		June 15	1.6	10.7	600
		Aug. 15	2.0	13.4	800
		Total	5.2		2000
19-5-9	50% S.C.U.	April 15	1.7	9.0	500
		June 15	1.7	9.0	500
		Aug. 15	1.7	9.0	500
		Total	5.1		1500

* A football field is 57,600 sq. ft.
** Sulfur Coated Urea

The above times of application and rates are suggestions. It might be desirable to adjust application dates one way or the other and it might be desirable to use slightly higher or lower rates. These programs are offered as a reasonable place to start.

PEST CONTROL

Weeds - Weeds are a very common problem on many athletic fields. They may be classified or grouped in several ways. Weeds may be classed as grassy types such a crabgrass, goosegrass, dallisgrass, etc., or broadleafs such as henbit, goathead, etc. Another way to group weeds is by their life cycle. They may either be perennial (live more than one year) or summer annuals or winter annuals. The following chart may help in the selection of the proper herbicide:

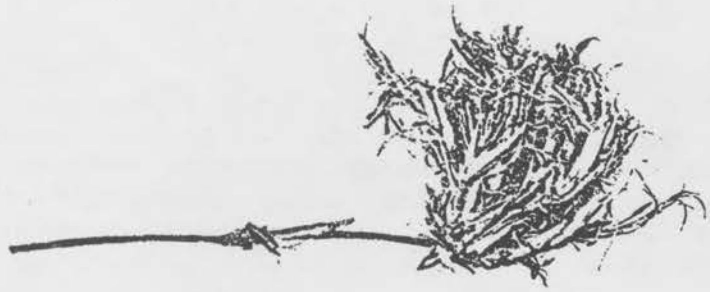
Weed Type	Chemical	Trade Names
Summer grassy	MSMA, DSMA	Various
Summer broadleafs	2,4-D, MCPP, Dicamba combinations	Trimec, TrexSan
All winter weeds (Spot apply when bermuda is dormant.)	Glyphosate	Kleen-Up or Round-Up

Note: Apply all herbicides according to the directions on the label.

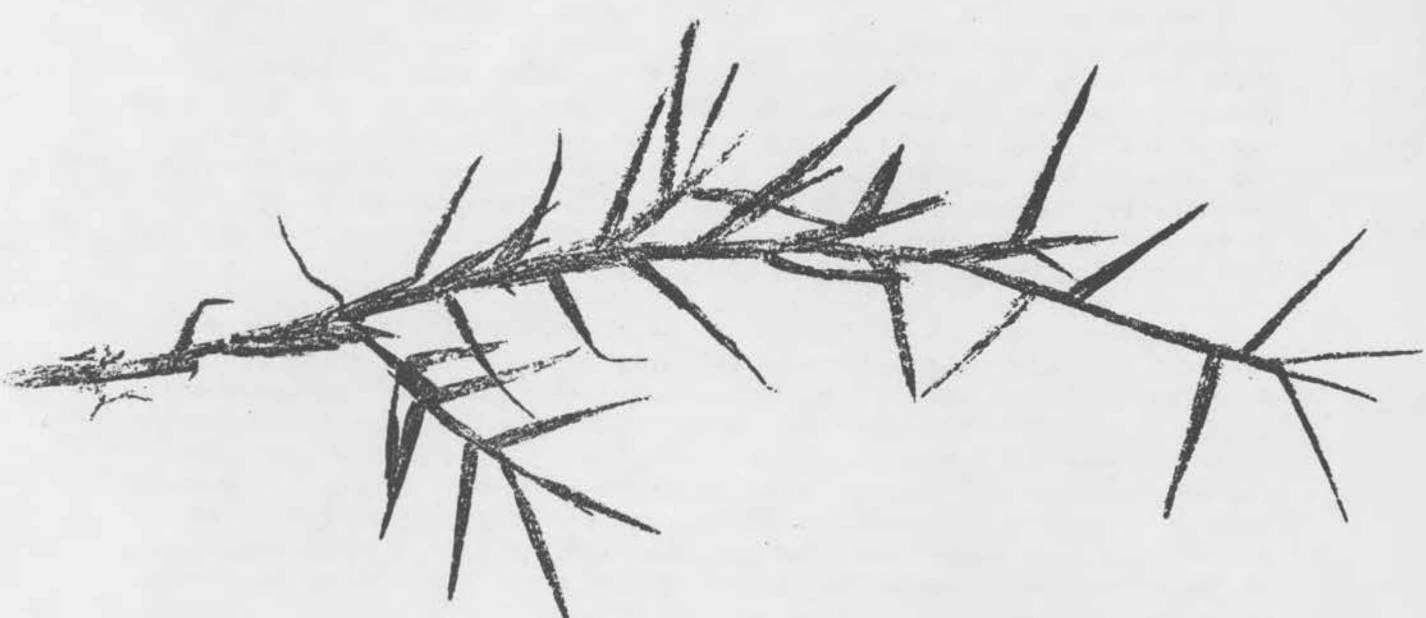
Insects - About the only insect that would commonly be a problem on athletic fields is the white grub. If they are going to be a problem, it is usually after August 1. If there are patches of the field that begin to wilt but do not respond to water, it may be grubs. Dig up a square foot of soil in the wilted area and look for grubs. If there are more than five, treatment with an insecticide such as diazinon or dursban is suggested. It is suggested that a surfactant (wetting agent) be used with the insecticide to facilitate its movement into the soil.

The occurrence of the bermudagrass mite has been noted on some fields and has caused some damage. Attached is a picture of the type of unusual growth pattern this insect causes. Use two applications of liquid diazinon at label rates five to seven days apart.

Diseases - A disease on bermudagrass is fairly rare under most conditions. Most diseases of turfgrass require free water or a very high humidity to grow and infect the plant. In most parts of the state, the humidity is fairly low during the bermuda growing season and it would probably take an extended period of rain or the excessive use of irrigation water for a disease to develop. One of the best methods of disease control is the proper use of the irrigation system.



BERMUDAGRASS MITE INFESTED STOLON



NORMAL BERMUDAGRASS STOLON

Problems and Needs: Turfgrass in Landscape Architecture

Craig Campbell
Craig Campbell Associates

I would like to offer at first a brief explanation of "landscape architecture"--what it is that we do, and how we relate to others involved in the vast field which deals with the man-made environment. Landscape architecture as a profession is closely related to architecture, civil engineering, and city planning; certain parts of our work either encompassing or interfacing with each of the other disciplines.

There are 42 accredited university degree programs in landscape architecture--the closest ones to New Mexico being Texas A&M, Texas Tech, Utah State, Colorado State, and the University of Arizona. We are involved at various times in all areas of land design and planning from urban renewal and city planning projects, pedestrian malls, campus planning, housing developments, park and recreational projects, commercial and institutional site design, land revegetation, etc. to the more modest scale of residential landscape design. Our training encompasses courses in surveying, road layout, cut and fill, grading and drainage, urban planning, horticulture, architecture of small structures, soils computer applications, site analysis, etc.

In addition to those of us in private practice, many landscape architects are employed with various levels of government from city parks or planning departments to federal agencies such as the National Park Service and National Forest Service. That explanation out of the way, I would like to now explain our role, as landscape architects, in the area of concern for plant materials and their performance. We are essentially the specifiers as opposed to the researchers, growers, and installers. We are involved more at the end of the continuum and as such are often out of touch with the research end.

It is exceedingly difficult for us to gamble with a client's money in order to experiment with untested plants, even though there are many occasions when we would like to broaden our range of planting with something unusual. Northern New Mexico presents a unique situation in terms of selecting suitable plant material for landscape use. Cold winters preclude the use of most ornamentals common in the low desert areas. Drying winds, alkaline soils, extreme diurnal temperature variations, and many other local factors also make it difficult to grow many of the ornamentals common in regions to the north and east of us. Even in Denver, for example, a great variety of oaks, birch, maples, buckeyes, and other trees are successfully grown which are nearly impossible to grow in New Mexico. Unfortunately, there has never been any extensive testing program for ornamentals in New Mexico--even though we confront one of the most difficult ecological areas of the country. Generally speaking, the nurseries in Colorado seem to be more willing to experiment with new plant introductions, test the possibilities of growing native grass sod--which they have had some success with--and offering a wider variety of plant material than we find in New Mexico. One nursery in Colorado, for example, grows all of its green ash from seed collected in Wyoming and Montana where it is highly adaptive to cold and alkaline soils. In New Mexico we have only a very few tree farms which grow specimen trees in the field. They are only able to supply a small portion of the existing market demand and the remainder of the specimen trees are imported from California, Texas, Colorado, and the Midwest. Needless to say, there are some severe acclimatization problems involved in transplanting a tree, for example, from California which has never known a true cold dormancy period and which has probably developed a top growth completely out of proportion to its root system. For that reason, we do not allow trees from California on our projects unless they have been transplanted and field grown in New Mexico for a minimum of one year. We generally prefer trees from Colorado or the Midwest if we cannot locate what we want locally for the hardier growth and better root systems. We are also looking more toward requiring that specimen trees be marked in the field prior to digging to indicate the north side of the trunk, as there exists considerable evidence that trees transplanted in the same orientation as they were situated in the field perform better with less bark splitting. There is probably a difference in the cellular growth pattern of the cambium and bark on the north and south sides of the trunk.

When we get into the area of turfgrass establishment, the same adverse situation prevails as with trees and shrubs. Even in the use of native grasses, none of which are really suitable for intensive use park or playfield situations, there are difficulties with establishment. We have had uneven results with a wide variety of native grass mixtures under varying regimens from no supplemental water to a complete underground irrigation system. The typical rangeland seeding rates are far too low to accomplish a reasonable cover from a visual standpoint and we normally double or triple those seeding rates. Even with the best drill seeded installation with hay mulch and tackifier, native grasses require at least two full growing seasons to fill in--with considerable weed problems in the interim, especially when supplemental water is applied. Fortunately, there exists a considerable body of literature on seeding of native grasses in New Mexico, thanks to publications by the New Mexico Inter-Agency Range Committee and New Mexico State University.

What many of us would like to see is an equivalent degree of interest in researching turf type grasses which could result in the same level of output of materials concerning turf grasses as are now available for the native and range type grasses. I have kept up as much as possible with the research into drought and wear tolerance of Kentucky bluegrasses undertaken by Dr. Jack Butler and others at Fort Collins, but climatic conditions vary enough between there and here that their rankings are only of relative value here. For example, one of the highest rated bluegrasses at Fort Collins is Merion--a bluegrass which doesn't perform so well in Albuquerque. Other research in Fort Collins has been directed toward developing turf type cultivars of bromegrass which could be used on roadsides, playgrounds, etc. The most interesting development, to me, in the area of turfgrass development is represented by the newer fine textured tall fescues such as Rebel, Olympic, Houndog, and others. The deep rooting characteristics of tall fescue, its tolerance of shade and wear, and the improved appearance of these new varieties are exciting to those of us concerned about lowering water consumption while still retaining a quality appearance in parks and other large scale turf areas. There has been a severe shortage of seed from these newer types for several years, so there are not many opportunities to observe the performance of local installations. AG Sod Farms, however, has been growing Olympic and Rebel over a polypropylene matting which provides the tensile strength necessary to handle sod lacking the rhizomatous roots of bluegrass.

What is sorely needed, in my judgement, is more localized testing of turfgrasses on varying soils, in each of the climatic zones of the state, for their performance at differing levels of moisture and fertilizer. There are also many questions to be answered regarding ultimate crowding out or dominancy by specific grasses in a mixture. Will bluegrass at 10% in a mix with tall fescue crowd out the fescue over a period of years? Will fine fescue be compatible with tall fescue in full sun under heavy use? Do Rugby and Enmundi bluegrasses really require much less maintenance and fertilizer? The potential questions are many; and given the present level of expenditures by cities, schools, and private industry in New Mexico for turfgrass establishment, there would seem to be as strong an argument on economic grounds for research in this area as there is in the area of agricultural crops. Water availability and cost have come to be of great concern in the Southwest, as witnessed by the present lawsuit involving the State of New Mexico vs. El Paso. The greatest misuse of water is probably in the area of supporting bluegrass turf in areas where more drought tolerant and heat tolerant grasses would be appropriate or where no grass is really needed at all. My office has been doing more projects utilizing effluent water which serve not only the function of growing grass but also of removing nitrogen and phosphorus from the effluent in accordance with federal regulations. The entire landscaped area, including a six acre playfield, at United World College (Montezuma Castle) in Las Vegas is on an effluent irrigation system, and the racetrack at Santa Fe plans to develop their entire infield into a landscaped park with effluent piped from the Santa Fe Treatment Plant five miles away. The use of effluent water for irrigation is one other area of research which is inadequately served at present. Many problems are unique to the use of effluent systems. The type of filtration required to avoid clogging of valve ports, the corrosion problems resulting from certain metals in the system, possible accumulation of toxic materials, and other questions are of concern to those of us designing irrigation systems utilizing effluent water.

I hope I have adequately expressed in this brief talk some of the concerns landscape architects have which interface with the activities and interests of many of the attendees at this conference.

THE PLANO STORY - A WASTE-SAVER LAWN CARE PLAN

by

Dr. William E. Knoop
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The Problem and the Plan

One of the major problems facing our cities is that they increasingly generate large volumes of garbage each day. In most cases it is the responsibility of city government to find methods of disposal. Most Texas cities use the sanitary landfill as their main method of disposal.

Plano is a rapidly growing Dallas suburb that shares a landfill site with the City of Richardson. Both these cities have had some concern over the fast rate at which their landfill is being filled.

The Plano Productivity Manager, Mr. Duane Kinsey, completed a study of their sanitation service. In that study, Mr. Kinsey found that about 23 percent of the garbage bags picked up during the spring and summer months contained grass clippings. The study also indicated that the bags of grass clippings amounted to 40 percent of the weight of garbage picked up since a bag of grass clippings weighs more than an average bag of garbage.

Mr. Kinsey contacted the Texas Agricultural Extension Service to find out if grass clippings need to be removed from lawns and, if not, could TAEX help develop a city-wide educational program aimed at reducing the bagging of grass clippings?

As a result of Mr. Kinsey's contact with TAEX, the Plano "Waste-Saver Lawn Care Plan" was developed. This was outlined in a brochure which was distributed to more than 21,000 homes. The brochure outlined a mowing plan, a fertility plan, and a watering plan to reduce excess clippings and eliminate bagging for disposal.

Benefits in 1981

As a result of excellent participation by Plano citizens in the 1981 "Plano Waste-Saver Lawn Care Plan", every Plano citizen benefited from the first year of the program.

Comparative statistics compiled during the summers of 1980 and 1981 indicate remarkable success. While the number of trash bags collected increased 12 percent in 1981 (this is comparable to the 12 percent growth in number of homes serviced), the number of grass bags actually decreased 11 percent. This reflects an overall reduction of 23 percent in the number of grass bags that would have been collected without the Waste-Saver Lawn Care Program.

Substantial benefits were enjoyed by participants in the plan, including savings of many thousands of dollars that would have been spent on plastic bags to hold the grass clippings, reduction in the amount of fertilizer needed, reduced water costs and, of course, considerably less labor in mowing lawns.

All Plano citizens benefited through substantial savings to the Solid Waste Collection Department. Considerably less labor was required because of the reduction in the number of bags collected, fewer trips to the solid waste transfer station resulting in savings in both fuel and man-hours, a reduced workload at the transfer station, and in fewer trips of transfer vehicles between the transfer station and the landfill operation. Most importantly, it helped alleviate the perpetual problem of landfill capacity.

The success of the Plano Waste-Saver Lawn Care Plan is best exemplified by the interest exhibited throughout the world. Requests for information were received from Australia, New Zealand, Canada and many other countries. Finally, the most convincing evidence is the fact that many cities in Texas are this year copying the Plano plan.

PEOPLE'S REPUBLIC OF CHINA--TURF OR LACK THEREOF

Merle H. Niehaus

During the winter of 1981-82 I spent five weeks in China travelling over 5,000 miles by train. During the summer of 1982 I spent nine weeks mostly at an agricultural college in northwest China. My first trip was funded by the Chinese government and the second by the United Nations.

The most striking thing about Chinese agriculture is the contrast between the old and new. It was common to see modern computers in laboratories with oxen or sometimes people doing the plowing just outside the laboratory.

The Chinese are doing a relatively good job of feeding themselves. I saw no hungry people and everyone had ample, though drab and ill-fitting clothing.

In 14 weeks and well over 5,000 miles of travel I can recall having seen no well maintained turfgrass. I saw two large sports centers but got inside only one stadium. It had no grass, but was being renovated. I did not get inside the other stadium but was told it did have turfgrass.

I was also told that during the Cultural Revolution (1966-1976) Mao proclaimed that pretty lawns were decadent and that they should be plowed and used for vegetables.

At the campus where I spent several weeks the area that would be expected to be in turfgrass was either bare ground or flower beds. The bare ground was swept weekly and kept weed free.

Chinese scientists and other people who interacted with me were for the most part friendly, candid, and well trained. They are conducting some good research but much of it is several years behind what would be expected in the United States. They are determined to catch up and in certain areas I'm sure they will. However, I saw no indication that any turfgrass research is likely. One hopeful sign, though, is a report that a new golf course is being built near Beijing (Peking) by Arnold Palmer and Associates.

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Published and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914, by the Cooperative Extension Service of New Mexico State University, John W. Oren, director, and the U.S. Department of Agriculture, cooperating. New Mexico State University is an equal opportunity employer. All programs are available to everyone regardless of race, color, religion, sex, age, handicap, or national origin.