Proceedings of the

Third Annual

NEW MEXICO TURFGRASS

CONFERENCE

Oct. 14-15, 1957

NEW MEXICO COLLEGE OF AGRICULTURE AND MECHANIC ARTS

Sponsored by

Agricultural Experiment Station

Agricultural Extension Service

of New Mexico A&M College

and the

United States Golf Association, Green Section

Foreword

Fifty individuals registered for the Third New Mexico Turfgrass Conference held at New Mexico A & M College on October 14 - 15, 1957. There were fifteen or twenty people attending at various time who did not register. These individuals heard only one or two papers presented that was of interest to them.

Again, we had an excellent cross-section of people dealing with turf. We had representatives from golf courses, colleges and high schools, nurseries, parks, cemetaries, military installations, commercial dealers, extension and experiment station personnel. Those attending exhibited considerable interest in the various papers presented. There was exceptional interest in the paper "Trees and Shrubs for New Mexico Landscaping" by Dr. J. V. Enzie. There were many nice comments on all the papers presented during the meeting.

We wish to take this opportunity to express our thanks to the Toro Manufacturing Corporation, Milwaukee Sewerage Commission and the United States Golf Association for their cooperation in making this meeting a success. We appreciate their efforts in providing time, personnel and expenses to make our turf meeting better.

We would especially like to thank the U. S. Golf Association for providing funds to establish an observational turf nursery at New Mexico A & M College. The State of New Mexico is providing sufficient funds to establish a turf research program at the Middle Rio Grande Substation located at Los Lunas, New Mexico.

The members of the Extension Service and the Experiment Station were glad to have each of you on the campus, and we are looking forward to seeing you next fall.

Clarence E. Watson
Secretary-Treasurer

THIRD ANNUAL NEW MEXICO TURFGRASS CONFERENCE

New Mexico College of A & MA
Faculty Club Room, Milton Hall
Box 306 State College, New Mexico

October 14 and 15, 1957

October 14

8:00 ..... Registration

9:00 ..... Welcome
Dr. Robert H. Black

9:15 ..... Announcements and Appointing of Committees
Mr. Fred A. Day

9:30 ..... Scenes from Pakistan
Dr. Harold E. Dregne

10:10 ..... Coffee Break - Small Dining Room

10:30 .. The Impact of Cultural Practices Upon Disease Incidence and Summertime Behavior of Bentgrass Dr. O. J. Noer

11:10 ..... To Be Arranged

Noon Recess

1:15 ..... On the Mowing of Grass
Dr. J. R. Watson

2:00 ..... Turf, Its Importance and Maintenance in a Park System
Mr. Ed Daniel

2:30 ..... Coffee Break - Small Dining Room

3:00 ..... Tour - Mr. Clarence E. Watson

6:30 ..... Banquet - Small Dining Room

October 15

8:30 ..... Advances in Turfgrass Management
Dr. Marvin H. Ferguson

9:10 ..... Business Meeting

10:00 ..... Coffee Break - Small Dining Room

10:20 ..... Trees and Shrubs for New Mexico Landscaping (Slides)
Dr. J. V. Enzie

11:10 Specific Uses of Selected Plants for Landscaping Public Areas
Mr. Fred A. Day and Mr. W. J. Wiltbank

SCENES FROM PAKISTAN

Dr. Harold E. Dregne 1/

A series of slides showing various points of interest in Pakistan. Some shots of grassed areas and landscaping of homes and public areas.

THE IMPACT OF CULTURAL PRACTICES UPON DISEASE INCIDENCE ON BENT GRASSES

O. J. Noer 2/

Turf diseases on bent grass greens are God-given or man-made. In both instances disease may be the immediate cause of damage. Fungicides usually prevent God-given attacks, but are less effective in controlling man-made disease. In these instances disease is secondary to something else, usually faulty management, poor drainage, or a bad soil condition. When the real cause is corrected disease is lessened or eliminated and fungicides do the job expected of them.

In the late Twenties a St. Louis club was plagued with disease. By mid-July they had spent over $5,000 for fungicides of every kind without success. In August the greens were devoid of grass and badly infested with weeds and clover. Dead grass never offers competition to anything. Ammonium sulphate was being used every Monday at 5 pounds per 1,000 square feet in a vain attempt to control weeds by creating an acid soil. The plentiful supply of nitrogen made the grass succulent and ready prey to every kind of disease. Weed invasion followed inevitably. The following year a sensible fertilizer program and preventative fungicide treatments produced good weed free greens with a very nominal expense for fungicides.

Leaf spot seriously damaged the grass on the greens at a Buffalo course within two hours. Fungicides did not stop the disease. The greens were blanketed with a thick thatch. The soil was strongly acid due to the use of ammonium sulphate as the sole source of nitrogen. The levels of potassium and magnesium were low. All greens were cross-aerified and Verti-cut. Dolomitic lime was applied generously. The revised fertilizer program provided needed potash and most of the nitrogen was supplied from an organic source. Recovery was quick and leaf spot has not been troublesome since.

The greens at Oakmont started to behave badly during late summer of the year prior to the last National Open Tournament held there. Disease was present and got blamed for the bad turf. Actually, disease did not attack the grass until after it had been weakened by iron chlorosis. The periodic use of ferrous sulphate stopped the chlorotic condition. It kept the grass healthy and succeeded where fungicides failed. The healthier grass resisted fungal attacks.

1/ Professor of Soil, New Mexico A & M College

2/ Agronomist, Milwaukee Sewerage Commission, Milwaukee, Wisconsin

Fungicides are needed and useful tools. They will perform satisfactorily when turf maintenance practices are sound. It is wrong to blame or condemn a fungicide when its failure was due to bad management.

There are many good bent grasses. Selection of the best one is affected by location. Seaside is popular in the semi-arid Southwest. It does well there. In the far north Seaside is not liked because of its susceptibility to snow mold. In the hot, humid weather belt Seaside falls prey to brown patch and pythium. Arlington alone or mixed with Congressional and Cohansey are among the favorites there. Cohansey is doing very well in Oklahoma. It appears to be more salt tolerant than other bent grasses. Washington, Old Orchard, and Toronto are among the better liked grasses in regions where the weather is moderate during summer and winter. Penncross is a new seed type of bent grass developed by Professor Musser of Penn State. Its behavior has been excellent so prospects for it are bright.

The grass used should have a record of good performance locally. It should be resistant to the prevalent diseases of the area and must produce a true putting surface. Otherwise it will not receive golfer acceptance. Without their approval any grass is doomed irrespective of every other virtue it may have.

It is unwise to use a new grass selection until it has been subjected to testing under use over a period of several years. A grass may do well in a nursery and not produce a good green for play.

Adverse weather emphasizes the necessity for good drainage. Overwetness promotes disease and may induce iron chlorosis. While good internal soil drainage is a must, the need for good surface drainage and adequate air drainage are imperative, also.

When the subsoil is of a porous nature, tile drainage is obviously unnecessary. On heavy soil tile usage is justified and will function properly if the installation is not a haphazard one. Quicker removal of excess internal soil water is required than on farm land. Tile should be placed 2 to 3 feet deep. Backfill in the trench should be gravel or crushed stone. Lines should be spaced close, about 15 feet apart. The herringbone system is a good one. In outline it resembles the silhouette of a tree with the main representing the tree trunk and the laterals the branches. The ideal way is to lay the tile in the subgrade and cover the shallow trench with coarse aggregate, then spread a 10 to 12 inch blanket of aggregate over the entire subgrade, and pre-mixed sandy loam soil above it.

The aggregate blanket underlaid with tile is very desirable in semi-arid regions where saline water must be used. Excess salt can be washed through the aggregate and carried away by the tile.

Any clubs located in wet, humid climates, or those confronted with saline water should insist on tile drains and gravel blankets when greens are built or reconstructed. The reward will be better grass and less disease in times of bad weather.

Moisture laden stagnant air on greens located in picketed areas creates an ideal medium for disease. Dew clings to the grass most of the day and invites disease. Underbrush and sapling trees should be removed from both sides of the green along a line in the direction of the prevailing summer wind. Then air movement across the green will hasten dew removal and lessen disease.

The physical characteristics of the topsoil profoundly affects the well being of the grass, particularly as to its rooting habits. It plays a part in the incidence of disease, also. A high content of clay, of silt, or of both minute sized particles restricts root development and retards water movement. Instead of possessing roomy channels for the free movement of water and the expansion of the root system, fine textured soils have micro-sized pores mostly. Surfaces tend to stay wet longer, which is bad when conditions are favorable for the development of disease causing organisms.

Soils in the range of sandy loams to loamy sands make the best topsoil for golf greens. They should contain 15 to 25 percent by volume of good quality organic matter. The tendency has been to use too little sand in the past. That does not justify the other extreme of using sand only. The presence of minute sized particles is highly desirable because of the many useful functions they perform. A soil mixture containing two to three parts sand, one part loam soil, and one part fibrous peat or similar organic material is a good one. The sand should be free of fine gravel, but should contain various sized particles. Some like concrete sand, and others use equal parts of it and plaster sand. Careful selection of the soil component is desirable. It should resemble a good, friable garden soil. The proportion of sand, silt, and clay particles in a loam soil is such that no one fraction overpowers the other two. In silt and clay loams, and in clay soils, the designated fraction imparts its properties to the soil.

There is bad soil on many greens. It is too heavy on some and layered on others due to attempted improvement by dressings of sand or peat. When the soil is too heavy the proper thing to do is to top-dress generously and frequently with a good soil mixture because it is impossible to change the existing soil by the use of sand or peat as such. Layered greens should be cross aerified with open type spoons, or should be cored with the tine type aerifier.

Good water practices are the key to good grass. Bad ones spell nothing but disaster. They invite disease, create shallow roots, and induce iron chlorosis. The evils of overwetness can not be overemphasized. Fertilizers are blamed frequently when turf damage is the result of faulty water usage.

By implication infrequent watering develops deep root systems. The solution is not that simple on golf greens. Soil compaction from traffic and power mowers, a layered soil profile, an overly acid soil, the presence of excessive thatch, and the rooting habit of the grass itself, affect root depth. The axiom about water usage and root development applies only if other factors are favorable. When roots are shallow and weather is hot it becomes necessary to ignore the axiom about infrequent watering.

During the cool weather in spring and fall the interval between waterings should be as far apart as possible. Maximum root development occurs during these seasons. Slight wilting is seldom fatal in cool weather.

During the hot weather of midsummer root systems often become shallow. When that happens watering in the daytime becomes necessary to stop wilt and prevent loss of grass. Hand syringing is best. Unless done promptly at the first sign of wilt, loss of grass may result. The workman should apply enough water to stop wilt and no more, because it may be necessary to water more than once on bad days. Not more than 5 to 10 minutes need be spent on a green.

Grass does not observe the 40-hour week. Somebody must be on guard to stop wilt on Saturday and Sunday.

California experienced warmer days and nights in 1957 than usual. Grass on greens fared badly as a result, especially the greens with a high percentage of poa annua. At most clubs nobody was on hand Saturday and Sunday to watch for and stop wilt by hand-watering. On week days they did not realize the importance of promptness in handling wilt. Loss of grass will continue under similar conditions until clubs adopt the vigilance practiced in the Kansas City to Philadelphia belt where hot spells are experienced every summer.

Grass may wilt after drenching rains, even when cups are full of water. This is wet wilt. To prevent loss of turf the grass foliage must receive a little moisture while the soil below is freeing itself of surplus water.

Iron chlorosis is associated with overwet soil. A high soil pH and an overabundance of soil phosphorus are other causes. Leaves become yellow in color and foliage becomes weak and soft. Such turf falls prey to leaf spot, pythium, brown patch, and every other kind of disease. Loss of grass can be prevented by applying ferrous sulphate (Copperas) promptly. The iron must be absorbed by the grass leaves. It is the one time foliar feeding is justified. The rate for ferrous sulphate should be 1 to 2 ounces per thousand square feet applied with not more than 25 to 30 gallons of water to the entire green. Late afternoon is the best time to make the application because the ferrous sulphate should not be watered-in.

Most greens in semi-arid regions are alkaline in reaction. A good practice on such greens is to use a little ferrous sulphate every time the fungicide is used, or every two to three weeks.

Moderate to strong acidity favors disease development. In the late Twenties finely ground limestone was applied on half of a Washington bent grass nursery at Merion Golf Club in Philadelphia. Several weeks later dollar spot damaged the unlimed part very severely. There was almost no disease on the limed half. The use of lime is justified when reaction is below pH 6.0. The level of magnesium may be low on acid soil. Then a dolomitic limestone of high magnesium content should be used to correct acidity.

The fertilizer program can encourage or discourage disease attacks. Nitrogen usage is the key, which opens or closes the door to the fungus diseases which attack grass. The secret of its use is to apply enough in cool weather to prevent serious attacks of dollar spot, and to reduce summertime rates in order not to invite attacks of brown patch, pythium, etc.

Bent greens require 3 to 5 pounds of phosphoric acid and 5 to 7 pounds potash per thousand square feet per year. These rates are for places where the grass is dormant in winter. Elsewhere the amounts should be increased 25 to 40 percent. Since phosphate and potash are not lost by leaching, the amount needed can be applied in two applications or in equal monthly amounts.

Nitrogen is the principal element which can be lost by leaching. Best practice is to use it once or twice a month in cool weather and each week in hot weather. The spring and fall rate should be 1½ to 2 pounds per thousand square feet per month. The hot weather rate should be in the range of ½ to 1 pound actual nitrogen per month, based on one thousand square feet also.

Thatched turf invites disease and makes control difficult. The thatch holds water like a sponge. Diseases flourish in a wet medium. Fungicides are trapped at or near the surface. Disease organisms continue to attack the grass in the thatch below. After a dollar spot attack the turf is pitted, and looks like smallpox scars on a person's face. When fungicide is condemned the attack is unjust.

Thatch of recent origin can be eliminated by alternate raking and close cutting, or by using the Verti-cut or power thatch. The operation is done best in early spring at the time growth starts. Generous nitrogen fertilization should follow to speed recovery along with a light top-dressing.

When the thatch has become a peat-like mass further decomposition must be encouraged. The cellulose decomposing organisms require moisture, a favorable reaction, oxygen, and an adequate supply of nitrogen. It is not difficult to satisfy these requirements. Needed moisture can be supplied readily. The first decomposition products are organic acids, so the use of a little hydrated, or finely ground limestone, is desirable. Rates need not exceed several pounds per thousand square feet. Cross aerification or tine forking will facilitate the entrance of air to provide needed oxygen. The rate of nitrogen application should provide enough for the grass and for the cellulose decomposers. A marked reduction in thatch can be expected within several years provided conditions are kept favorable by aerification, the periodic use of a little lime, and by providing enough nitrogen to speed decomposition.

Most superintendents have learned the tricks of turf management under normal conditions of local climate. They avoid the man-made diseases and control the God-given ones. Their troubles occur during periods of unusual weather. Disaster seldom hits healthy turf on greens with the right grass, the proper kind of soil, good internal

and external drainage, along with correct management of water, fungicides, and related maintenance factors. Even though slight damage occurs, recovery is rapid when weather returns to normal.

Where the thatch has undergone partial decomposition into a peat-like mass, further decomposition must be fostered. The organisms responsible for decay require moisture, a favorable reaction, oxygen, and an adequate supply of nitrogen. There must be moisture in the mat.

ON THE MOWING OF GRASS

J. R. Watson, Jr. 1/

Grass cuttingis the major time consuming operation in the maintenance of any turfgrass area. Good mowing practices are perhaps the most important single factor contributing to a well groomed appearance and the longevity of any turfgrass area. The manner in which grass is cut will also greatly influence its health, vigor and density. These factors, along with an adapted grass, proper fertilization, aeration and judicious watering will determine the ultimate quality of turfgrass areas. All are instrumental in the degree of weed invasion which may occur and, collectively, control the overall appearance of the lawn. An understanding of the basic growth habits and characteristics of grass is essential for the development of proper mowing techniques.

Growth Habits and Characteristics

On the basis of growth type, grasses may be classified into three general groups. Bunch type grasses, such as ryegrass and chewings fescue, produce new shoots which grew inside the sheaths of the previous stem growth. Stoloniferous grasses such as bentgrass spread by runners or stolons which develop from shoots that push through the sheath and run along the surface of the ground, rooting at the nodes (joints). Kentucky bluegrass, a rhizomatous type of grass, develops shoots at the underground nodes. Some grasses, such as bermudagrass and Zoysia, spread by both rhizomes and stolons. This is one reason why bermudagrass is such a vigorous grower and is so difficult to control and keep out of flower beds, gravel walks and similar areas. There are also intermediate types with decumbent stems which root at the nodes, such as crabgrass, nimblewill and some fescues.

The grass leaf is remarkably adapted for intercepting a maximum of sun rays which are essential for photosynthesis. The long flattened grass blades provide a maximum of exposure with a minimum amount of protoplasm, thus making efficient use of the living tissue. A reduction in the plant leaf area exposed to sunlight reduces the plants capacity to carry on photosynthetic activity. This is a vital and basic consideration in determining the frequency and height of cut of turfgrasses.

1/ Chief Agronomist, Toro Manufacturing Corporation, Minneapolis 6, Minnesota.

The ability of grasses to withstand frequent and relatively close cutting is related to certain peculiarities of the grass family. Grasses exhibit basal growth, as opposed to terminal growth found in most other plants. Basal growth means simply that growth initiates at the base rather than at the tip of the blade or stem. From a practical standpoint, this means that normal and frequent mowing does not cut off the growing areas of the grass leaf. Removal of too much leaf surface at any one cutting may, however, destroy some of the growing points.

Height of Cut

The height at which a given perennial grass can be cut and still survive for extended periods is directly related to its ability to produce sufficient leaf surface for the photosynthetic activity required for its growth. Basically this ability is related to the inherent type and habit of growth found in the grass. The length of internodes, the number of stolons or rhizomes, and the number of basal buds all influence the amount of leaf mass produced by a given grass; hence, affects its ability to withstand low heights of cut.

Creeping type plants, such as bentgrass and bermudagrass, when properly fertilized and watered, are able to produce adequate leaf surface at very low heights of cut (3/16ths inch). Buffalograss, although a creeper, can not produce sufficient leaf mass at low heights because too few basal buds exist and, therefore, can not withstand low clipping. For this same reason, Kentucky bluegrass and fescue must be cut relatively high (1 - 1½ inches). If bunch type grasses are cut close, too much leaf surface is removed, and the plant can no longer carry on sufficient photosynthetic activity to sustain satisfactory growth.

Frequency of Cut

Frequency of mowing is also an important consideration in the maintenance program. Infrequent clipping allows the grass to elongate to such a degree that any subsequent clipping removes an excessive amount of leaf surface. At no time should clipping amounts in excess of 1/4 to 1/3 of the total leaf surface be removed at a given mowing. Removal of larger amounts of leaf surface will result in a physiological shock to the plant, cause excessive graying or browning of the leaf tips, and greatly curtail the photosynthetic production of food with a resultant depletion of root reserves. In addition, the accumulation of excessive clippings may smother the grass and provide excellent environmental conditions for disease organisms and insects. The frequency of clipping must be governed by the amount of growth, which in turn is related to weather conditions, season of the year, soil fertility, moisture conditions and the natural growth rate of the grasses.

Stage of Growth

The stage of growth of turfgrass plays a major role in mowing practices. Young tender growth in the spring is generally soft and succulent. The moisture content of young immature turfgrass is much

higher than that of mature grass. Likewise, the fiber content of young grass is much lower than that of mature grass. Such a condition influences mowing practices. Tender young grass must be cut with a sharp well adjusted mower to avoid mechanical damage, and the early growth must be cut frequently to avoid the problems associated with high moisture.

Mowing practices during the early stages of growth exert a material influence on density of turfgrass. Cutting at heights somewhat lower than normal during early spring will encourage lateral growth which, in turn, promotes density and helps prevent weed invasion.

Mowing Practices

Selection of the Mower

The proper type and size of mower is important in maintaining any turf area. Good mowers are characterized by high maneuverability, easy adjustment, durability and adequate horsepower for the size and usage expected. In addition to these inherent design features, the ready availability of parts and service is an important consideration.

Four basic types of mowers are available - real, rotary, sickle bar and vertical. Choice of a given type will be governed by the particular duties the unit will be expected to perform. Each type has certain advantages and limitations which should be carefully considered before final selection of a mower is made.

Reel type mowers are always recommended for the cutting of formal and semi-formal turf areas, including golf greens, tees, fairways, and well kept lawns. Reel type gang mowers are also the most efficient and economical for mowing large open areas such as airfields and parks. The cutting action of the reel is like that of a pair of scissors. Reels, when sharp and properly adjusted, give a clean even cut which can not be equalled by any other type of mower. Certain kinds of grass should always be cut with reel type mowers. Bentgrasses and bermudagrasses used on putting greens are an example.

The use of reel type mowers may be limited in some turf areas because they require relatively smooth ground upon which to operate, and they will not cut tall, rank growing weeds. In addition, the cost of maintenance is somewhat higher than other types of mowers.

Rotary mowers are best suited to rough conditions and to areas where control of grass, rather than appearance, is the predominant consideration. In addition to controlling the grass, rotaries may be used to grind up leaves, cut tall stemmy weeds, and for trimming. The rotary cuts by impact similar to the cutting action of a scythe. For this reason, a sharp properly balanced blade is necessary to avoid ragged tearing of the grass blade and to prolong engine life. Cutting with a dull blade generally results in a graying and subsequent browning of the leaf tip. When selecting a rotary mower,

particular attention should be given to the safety features, the type of blade and method of blade mounting, ease of adjustment and the horsepower of the unit. Power requirements -- the highest of any type of mower -- and scalping on uneven or rough terrain, along with poor quality of cut in comparison to a reel are the major limitations of rotary mowers. The cost of maintenance is low on the rotary unit, although the cost of engine maintenance may be much higher than on reel units, particularly if the unit is underpowered.

Sickle bar mowers have no place under normal turfgrass conditions. They may be used to advantage in rank weedy growth where only an occasional mowing is required. Sickle bars are extensively used by highway departments to cut highway berms where foreign objects such as cans, bottles and other debris often interfere with reel or rotary operation. They have a very high cost of maintenance and relatively slow ground speed and consequently are an expensive method of mowing.

Vertical mowers are made with fixed blades or with free swinging blades (hammer-knife). They cut by impact similar to the rotary mower, except that the blades travel in a vertical plane rather than a horizontal plane. Hammerknife mowers can be used on rough terrain more satisfactorily than rotary mowers because the wheelbase is shorter and scalping is lessened. They are also excellent for clearing light brush and undergrowth. They have a very high cost of maintenance.

Vertical mowers having fixed blades are used primarily for controlling thatch and grain on golf greens and other highly specialized turf areas.

It is essential that all types of mowing equipment, whether reel, rotary, vertical or sickle bar, be kept sharp and in good operating condition. Dull improperly adjusted equipment not only destroys the aesthetic value of the area, but also bruises the leaf tips, thus providing ready access to disease and insects.

Washboard effect. Turfgrass areas regularly cut with power mowers or gang mowers sometimes develop a series of wave-like ridges running at right angles to the direction of mowing. The development of this washboard effect may be prevented or partially remedied by regularly changing the direction of mowing (diagonal or right angles). Alternate directions of cut will partially control runners of creeping grasses and aid in the prevention of grain and thatch.

A very similar washboard appearance is often observed on turf areas, but is no fault of the mowing equipment or the operator. Many times land is plowed for seedbed preparation and not properly disked and leveled prior to seeding. Settling then takes place in the plow furrows and unevenness develops. Such a situation may be reduced in severity over a period of years by heavy aeration followed by dragging. The dragging operation generally will remove most of the soil cores from the high areas and deposit them in the low areas.

Wet conditions. Mowing wet grass should be avoided as much as possible, although available labor and time often make it impractical to do so. Dry grass cuts more easily, does not ball up and clog the mower, and gives a much finer appearing lawn. Timing tests show that mowing dry grass requires less time than mowing wet grass.

Uneven Terrain. Mowers are not built for grading purposes. Turf areas containing high areas which are continually scalped should be regraded in order that they may be cut properly and to reduce the wear and possible damage to mowing equipment.

Inadequate insect control can become a serious mowing problem. Areas heavily infested with earthworms or ants will have many soil mounds caused by their activity which will result in a poor appearing area and will cause damage to mowing units. Mounds of earth thrown up by gophers and other soil burrowing animals will have the same result.

Improper operation. Irregular or uneven cutting often occurs due to bobbing of the mowing units. This may be caused by mowing at excessive speeds or by equipment not built correctly for the grass it is cutting. This often occurs where the grass is extremely heavy or dense and the mower, because of insufficient weight and/or cutting ability bobs up as the mower hits heavy grass.

On specialized areas such as putting greens, bowling greens, lawn tennis courts, etc., improper handling of the mower on turns will result in turf damage through bruising and wearing of the grass.

Terraces and banks. Terraces and banks offer a difficult mowing problem. Scalping generally will occur if the bank or terrace is mowed across the slope. Up and down mowing generally is the most satisfactory method of cutting these areas.

Summary

Mowing is not a simple operation to be regarded merely as a means of removing excess growth. Mowing practices are related to the species and strain of turfgrass being grown. The inherent physiological anotomical and morphological characteristics of a given grass will determine the height and frequency of mowing that will give the most satisfactory performance. Mowing is a maintenance practice which has far reaching affects on the appearance and longevity of any turfgrass area.

TURF, IT'S IMPORTANCE AND MAINTENANCE IN A PARK SERVICE

Ed Daniel 1/

The largest overall investment a park and recreation department has is in turfgrass. Approximately 75% of a park is devoted to open play area. This open play area is covered by turfgrass. The

1/ Director Park & Recreation, Carlsbad, New Mexico

remaining 25% is set aside for buildings, trees, shrubs, slabs, and apparatuses. If you look at the initial cost of construction of a park, you will find the total spent for buildings, trees, shrubs, slabs and apparatuses, far exceeds that total spent for seedbed preparations, irrigation systems and seed. Yet, we say that our largest investment is in turf.

Let us look at the budget proposal for a park in the second and third years after construction. Mind you, we are figuring maintenance budgets now. Items we consider for maintenance of structures are few in number, such as new swing seats, hangers, chains, paint, and a few other regular maintenance practices. Now let us look at the items we must figure for maintaining our turf grass. Fertilizers, weed-killers, insecticides, a new mower and mower operator, a fertilizer spreader, an aerifier, water, and a man to do the watering. You might ask, "Why budget for the water we will use when the park and recreation department is a part of the city just as the water department?" Yes, but you must also remember that the water department must account for its expenditures and for the volume of water pumped. It costs the water department just as much to pump, filter, and treat water for our use as it does for a home owner.

Now look at the totals for maintenance of buildings and structures, and for maintenance of turfgrass. The cost of maintaining turfgrass far exceeds that of a building or structure. We can also be assured that for the next three or four years the cost for that turf will be approximately the same. Now where is the greater investment?

Responsibility of all plant care and recreation activities, usually falls on the Department of Parks and Recreation of a municipality. A diagram of a park and recreation department showing the various divisions, in most cases, would show a golf division, cemetery division, park division, and a recreation division. Each division has its own head or foreman. So, let us look at the various divisions and the problems connected with growing a suitable turfgrass.

The principal duty of a Golf Course Superintendent, is growing the best turf most economically. Almost 100% of a golf course budget is spent for turfgrass maintenance. Greens and fairways make up most of a golf courses' land area. On, yes, don't forget the roughs. To you golf course superintendents, we duffers want to point out that a rough is that area you do nothing with, but the place where we spend our time! It lies to the right or left of that nicely manicured area we call a fairway. Golf Course Superintendents spend their money maintaining that narrow strip, and few people ever use it!

What kind of a turf does the golf course have? Three principal kinds of turf are found on a golf course. Specialized turf--the green; durable and beauty turf--the fairway; and what you may have, for the roughs. Each type of turf calls for different maintenance practices. The care of a green, as you know, is very specialized. You must have a turf grass that will withstand heavy traffic, take little water, produce deep roots when cut shorter than one-half inch,

withstand high as well as low temperatures, be at least semi-disease and insect resistant, have a beautiful color, be able to crowd out weeds, will not have to be fertilized often, will not mat up, and will withstand extreme soil reactions. Now if the superintendent can not find a grass with these characteristics, he has to do the next best thing. That is, he has to know what will have to be done to grow the grass of his choice. He must question himself on the why, when, where, what, and how, for each desirable characteristic. All this time his ulcers are fighting, and especially when he asks for the money needed. He will probably get about half of what he needs. Then he will have to begin all over and learn to live and produce with what he has.

The second kind of turf found upon a golf course, is that used on fairways. One that will grow well, add beauty, and make for a good lie. This type of turf is the same used in parks and cemeteries also. This turf must pass many of the same tests for qualities as a greens turf, but not so specificially. One characteristic that must be considered is how rapidly will this or that grass heal over from divots.

Needless to say that all people working on a golf course must develop into a specialist, whether it be watering, mowing, or greens-keeping. To hold these specialists, we must provide either a high salary, or a medium salary with extended benefits, such as sick leaves and vacations. So, you see, the cost of turf maintenance has skyrocketed.

The cemetery division has its own problems. Turfgrass in a cemetery is principally for beauty. This one word alone gives the most headaches to a cemetery manager. For ease of maintenance, it is desirable to have only one grass for the entire area. However, in a municipally operated cemetery, we will seldom find only one grass. More likely five or six different kinds. Mrs. Jackson wants Bermuda, Mrs. Jones likes St. Augustine, Mrs. Smith prefers Bluegrass. Now don't permit Mrs. Jackson's grass to crowd out Mrs. Jones grass! These are what we call "inherited headaches." They existed before the city was obligated to take over the cemetery--but one has to live with them.

Another typical problem in a cemetery, is keeping a good turf under some of the varieties of evergreens, or in a constantly shaded area. I know you want to know the answer to this problem. I shall answer you like the owl did the centipede.

After we find the satisfactory grass for the cemetery, maintenance becomes a year round routine of watering, fertilizing, mowing, trimming and edging. Trimming and edging are the most labor consuming activities in a municipal cemetery, even with modern equipment. Each and every monument and marker has to be carefully trimmed and edged. If extra care is not taken, Mrs. Smith's marker may get chipped, and that would be costly.

In a park division, you will find a combination of both golf course and cemetery turfgrass. Instead of classifying a turf as

either a green, fairway, or rough, in a park division the classification is based upon the principal use for which the area is to be devoted. Three classifications are used in this division--beautification, durability, and soil-holding capacity. These are broad classifications, and usually the grass used possesses a combination of all three qualities. Areas that are set aside for rose gardens or traffic dividers present a particular challenge. Grass, flowers, and trees, are usually all these areas contain. They are not large enough for buildings, nor safe enough to allow any activity, so the park department is expected to beautify these areas. These areas use up the maintenance budget, but require specialized maintenance practices.

A park used for normal recreational purposes must have a rugged turf. This turf must possess qualities of beauty, and grow under extreme conditions such as under dense shade, heavy traffic, and soils of extreme reactions. This is what we call a durable turf. Sometimes two or more grasses will have to be used.

The third type of turfgrass we use in a park system, is one which receives little or no care. This type of turf is not a permanent turf. It is used for soil cover on undeveloped areas until such time as the area can be developed. Bunch grasses such as rye, fescues, and blue grasses, are used in our area for holding soil from the ravages of wind and water erosion.

Proper maintenance of turfgrass in a park and recreation system depends upon three factors. (1) trained supervisors, (2) qualified employees, and (3) adequate equipment. The know-how of the supervisors can be obtained in technical training, by trial and error, and by just plain experience. The trial and error procedure is by far the more expensive, both in time and money. Technical training and experience actually go hand in hand. I do not necessarily mean a formal education in turfgrass, but just as we are doing here today; attending short courses, asking questions, finding out where we need to go for help for our specific problems, and a general exchange of our individual problems with their solutions. We can not afford to guess! Experience is by far our best teacher, but only if we profit by our mistakes. One who makes a mistake is doing something, but one who makes the same mistake twice is better off doing nothing.

The most important assest to a park system is its employees--good employees. From the laborer through the director, his importance to the organization depends upon how well he is trained. We do not want to wrap all of our packages into one bundle. It is easy to lose that one bundle. We can learn from them by being a part of them instead of being apart from them.

Equipment, proper equipment indicates how well a job an employee can do. Ascertain the equipment needed, buy the best, and treat it as you would a new hunting rifle or car. Purchase the piece of equipment for the job you need done. An equipment inventory list of a park and recreation department, would sound like this: trucks, pickups, tractors, mowers i.e. self-propelled, tractor drawn, rotary, vertical, and greensmowers; fertilizer spreaders, seeders, aerifiers

i.e. greens, parks and fairways; edgers, trimmers, hose in all sizes; sprinklers in all sizes; sprayers; hand, power, and shop tools. The quanity, of course, depends on the size of the department. We must try not to duplicate the equipment or efforts. Organize the employees into crews for mowing and watering. We find this method more economical than having Jim water today, and maybe mow tomorrow. Also, it is better for the equipment to have one operator.

I have attempted to point out the importance of turf to a park system and some of the problems encountered in maintenance. Golf courses, cemeteries, and parks have similar problems with turf, but each has its solution. This tremendous investment in turfgrass by the park and recreation department is not so great when we compare the cost per capita, and I am sure that you will agree with me that it is a most worthwhile investment.

TURFGRASS STUDIES IN NEW MEXICO

Clarence E. Watson 1/

In the winter of 1956-57 the United States Golf Association allocated $250.00 toward establishing an observational turfgrass nursery at New Mexico A & M College.

This nursery was established in the spring and summer of 1957. The nursery consisted of 69 varieties and strains of Bermuda grasses and two Zoysia varieties. The source of this material was extremely varied ranging from native species to introduced strains. The greatest number of introduced species came from South Africa, but some came from Iran and India.

Only a relatively few varieties showed promise as being desirable for turf in Southern New Mexico. Many of these produced a rather open turf that permitted weed invasion. Some seemed unable to withstand the high summer temperatures and tended to thin out during July and August. Others produced a reddish tinge on the leaves with the arrival of the first cool nights in the fall.

A short description of the more desirable species is given below, including the advantages and disadvantages.

1. Uganda - A fine-leaved grass with medium dark green color. It had excellent drought tolerance but was not outstanding in heat resistance. Could not tolerate excessive trampling. Further testing is necessary before this variety can be recommended for New Mexico.

2. Ormond - A medium textured leaf with an excellent dark green color. Forms a dense turf that resists weed invasion and can resist heavy traffic. This grass would be excellent for home lawns, play areas, or athletic fields.

1/ Assistant in Agronomy, New Mexico A & M College

3. Tifgreen (Tifton 328) - This variety is a fine leaved, close growing grass that forms a dense, compact turf. Close mowing is required of this variety ($\frac{1}{4}$ to $\frac{1}{2}$ inch) to keep a good turf. If properly managed, this grass will provide an excellent turf for putting greens and home lawns. This grass does not respond well on light sandy soils.

4. Texturf 10 (T-47) - This is a medium to coarse leaved grass of excellent dark green color. It forms a very dense compact turf that is resistant to weed invasion. This grass makes an excellent turf for play areas, home lawns and fairways on golf courses. Does very well on sandy soils and requires less water than most Bermudas. The greatest objection to this grass is the rapidity of thatch formation. It is also very sensitive to insecticides such as chlorodane and will become chlorotic with light applications of this chemical.

5. N.M. #1 - This is a selection made at New Mexico A & M College that has shown promise as a grass for home lawns. It produces a good compact turf of excellent color. The question at present is winter survival for this variety. Further testing is necessary before this grass can be recommended for New Mexico.

There are other Bermudas in the test that show some promise; however, further testing is necessary before their good qualities can be determined. In general, the fine leaved Bermudas do not withstand weed invasion, are not drought tolerant, and will not tolerate excessive traffic.

An observational nursery is now established north of Silver City, New Mexico to determine the winter survival of some popular varieties of Bermudas. Those included in this test are Texturf 10, Tifgreen, Uganda, Sunturf, African, Skaaplaas and Murray grass. Information should be available in 1958 on the winter hardiness of these strains and varieties.

The New Mexico Agricultural Experiment Station has provided funds to establish a turf project at the Middle Rio Grande Substation, Los Lunas, New Mexico. This project will include adaptation studies on warm and cool season turfgrasses. Plans are being made to include fertilization, mowing, and watering studies on the various types of grasses.

TREES AND SHRUBS FOR NEW MEXICO LANDSCAPING

Dr. J. V. Enzie 1/

The trees and shrubs listed on the following pages may be considered representative of the many species that may be grown in New Mexico. No attempt was made to include all of the different trees and shrubs that are known to grow. There are available from the nursery trade many of the newer species and varieties of the genera listed. For a more complete list of plants with descriptions, the reader is referred to New Mexico Extension Circular #284.

1/ Head, Horticulture Department, New Mexico College of A & MA

TREES

Common Name	Scientific Name	Size	Deciduous or Evergreen	Special Considerations
Mulberry	Morus alba	L	D	Several varieties, use budded male trees
Thornless Honeylocust Moraine Locust	Gleditsia triacanthos var. inermis	L	D	No seed pods on Moraine
Sycamore Plane Tree	Platanus orientalis	L	D	Sensitive to alkali; marginal burn on leaves in some locations
Box Elder	Acer negundo	L	D	Aphids and box elder bugs
Lombardy Poplar	Populus nigra var. italica	L	D	Worms
Pecan	Carya illinoensis	L	D	Aphids
Arizona Ash Modesto Ash	Fraxinus velutina var. glabra	M	D	Very clean tree
Weeping Willow	Salix babylonica	M	D	Borers; short lived
Purple Leaf Plum	Prunus pissardi and others	S	D	Striking foliage color
Desert Willow Flowering Willow	Chilopsis linerais	M-S	D	White, pink, rose flowers; Aphids; drought resistant
Mimosa Silk Tree	Albizzia julibrissin	S	D	Showy pink flowers; not winter hardy when young
Russian Olive	Elaeagnus angustifolia	S	D	Yellow flowers; chocolate bark

Mexican Elder	Sambucus mexicana	M-S	D	Aphids; mites
Salt Cedar or Tamarisk	Tamarix gallica T. articulata (aphylla)	S M	D E	Evergreen tamarisk not winter hardy; scale
Arizona Cypress	Cupressus arizonica	M-L	E	Mites; several forms of this species
Italian Cypress	Cupressus sempervirens	M	E	Mites
Deodar Cedar	Cedrus deodara	L	E	Slow growing when young
Aleppo Pine	Pinus halepensis	M	E	Best pine for southern New Mexico

Large = 40' or more Medium = 20'-40' Small = 20' or less

SHRUBS

A. Broadleaved Evergreens

Common Name	Scientific Name	Size	Flower Color	Special Considerations
Chinese Photinia	Photinia serrulata	L	White	Aphids; chlorosis
Parnay Cotoneaster	Cotoneaster parneyi	M	White	Red berries in favorable seasons
Japanese Euonymus Japonica	Euonymus japonica (several varieties)	L	Greenish-white	Mildew; aphids; can be trained to most any shape
Small Leaf or Dwarf Euonymus	E. japonica var. microphylla	S	Greenish-white	Fine for low plantings
Oleander	Nerium oleander	M	White, pink, yellow, red, salmon, rose	Aphids; not winter hardy

Pyracantha Firethorn	Pyracantha coccinea P. graberi P. rosedale	L	White	Aphids; chlorosis; berries red to orange
Wax Leaf Privet	Ligustrum japonicum (lucidum)	M-S	White	Chlorosis; not winter hardy
Nandina Heavenly Bamboo	Nandina domestica	S	White	Red leaves and berries in winter
Japanese Pittosporum	Pittosporum tobira	M-S	White	Mealy bug
Oregon Holly Grape Mahonia	Mahonia aquifolium	M-S	Yellow	Does best in part shade; blue berries
Senisa Texas Ranger Texas Sage	Leucophyllum frutescens (Texanum)	M	Orchid to violet-purple	Needs frequent pruning to obtain compact, heavy-blooming plant
Florida Jasmine	Jasminum floridum	S-M	Yellow	
Rockspray Cotoneaster	Cotoneaster microphylla	S	White	Large red berries
Spanish Broom	Spartium junceum	M	Yellow	Aphids; worms
Dusty Miller	Centaurea cineraria	VS	Yellow	Not hardy
Santolina Lavender-Cotton	Santolina chamaecyparssivs	VS	Yellow	Excellent for low borders

B. Narrowleaved Evergreens

Berckman's or Golden Arborvitae	Thuja orientalis aurea nana	M-S	--	Mites; aphids
Bonita Arborvitae	Thuja orientalis bonita	S	--	Mites; aphids
Pfitzer Juniper	Juniperus chinensis pfitzeriana	M	--	Mites; aphids
Savin Juniper	Juniperus sabina	S	--	Mites; aphids

C. Deciduous Shrubs

Crape Myrtle	Lagerstroemia indica	M-L	Lavender, red, pink, purple	Not winter hardy, especially when young
Smoke Tree	Cotinus coggygria	L		
Spice Bush Vitex Chaste Tree	Vitex agnus castus and others	L	Blue	Aphids
Pomegranate	Punica granatum (nana)	L or Dwarf	Red to orange	Not winter hardy; dwarf and large forms
Bridal Wreath	Spiraea van houttei and others	M	White	
Dwarf Flowering Almond	Amygdalus alba (rosea) nana	S	White or pink	
Coralberry Snowberry	Symphoricarpos (alba) Chenaulti	M-S	White	Berries red or white

Red Leaved Barberry	Berberis thunbergi atropurpurea	S	Pale yellow	Brilliant red foliage
Rose of Sharon Althaea	Hybiscus syriacus alba (rosea)	L	Rose, Pink, White	Aphids; nematodes
Butterfly Bush	Buddleia alternifolia	M-L	Deep purple, pink	Not winter hardy
Lantana	Lantana camara	S	Yellow, white, pink, orange	Not winter hardy

Large = Over 10' Medium = 5'-10' Small = Under 5'

PLANTING AND MAINTAINING TREES AND SHRUBS

W. J. Wiltbank 1/

Directors and supervisors of golf courses, park systems, cemeteries, and other large, public or semi-public turf areas must contend with many problems in addition to problems with turf. In this discussion today I would like to point out some of the more common problems and solutions to them.

First, we might discuss the planting of new trees and shrubs. One of the biggest questions regarding new plantings is the time when this can be done. In central and southern New Mexico planting has been very successful during fall, winter, or spring since winter temperatures in these parts of the state are not severe and little winter damage occurs. From Albuquerque north, however, below zero temperatures occur quite often and early spring and spring plantings appear best. Planting in the fall or winter in milder areas has several advantages. Among them are more even distribution of labor requirements throughout the year and the longer period of time in which the newly set plants can establish themselves before our spring winds and variable spring temperatures occur. Fall planting allows some new root growth almost immediately after the transplants are placed in the ground and this reduces leaf burn, needle dieback and other problems which are very common on newly set plants.

Another question which commonly arises when planting new trees and shrubs is that of the best size to purchase. In general, younger, smaller plants will transplant easier than older or larger plants. These younger and smaller plants are also less expensive. If however, an immediate or quicker effect is necessary, then the larger plants must be used but should be used with the understanding that greater losses might be forthcoming. In many cases the purchase of smaller plants and the use of nursery areas to grow them for a year or two before putting them in their permanent positions has been very worthwhile and has reduced plant cost considerably.

The actual planting operation also is very important to the success of any plantings. Break up any hardpan or caliche layers in the soil before planting. Most New Mexico soils are estremely low in organic matter and the addition of manure or other organic materials is very worthwhile. The addition of commercial fertilizer before planting can be injurious, so plan on using commercial fertilizer after the plant has become established rather than in the seedbed preparation. When planting balled-and-burlapped evergreens or the so-called "canned" plants, don't break up the soil ball around the roots -- keep it as intact as possible. When planting bare root deciduous trees and shrubs make sure that you don't crowd the roots or allow the roots to dry out before planting. When planting any tree or shrub be sure that the soil is well firmed around the roots or around the soil ball. Water well after planting to settle the soil and fill in any air spaces. On newly planted trees and shrubs there is a tendency to overwater rather than underwater. Keep the soil moisture level at moderate levels rather than extremely wet.

1/ Extension Horticulturist, New Mexico College of A & MA

Most evergreen plants do not require pruning at planting time but deciduous stock should be pruned. Eliminate a number of the branches from the plants after planting to bring about a better balance between tops and roots. Protection of newly planted trees and shrubs is also very worthwhile. Use burlap bags, old canvas, cardboard boxes, lumber, large tin cans, or other materials which you have handy to give the plants a little extra break against wind and sun during the first few months after planting.

The three big maintenance problems on established trees and shrubs are watering, fertilization, and pruning. Certainly more attention could be given to these maintenance practices than has been given to them in the past. Again, I have found a tendency to overwater many trees and shrubs in most areas of the state. The important thing when watering is to water deeply and accurately at irregular intervals rather than to water lightly and frequently. Quite often soil conditions are such that water penetration to lower levels is difficult and if such is the case, then mechanical methods for breaking up the soil should be used. Post hole diggers and crow bars have been used with great success to penetrate impervious soils.

Fertilization rates should be varied with particular plant types. On most of our evergreens rapid, excessive growth is not desired. Just a small amount of growth each year with good color is what we're after. On shade trees and deciduous shrubs, however, greater amounts of terminal growth are usually desired so fertilization rates should be higher. Fertilization rates vary with the amount of pruning also, and practice can bring about a better balance between pruning and fertilization which results in good terminal growth and adequate color for the many plants which you grow on your turf grass areas.

Surface application of fertilizer can be practiced but experience has shown that it is better to apply the fertilizer in such a way that they are placed in the deeper soil levels where the tree and shrub roots are doing most of their feeding. Again the use of post hole diggers or crowbars to make holes in the soil for fertilizer application and to improve water penetration is good practice.

Pruning is something which requires considerable experience to perform adequately, however, attention to detail when performing the pruning operation can make a good pruner out of an experienced worker within a short time.

To understand the proper pruning methods, you'll have to study, practice, and observe -- study the plant, its growth habits and flowering characteristics, practice removing stems and branches, and observe the effect of your pruning job on the shape, vigor, flowering, etc., of the plant. You'll get a good deal of satisfaction from seeing your plants young looking, vigorous, and beautiful over the years.

Start by thinking about your plants in groups rather than as individuals. Group, in your mind, all your plants with similar growing habits and flowering habits. Also group the plants which

have similar uses. A particular plant belongs to a certain group and each plant of this group needs special pruning. That's easier than remembering the special pruning methods for a large number of individual plants.

In grouping plants, remember that all plants can be classified as either evergreen or deciduous. Evergreen plants retain their leaves or needles throughout the year. Deciduous plants drop their leaves in the fall and replace them in the spring. Spruce, arborvitae, juniper, euonymus, barberry, and pyracantha are evergreens, while shade trees, dogwood, flowering peach, spirea, crape myrtle, and honeysuckle are deciduous.

Evergreen plants can be divided again into two groups - narrow-leaved and broad-leaved. Narrow-leaved evergreens include privets, euonymus, cotoneasters, nandinas, photinias, and pyracanthas. Narrow-leaved evergreens can be conveniently grouped as whorled or non-whorled. Whorled, narrow-leaved evergreens have only a few branches, which grow around the main stem in a very regular pattern, just as on the pine and spruce. Non-whorled, narrow-leaved evergreens have many side branches, which grow very irregulary from the main branches, as with the juniper and arborvitae.

Divide your deciduous plants into groups. First, according to their use, would be shade trees or flowering shrubs, trees, or vines. Most shade trees have similar growth habits, so no further grouping of them is necessary. Flowering shrubs, trees, or vines, however, need to be placed in several classifications. With flowering plants, one important difference in flowering is very apparent. Some of them bloom early, with the flowers arising from wood grown last year, while others bloom later on new growth of the plants. Plants flowering on new wood include althea, buddleia, vitex, hibiscus, honeysuckle, and clematis. Those flowering on last year's wood include flowering peach, flowering crab, redbud, forsythia, trumpet vine, lilac, and wisteria.

In the group flowering on last year's wood, you will notice another important difference. Some, like redbud, dogwood, flowering peach, and forsythia flower before the leaves unfold in the spring. Others, such as lilac, wisteria, flowering quince, and bush honeysuckle flower at the same time or after the leaves unfold.

Now, instead of learning how to prune each separate plant, learn how to prune the various groups. Every plant in your yard should fall into one of the previous groupings.

Types of Pruning

Here are a few pointers about the types of pruning cuts:

Thinning out is a process by which entire branches are removed back to the ground or to their points of origin from main branches. Renewal is a special type of thinning-out pruning which is designed to regrow the top growth of the plant completely over a period of one to several years. If renewal is desired in three years, the oldest

one-third of all main branches are removed each year. Renewal in four years requires removal of one-fourth of the main branches every year.

Heading back is the cutting back of the terminal growth of the plant. Shearing of formal hedges and cutting terminal growth on whorled evergreens are heading-back processes. Annual rejuvenation is a very severe heading-back by which all canes or stems are cut back almost to the ground.

Pruning the Different Groups of Plants

Whorled, narrow-leaved evergreens need very little pruning. If the growth of your pines, spruces, or firs is rapid, and open spaces are developing between the upper branches, cut off about half of the terminal shoot or leader. Do this in the spring, when the new needles are about half developed. Cutting before growth starts or late in the growing season will stop the terminal shoot from making additional upward growth. If two or more leaders have developed, remove all but one in early spring, before growth starts. Lateral branches which are growing out of proportion or are not branching sufficiently should be pruned the same as the terminal shoot.

Non-whorled, narrow-leaved evergreens need more pruning than the whorled type. Most plants in this group make a flush of growth in the spring and in the fall. Prune just before, or during, the spring or fall growth period. Begin shaping the plant when young. Keep junipers in bounds by removing entire branches back to an inner bud or branch. Shear arborvitaes lightly to keep them balanced and to encourage growth in the center of the plant.

Broad-leaved evergreens are grown to formal and informal shapes. Train your formal hedges of privet, euonymus, or other broad-leaved evergreens by shearing the plant to shape before growth in the spring. Then shear once or twice during the summer to maintain shape. Keep hedge slightly wider at the bottom than at the top to help keep hedge thick at the bottom. Specimen plants and informal hedges (privet, barberry, euonymus, pyracantha, cotoneaster, etc.) should be pruned during the winter or early spring. Renewal pruning will give you the best results. Remove entire branches back to the base as necessary to keep the plant in bounds and stimulate new growth. If you remove two or three of the oldest branches each year, you will keep the above ground portion of the plant young and full.

Deciduous shade trees (those that drop their leaves) need little pruning after the head has been formed. Pruning to form a satisfactory head is very important. During the first four or five years after the tree is planted, select five or six lateral branches spaced evenly around and up and down the main trunk. Remove the others. The lowest branch should be high enough above the ground to allow passage under the tree. A branch that is four feet above the ground when the tree is three years old will still be four feet above the ground when the tree is twenty years old. After the head of the tree is formed, remove dead or weak branches as they appear.

Deciduous flowering shrubs, trees, and vines which flower on new growth (Althea, butterfly bush, vitex, clematis, smoketree, crape myrtle, coralberry, snowberry, honeysuckle, viburnum, roses (summer flowering), spirea) should be pruned in the spring, before the plants leaf out. Here again, renewal pruning is your best practice. Instead of cutting a small amount from the end of each branch, remove entire branches back to the point where they originate. A flowering shrub, tree, or vine is only as young as its flowering wood. Renewal pruning keeps all the flowering wood young.

Adjust the amount of pruning to the responses of the plant. If your pruning was too heavy, large amounts of leaf and twig growth will result with very few flowers. If your pruning was too light, very little renewal growth of twigs and leaves will be seen. Spice bush (Vitex), summer flowering spireas, and buddleia require heavy annual pruning for best growth, while mockorange and coralberry require only light pruning. Annual rejuvenation is often practiced on plants like buddleia and summer flowering spireas. This is a very severe heading-back pruning which removes all canes to within a few inches of the ground.

Deciduous flowering shrubs, trees, and vines which bloom on last year's wood form their flower buds in the fall. If you remove wood during the winter or spring from plants in this group, you remove flower buds and reduce the number of flowers on the plant. So the best time to prune is in late spring after the plant has flowered. Light renewal pruning during the dormant season can be practiced on these plants, however, without noticeably reducing the number of flowers. Light pruning is especially good for plants which flower after the leaves have appeared (flowering crab, wisteria, cydonia, deutzia, hawthorne, weigela, jasmine, mockorange, bush honeysuckle, roses (early flowering), spirea, viburnum). The removal of a large amount of leaves in pruning weakens the plant. Proper pruning is also much more difficult when leaves hide the main framework of the tree, shrub, or vine. Flowering trees, shrubs, and vines which flower before the leaves unfold (redbud, dogwood, almond, plum, cherry, peach, forsythia) can best be pruned immediately after flowering. Thin out enough branches within the plant to encourage renewal growth and keep the plant vigorous.

Following the principles given above, studying the growth habits of your plants, and observing the effects of your pruning practices, will give you landscape plants in which you and your organization can take great pride.

Attendance Record 1957

Althus, Harry - Alamogordo Country Club, P. O. Box 925, Alamogordo, New Mexico

Archer, Frank - P. O. Box 1191, Porterville, California

Bedker, Ervin - Kirtland Air Force Base, 2726 San Diego, S.E., Albuquerque, New Mexico

Bramble, Jack - Buildings & Grounds Department, New Mexico College of A & MA, P. O. Box 545, State College, New Mexico

Brown, Charlie - Superintendent, Parks Department, City of Clovis, Clovis, New Mexico

Chavez, Rumaldo - University Golf Course, University of New Mexico, Albuquerque, New Mexico

Chew, Ed - Allen Arms, Inc., 315 Mills Street, El Paso, Texas

Day, Fred A. - Director, Buildings & Grounds, New Mexico College of A & MA, P. O. Box 545, State College, New Mexico

Daniel, Ed - Superintendent, Park and Recreation Department, City of Carlsbad, P. O. Box 769, Carlsbad, New Mexico

Ferguson, Marvin - Mid-Continent Director, U. S. Golf Association, Green Section, Texas A & M College, College Station, Texas

Foster, W. S. - County Extension Agent, 524 U. S. Court House, El Paso, Texas

Garley, Adan - Base Engineers Office, Sandia Base, Albuquerque, New Mexico

Gaunt, David - Heights Nursery, 221 San Pedro, N.E., Albuquerque, New Mexico

Getchell, John - Base Engineers Office, Sandia Base, Albuquerque, New Mexico

Goddard, G. - The Myers Company, 140 North Cotton Avenue, El Paso, Texas

Goodman, J. G. - Restlawn Memorial Park, 8800 Dyer Street, El Paso, Texas

Grandjean, Louis - Superintendent, Building & Grounds, New Mexico Inst. Mining & Tech., Campus Station, Socorro, New Mexico

Hager, Frank - New Mexico Military Inst., Golf Course, Roswell, New Mexico

Halla, Frank - President, The Myers Company, 140 North Cotton Avenue, El Paso, Texas

Hood, Reuben H. - Superintendent, Parks Department, City of Farmington, 1129 Mesa Verde, Farmington, New Mexico

Kinkade, Geral - Clovis Country Club, P. O. Box 212, Clovis, New Mexico

Kottke, Bill - Manager, Ascarate Golf Course, P. O. Box 5083, Ascarate Station, El Paso, Texas

Landahl, William L. - Assistant Superintendent, Parks and Recreation, c/o Washington Park, El Paso, Texas

Lessau, Heinz - Buildings and Grounds Department, New Mexico Inst. Mining & Tech., Campus Station, Socorro, New Mexico

Martin, Iverson - Municipal Golf Course, City of Carlsbad, Carlsbad, New Mexico

Martinez, P. L. - Base Engineers Office, Sandia Base, Albuquerque, New Mexico

McKean, Gordon - Van Horne Park, 302 Berry Circle, Fort Bliss, Texas

Moncrief, James - Southwestern Agronomist, U. S. Golf Association, Green Section, Texas A & M College, College Station, Texas

Noer, O. J. - Agronomist, Milwaukee Sewerage Commission, P. O. Box 2079, Milwaukee, Wisconsin

Patterson, A. S. - Base Engineers Office, Sandia Base, Albuquerque, New Mexico

Ray, Elie D. - P. O. 895, Holloman Air Force Base, New Mexico

Sanders, Bill - Country Club Grass Farm, 425 Poplar Drive, El Paso, Texas

Sarabia, Joe - Las Cruces Country Club, P. O. Box 883, Las Cruces, New Mexico

Scoggins, Dan - Flinn Nursery, 900 Adams Street, Alamogordo, New Mexico

Serna, Julian - Albuquerque Country Club, P. O. Box 1076, Albuquerque, New Mexico

Smith, Russell P. - Base Engineers Office, Sandia Base, Albuquerque, New Mexico

Watson, J. R. - Agronomist, Toro Manufacturing Corp., 300 West 82nd Street, Minneapolis, Minnesota

Watson, Clarence E. - P. O. Box 306, State College, New Mexico

Wethington, James R. - Fruitland, New Mexico

Williams, Bill - Allen Arms, Inc., 315 Mills Street, El Paso, Texas

Wiltbank, W. J. - Extension Horticulturist, Extension Service, State College, New Mexico

Woodburn, Horace - Flinn Nursery, 900 Adams Street, Alamogordo, New Mexico

Officers of New Mexico Turfgrass Association

Directors:	Louis A. Grandjean, Superintendent Buildings and Grounds New Mexico Institute of Mining and Technology Campus Station Socorro, New Mexico
	Frank Halla, President Myers Company 140 North Cotton Avenue El Paso, Texas
	Ed Chew Allen Arms, Inc. 315 Mills Street El Paso, Texas
President:	Fred A. Day, Director Physical Plant New Mexico College of A & MA P. O. Box 545 State College, New Mexico
Vice President:	Ed Daniel, Superintendent Department of Parks and Recreation P. O. Box 769 Carlsbad, New Mexico
Secretary-Treasurer:	Clarence E. Watson Agronomy Department P. O. Box 306 State College, New Mexico

1957 Membership

Althus, Harry - Alamogordo Country Club, P. O. Box 925, Alamogordo, New Mexico

Anderson, John - Buildings and Grounds Supervisor, Board of Education, City of Albuquerque, P. O. Box 1719, Albuquerque, New Mexico

Archer, Frank - P. O. Box 1191, Porterville, California

Brown, Charlie - Superintendent of Parks Department, City Hall, Clovis, New Mexico

Chew, Ed - Allen Arms, Inc., 315 Mills Street, El Paso, Texas

Day, Fred A. - Director, Physical Plant, New Mexico College of A & MA, P. O. Box 545, State College, New Mexico

Daniel, Ed - Superintendent of Parks and Recreation, City of Carlsbad, P. O. Box 769, Carlsbad, New Mexico

Foster, W. S. - County Extension Agent, 524 U. S. Court House, El Paso, Texas

Goddard, G. - The Myers Company, 140 North Cotton Avenue, El Paso, Texas

Goodman, J. G. - Restlawn Memorial Park, 8800 Dyer Street, El Paso, Texas

Grandjean, Louis - Superintendent of Buildings and Grounds, Campus Station, New Mexico Inst. Mining & Tech., Socorro, New Mexico

Grilly, Ed - Los Alamos Golf Association, P. O. Box 485, Los Alamos, New Mexico

Hager, Frank - Greenskeeper, New Mexico Military Inst., Golf Course, Roswell, New Mexico

Halla, Frank - President, The Myers Company, 140 North Cotton Avenue, El Paso, Texas

Hood, Reuben - Superintendent, Parks Department, City of Farmington, 1129 Mesa Verde, Farmington, New Mexico

Kinkade, Geral - Clovis Country Club, P. O. Box 212, Clovis, New Mexico

Landahl, William L. - Assistant Superintendent, Parks Department, City of El Paso, City Hall, El Paso, Texas

Lessau, Heinz - Golf Course, New Mexico Inst. Mining & Tech., Campus Station, Socorro, New Mexico

1957 Membership

Oliver, Major Wm. L. - New Mexico Military Inst., Roswell, New Mexico

Ray, Elie D. - P. O. Box 895, Holloman Air Force Base, New Mexico

Rystad, Grant A. - Restlawn Memorial Park, 8800 Dyer Street, El Paso, Texas

Sanders, Bill - Country Club Grass Farm, 425 Poplar Drive, El Paso, Texas

Sarabia, Joe - Las Cruces Country Club, P. O. Box 883, Las Cruces, New Mexico

Serna, Julian - Albuquerque Country Club, P. O. Box 1076, Albuquerque, New Mexico

Sheridan, Paul - Buildings and Grounds Department, University of New Mexico, Albuquerque, New Mexico

Smith, R. P. - Sandia Base Engineers Office, Sandia Base, Albuquerque, New Mexico

Watson, Clarence E. - Agronomy Department, New Mexico College of A & MA, P. O. Box 306, State College, New Mexico

Williams, Bill - Allen Arms, Inc., 315 Mills Street, El Paso, Texas