CARE OF LAWNS AND SHRUBBERY

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1. GENERAL

1.01 This section deals with the description and culture of lawns, trees, and shrubs employed in landscaping Telephone Company properties. In general, the trees and shrubs which are set out on central office grounds have been confined to species readily grown in the locality. In those instances where unusual plants are to be dealt with, additional information should be obtained from well informed sources before proceeding with their treatment.

1.02 Inasmuch as the planting of shrubs and trees on Company properties is generally entrusted to experienced landscapers or nurserymen, there will be little occasion for Company forces to handle this class of work; accordingly, the details of this phase of the work has not been included.

1.03 The landscaping around Telephone Company buildings should be of the simplest practicable design to be in keeping with the surrounding properties and should be of the type requiring the minimum amount of maintenance. Seeded areas around the buildings should be kept small if provided at all. In most cases shrubbery will not be provided but where it is considered necessary, it should be confined generally to the front of the buildings.

1.04 Some Companies may consider it desirable to modify this section by a supplement outlining practices that will conform to conditions in their territories more closely than do those outlined herein.

2. SOILS

(A) Description

2.01 The three principal types of soil generally encountered in grading work are sand, clay, and loam.

2.02 Sandy soils are usually made up of comparatively large particles of disintegrated rock of the harder type. They are well drained which results in their being rather lacking in plant food because such elements as are found naturally within the sand are soon washed away by water.

2.03 Clay soils are made up of very fine particles of disintegrated rock of the softer types, and hold great quantities of water. They are inclined to contain more plant food than sandy soils.

2.04 Loam is a mixture of sand and clay which contains a considerable amount of organic matter like decayed vegetation. It has enough clay to retain some moisture and possesses sufficient food content to sustain plant life. It has enough sand to give the soil the right texture and porosity and it contains bacteria from decayed vegetation suitable to promote plant growth. Soil bacteria are necessary because they have the ability to manufacture the substances which plants take from the soil for growth. Inorganic soil particles do not have this property.

3. SOIL CHEMISTRY AND FERTILIZERS

(A) Soil Chemistry

3.01 General: Although there are many elements which are considered actually essential for plant growth, the three most important are nitrogen, phosphorus, and potash. Other essentials are hydrogen, oxygen, carbon, calcium, magnesium, sulphur, iron, and manganese. In human food, proteins, fats, and vitamins are essential to good health. In a similar manner nitrogen is likened to protein, phosphorus to fats, and potash to the vitamins.

3.02 Nitrogen is associated with leaf and stem growth and its deficiency is manifested by the stunting of plants and the yellowing of foliage which, however, hangs tenaciously on to the plant. Nitrogen is obtainable in the form of chemical compounds such as nitrate of soda, ammonium sulphate, calcium nitrate, and such strictly organic substances as blood, tankage (dried organic matter), cotton seed oil and soot. Pulverized cattle and sheep manures are also advocated for the same purpose. The strictly chemical compounds are quickly available for plant food and should be applied lightly or in liquid form. The others are more slowly soluble and may be used in heavier doses.

3.03 Phosphorus produces greater root development, strength of stems, and is associated with early maturity which means early flowering. Phosphorus is found principally in tankage, bone meal and other slaughter house by-products. The usual rate of phosphorus application is five pounds per hundred square feet.

3.04 Potassium, like a vitamin, acts as a conditioner and occasionally is helpful in warding off diseases of the plant. It also plays its part in root development, its growth and coloration of flowers. Potash comes in three general forms, potassium sulphate, potassium chloride, and wood ashes. The first two are extremely valuable and should be used when the plant is in a vigorous state of growth. The ordinary amounts recommended are two pounds per hundred square feet. Wood ashes if unleached are safer to use, but fully four or five times the above amount are necessary to equal the action of the chemical ingredients. Potash is frequently lacking in light soils and applications of the material are necessary in addition to the balance of plant food which may have been used.

(B) Fertilizers - Natural

3.05 The principal natural fertilizers are manures from various sources, peat moss, humus, and leaf mold. Fertilizers containing animal blood have been introduced more recently. The use of manures is not as prevalent as formerly due to their scarcity. Such materials have little actual plant food value because they carry such minute quantities of available nutrients. A ton of manure is apt to provide a lesser quantity of plant food than a hundred pounds of scientifically prepared fertilizer. Furthermore, manures are likely to introduce enormous quantities of objectionable weed seeds. The real benefit from manures and similar substances results from the humus they add to the soil, improving the physical rather than the chemical conditions.

3.06 Peat moss comes in alkaline as well as in acid forms, although the acid is most common. It may be well to ascertain the type being obtained, especially if it is being used for rhododendrons or other acid soil plants. It makes an unusually good summer mulch. A layer of 1/2 to 1-inch thick should be placed over all newly planted shrubs. A standard bale of peat moss when spread 1/2-inch thick will cover about 720 square feet.

(C) Top Dressing

3.07 In these instructions the term "top dressing" has reference to a compost containing loam and fertilizers for the purpose of spreading over lawns. In order to maintain a lawn in good condition, a top dressing should be applied in the early spring.

3.08 It should consist of two parts of light loam and one part comprised of peat moss, humus, or leaf mold. Sand should be added in

the case of a heavy clay soil. The top dressing should be mixed thoroughly and screened before it is applied to the lawn.

3.09 A cubic yard of this mixture should be sufficient to top dress from 3,000 to 5,000 square feet of lawn.

3.10 In addition to the use of the top dressing during the early spring it may sometimes be well to make another application in late August or early September.

3.11 It should be raked in lightly with a bamboo rake and given a thorough watering to settle the particles about the roots of the grass.

3.12 In case the above practice is followed, it is not necessary to spread manure over the lawn in the fall or early spring. The use of ordinary manure has a tendency to scatter weed seeds which may kill out the grass in spots. However, heat treated manure in which the seeds have been killed, may be safely mixed with the top dressing.

4. LAWNS

(A) General

4.01 Success in cultivating lawns depends largely on the preparation of the soil, drainage, selection and sowing of the seed, and care and attention during the early stages of development. If there is reason to believe that the condition of the soil is faulty, a soil analysis should be made to determine the special treatment required.

(B) Seeding

4.02 New Lawns: Probably no lawn should give less trouble than one planted in late summer and maintained by regular feeding. After a summer of baking sun, shriveling drought and destructive insects, nature affords an ideal season to repair the damage and build a lawn that will not retreat the following year. Grass started in the fall develops a more spreading and deeply anchored root system.

4.03 Fall weather is nearly ideal for quick germination and the subsequent development of grass. The seeds lodge in the warm soil, there is a helpful temperature variation in the warm days and cool nights and further, there is usually adequate rainfall. Autumn rains are gentle and the soil is able to absorb them so that there is less washing and drowning of seedlings. These favorable conditions offer every encouragement to a deep and sturdy root development. The advantages to be obtained should not be neglected in the weeks from mid-August to late October.

4.04 Old Lawns: Fall is the best time to renovate old lawns. If an established lawn is so poor that reconstruction seems necessary, the first step is to find out the cause of failure and guard against a repetition of the experience.

4.05 Even a good lawn will be better the next year if it is seeded and fed in the fall. A good turf will not need drastic treatment but it is advisable to rake vigorously to scratch the surface soil and to mow closely. This permits the seed to reach the soil.

4.06 If the lawn turf is uneven it is well to level it with a top dressing of compost or good top soil. Depressions in the lawn should be corrected in this way and not by heavy rolling.

4.07 Seeding in two directions assures even covering. A light raking and rolling afterwards will form the soil around all sides of the seeds.

4.08 If an old lawn has been treated in the fall, it should be cut regularly and rather closely through September to give the new grass a chance to receive sunlight. There is not much danger of injuring young grass blades unless the soil is very wet at the time of mowing. After the end of September raise the height of cut to a minimum of two inches so there will be fairly long growth in event of a sudden cold snap.

4.09 Occasionally good lawns are sure to suffer some injury over the winter months caused by warmth during unseasonable days when the ground thaws. Then at night the soil which is usually well saturated in moisture is apt to freeze again. During the next thaw the ice melts and the soil settles back leaving the roots partly out of the ground. After this process has been repeated a few times many grass roots will be heaved to such an extent that they are broken off and exposed to the drying sun and wind. Plants need moisture even in winter and they are soon destroyed if they can not take it from the soil. Because of this lifting or heaving, an open winter may be more damaging to grass than the so-called old fashioned winters. Good grass is better off if it remains frozen all winter especially if it lies buried under a protecting blanket of snow.

(C) Grass Seeds

4.10 General: To provide a first class seed bed in the most approved manner would be wasted effort if the proper seed of the right varieties were not secured. For the average lawn, Kentucky Bluegrass should predominate. This seed, together with other either desirable or at least acceptable varieties that may be included, are discussed below. The use of Lespedeza is suggested for areas adjacent to auxiliary and other unattended buildings that will receive care at infrequent intervals.

4.11 Above all, seed should be pure. The total weed content should not exceed 1/4 of one per cent and still cleaner seed is obtainable. A high-grade lawn mixture composed of well chosen grasses that are free from weeds and chaff should weigh about 13 to 14 ounces to the quart; this constitutes a rather good test of quality provided Bluegrass is known to predominate. Such seed should be sown 4 pounds per 1000 square feet, or roughly, one pound to a space 15 by 16 feet. One-fourth to one-half of this amount is sufficient for seeding old lawns. Seeding should be done on a calm day, from two directions so as to insure uniform coverage. Following seed, the ground should be sprinkled with a fine spray and lightly rolled.

4.12 Varieties: Brief descriptions of the common varieties of grass are given in the following paragraphs.

(a) Kentucky Bluegrass (Poa prantensis, meaning meadow grass): The standard of grasses. Slow in germinating but makes strong permanent turf. Does not attain proper development until third year. Succeeds in any but an acid soil. Apt to become brown in mid-summer. Strong growing and will crowd out other grasses in a few years.

4.13 Kentucky Bluegrass requires 21 days to germinate and constant moisture is required for this period to get satisfactory germination. The lawn should be watered so that it is moist from three to four inches deep the first time. When the new lawn shows a shade of green, sprinkle more water on it at one time but not as often.

(b) Canada Bluegrass (Poa Compressa): Distinguished from Kentucky Bluegrass by its compressed stems, blue green color of blade, and its prominent root stocks. Its use is confined to very poor clay soils and gravel knolls, or as a soil binder on silt or slopes. Mixed with Chewings fescue it makes a fair turf.

(c) Fescues: Have fine round and bristle-like blades; useful in forming dense sod mat; will stand drought; are included in mixtures to give quick effect; somewhat superior to Rhode Island bent in partly shaded areas; very low growing and bunchy; thrive on poor sandy soils.

(1) Sheeps Fescue (Festuca Ovina): Leaves are blue green and very bristly, producing stools or tussocks from four to eight inches in diameter.

(2) Various Leaved Fescue (Festuca Leterophylla): Gives a very fair but bunchy turf if used under shade on soil rich in humus. The color is very dark green.

(3) Chewings Fescue: A creeping variety; does not form tufts or bunches, but a mat-like turf brownish green in color; is long wearing even under hard usage.

(d) Ryes (Lolium Perenne, meaning Perennial): Is biennial; germinates almost immediately and grows rapidly, giving good appearance first year; will remain in lawn about two years; stands hard wear; does not have fine foliage and if used too freely will result in coarse looking lawn; narrow flat blades of glossy dark green color; favored for athletic fields.

(e) Meadow Grass (Poa Trivialis): Good for moist and shady places and a heavy soil.

(f) Red Top (Agrostis Palustris, meaning Swamp Field): Succeeds on slightly acid soil; forms dense mat; used to secure a stand in places where soil is too acid for Bluegrass.

(g) White Dutch Clover (Trifolium Repens): Useful for mixtures; forms dense ground cover; does well in shade; will grow more abundantly on infertile soils where other grasses fail; will not stand rough use; grows below level of lawn mower cutting height as generally set; does not interfere with growth of permanent grasses; affords green ground cover in dry weather.

(h) Crested Dogs Tail (Cynosurus Cristatus): Tough grass which makes early low dense growth and stands hard wear; good for shady areas.

(i) Rhode Island Bent (Agrostis Capillaris, meaning hair-like): Closely related to Red Top from which it differs in being lower and more delicate. It does not produce root stocks as does Bluegrass but the stems are creeping at the base.

(j) Creeping Bent (Agrostis Maritima): Is the type to which the best of the fine-lawn bent grasses belong. Both it and Rhode Island bent withstand close cutting well.

(k) Bent Stolons: A stolon is a creeping stem which has a number of joints, or nodes, from which new shoots and roots are developed, each shoot being able to produce an independent plant. The closeness of the nodes determines the texture of the resultant turf and usually indicates the rapidity with which the plant will spread.

4.14 The price of stolons for a lawn is about four times that of seed for the same area.

4.15 The preparation of the lawn for stolons is the same as that for seeding. Just previous to planting, the lawn area should be raked, but need not be left in as smooth condition as for seeding. In fact, the ridges formed by the rake teeth make an excellent planting surface. Stock from a nursery comes in bags already chopped into pieces one to one-and-half inches long; it may be planted at once or stored in a cool dry place.

4.16 The stolons should be dropped evenly over the measured lawn area and immediately covered with a 1/4 inch of sifted loam, also dropped, as spreading the loam with a shovel will push the stolons into rows and result in an uneven planting and covering. The loam top dressing is for the purpose of holding the stolons in place and to help keep them from drying out.

4.17 Following the covering, the stolons should be rolled and sprinkled in such a manner that there is no washing of the top-dressing. Should washing occur, the washed area should be top-dressed. It is not necessary to water the stolons every day after planting but a light sprinkling twice a week for the first four weeks should be done.

4.18 Two days after planting, young shoots will appear, and at the end of a week the areas will have the appearance of a very thin lawn.

4.19 Many weeds will have started by this time but these need not cause concern as they will quickly disappear under clipping and the aggressiveness of stolons. Usually at the end of one week there will be many shoots two or three inches tall. If so the lawn should be mowed and again top-dressed in order that the nodes from the clippings may take roots. The lawn should be clipped and top-dressed each time there are a number of tall shoots, as this treatment strongly promotes the vegetative propagation.

4.20 A spring-planted bent grass lawn should be fully developed by June 1, and a fall-planted lawn by May 10 or 15 of the following year.

(L) Range Grasses: The grasses of the Great Plains section are numerous, but three species, Buffalo grass, Grama grass and Curly mesquite stand out as being especially important. These are all popularly known on the plains as short grasses in which the foliage is short and curly, forming a close covering to the soil.

(1) Buffalo Grass (Bulbilis Dactyloides): Light or grayish green creeping grass that forms a strong firm sod. The flowers are of two sorts, the male being produced on short erect stems 3 to 6 inches tall, with 2 or 3 short pale spikes not over 1/2-inch long, near the top. The female or seed bearing flowers are in little green clusters or heads hidden among the leaves.

(2) Grama Grass (Boutelona Gracilis): Is not creeping, either by stolons or root stocks, but where the grass is abundant, the bunches are so close together that they form a continuous covering. Grama resembles Buffalo grass in its foliage, but may be readily distinguished by the flower stalks.

(m) Lespedeza (L. Striata): Bush Clover or Japan Clover.

4.21 Mixtures: The following are recommended grass mixtures (expressed in percentages) for the various soils and surfaces indicated:

	Sand	Clay	General	Sunny	Shady	Terrace	Bottom Land	Hill Tops
Kentucky Blue	20	15	50	75	40	10	30	40
Rhode Island Bent	35		15					25
Creeping Bent	35	35				40		20
Sheeps Fescue	10							10
Crested Dogs Tail		30			15	25		
Canada Blue		20				25		
Rye			15				20	
Red Top			20	25				
Meadow Grass					40		30	
Various Leaved Fescue					5		20	
White Clover								5
	100	100	100	100	100	100	100	100

4.22 Seed for Use in South: The establishment and maintenance of lawns in the South present very special problems. Bluegrass which is the chief ingredient of most lawn grass mixtures in the North will not thrive under conditions of extreme heat or drought. Bermuda grass meets the requirements of these conditions more completely than any other.

(D) Watering

4.23 The brilliant green lawns of the British Isles owe their beauty mainly to ideal moisture conditions. Gentle rains fall so frequently and atmospheric conditions are so favorable there is no critical drying.

4.24 In the United States most sections east of the Rockies have an annual rainfall almost six per cent greater than that in England, yet the watering problem is more difficult. About the same amount of moisture falls each month throughout the year. June, July, and August even have a slight excess over the other months. Unfortunately, evaporation during the summer is highest, and many of the rains come in heavy dashing storms. They do the grass little good because much of the water runs off the surface before it can be absorbed. There may be such rains during the summer with severe drought in between. To offset this fluctuation and provide a more even moisture supply a careful watering program is needed.

4.25 On loam and clay soils a good turf can withstand severe and protracted drought. It may turn quite brown, but unless cut too short it will be revived by the slow drizzling rains of fall. This is not true of sandy soils. They dry so completely that even weeds may be killed in dry weather.

4.26 Some soils have a greater moisture retaining capacity than others. If there is an abundance of organic matter this acts as a sponge in retaining moisture and releases it to the grass if needed. Because of their finer particles, loam and clay soils hold more water than sandy and gravel soils. Evaporation is reduced by cutting the grass 1-1/2" and 2" high because the longer growth shades the ground. As pointed out under the paragraph "Mowing," high cutting promotes deeper rooting so grass can reach to a greater depth for moisture.

4.27 Steep slopes receive fewer benefits from rainfall and watering because there is more surface run off. Those facing the south are subject to greater loss of moisture by evaporation.

4.28 The amount and type of natural rainfall are the main factors affecting the timing of the watering program. A slow soaking rain of 1/2" will do more good than a driving downpour of several times that amount. When rains have been missing for a week or two, the soil should be examined for dryness. Sometimes this condition develops much earlier in the spring than is realized. A bright sun and crisp winds can evaporate considerable soil moisture within a few days, even in April. Therefore, it is important to start watering early enough in the season. A good lawn watering program can not be scheduled by the calendar. A good plan for determining the dryness of soil is to cut a small plug 2" or 3" deep with a knife or trowel. If the upper inch or so reveals any kind of dryness, it is time to water.

4.29 As the soil dries out it should be necessary to replace only as much water as was lost during the interval by evaporations from it and transpiration from grass leaves. From an average loam soil this loss on a warm summer day would be 50 gallons per thousand square feet. In six days that would be three hundred gallons or the equivalent of about 1/2" of rain. The length of time needed to replace that would depend upon the sprinkler and the water pressure. A good type at 20 pounds pressure would need to run two or three hours.

4.30 In the case of a sandy soil the moisture lost should be replaced long before it amounts to as much as 1/2" of rain. Even though such soils absorb water quickly they actually hold less moisture and lose it more readily. They need to be watered more frequently but in smaller quantities.

4.31 The delivery of a sprinkler over any given time may be checked by placing coffee cans or similar receptacles under the spray and measuring the depth of water collected. To be sure of complete coverage it is necessary to overlap the border to the area covered by the sprinkler.

4.32 The belief that grass plants absorb water through their blades and stems is erroneous. Actually grass can make use of moisture only by taking it from the soil through the root system. Merely wetting the grass and soil surface does no good. The water must be put into the ground where it becomes available to the roots.

4.33 If water is suitable for human consumption or even for laundry purposes it is not likely to hurt grass. It is doubtful if enough of such water would ever be put on a

turf to cause an appreciable concentration of chemicals. The lime in some water may tend to alkalinize soils but never harmfully so. The quantity of chlorine and other chemicals used for purifying city water will not be harmful to grass.

4.34 Careful tests have shown that cold well water, or warm tank water is not detrimental to grass.

(E) Mowing

4.35 The principal purpose of mowing a lawn is to improve its appearance. Unless properly done, however, this improvement will only be temporary. The continued removal of its foliage will eventually starve any plant. Close mowing has the same strangling effect on grass. Yet if mowing is neglected the grass becomes tall and spindly in an effort to reach the light. It forms a thin, weak covering instead of a thick sod.

4.36 Somewhere between these two extremes lies the happy medium where mowing causes the least possible injury and gives the desired appearance.

4.37 This medium is attained by cutting 1-1/2" to 2" high. At this length the turf will not suffer even from frequent cutting and the grass tips can be kept uniformly trimmed so that the lawn has a decent well groomed appearance. Taller grass minimizes the presence of weeds by shading the surface soil and so prohibiting the germination of many weed seeds. It also prevents weeds from overgrowing the desirable grass and smothering everything beneath them. Obviously, high grass forces weeds into an upright position where the mower blades can sever their seed heads and much of their foliage.

4.38 Aside from appearances, proper cutting has a lasting effect on the general health of the grass. There is a definite relation between grass growth above ground and that below ground, a longer top growth resulting in a more extensive root system. Such a root system is much to be desired because it is capable of reaching more moisture and absorbing more food. Taller growth also provides shade and so reduces evaporation of soil moisture. In periods of drought these factors may mean the difference between saving and losing the lawn. In cases of shaded lawns, higher cutting is especially important because of the reduced volume of sunlight and the competition of tree roots.

4.39 The first spring cutting should be delayed until the grass has had an opportunity to grow. A large portion of the root system is regenerated every spring. Consequently by allowing more growth before mowing the roots have more time to develop. This condition influences the grass for the rest of the entire season.

4.40 Cutting the grass every few days does no harm provided the height of cut is correct. Nevertheless, it is better to adopt a mowing schedule regulated by the amount of growth made, rather than by the calendar. Instead of mowing at fixed periods, mow whenever the length is one inch taller than when cut last. This will be more often during the growing season, and less often during hot dry weather.

4.41 At no time should grass be cut with a dull mower which chews off the blades instead of shearing them cleanly; the resulting bruise gives a brownish cast to the lawn. In the fall the last mowing should be done at such a time that further growth will take place before winter. A length of two or three inches is desirable and is all the winter protection the lawn needs.

4.42 An exception to the above is applied in the case of creeping bent which is composed of an unusual type of grass, the nature of which is to make an extensive lateral growth. Because of this it tolerates and even thrives under close clipping.

4.43 In cutting the crown of a terrace, mow up and down the slope. Trying to cut crosswise will invariably leave the ridge scalped by the bed knife. Then it is only a question of time until the grass turns brown and is burned out. Grass on terraces is often exposed to the direct rays of the sun. Soil washes easily from around the grass crowns, exposing the surface roots. Here high cutting is doubly important. Taller grass will reduce the soil washing and the evaporation of moisture.

4.44 The combined length of clippings removed from a single blade of grass during the year may add up to a total of 36 inches. Considering how closely together grass blades grow, the immensity of this crop is more apparent. To produce such a harvest there is a continual flow of food from the soil through the grass roots to the blades which are then removed in mowing. No soil can long continue to yield so bountifully without replacing some of the facilities through the use of complete grass foods.

4.45 Contributing some small part of this replacement are the grass clippings left on the lawn. They work down to the ground and at least partially decay, thus liberating a portion of their food. The greatest benefit of clippings, however, derives from the protection they afford. Acting as a mulch they reduce evaporation to the soil surface keeping it cooler and more moist.

4.46 But clippings are detrimental, too, in that if wet, they will mass cake, smothering the grass underneath them. If much over an inch long they do not readily work down through the grass. As they dry out their brownish color dulls the lawn.

4.47 Although proper mowing can not be considered a cure all for straggly turf, much can be accomplished by following these simple rules:

(a) Delay the first spring mowing until the grass has made some new growth.

(b) Cut the grass at a minimum height of 1-1/2" to 2", using a sharp mower.

(c) Remove the clippings during wet weather whenever they are heavy enough to mat.

(d) Stop mowing early enough in the fall to insure a growth of 2 or 3 inches before winter.

4.48 New grass should be cut when it reaches between 2-1/2 to 4 inches, using a mower set at 1-1/2 inches high. Cut up and down the lawn, or, if cut round and round, reverse the direction each round; in this way the grass matted down by the driving wheel will be picked up by the cutting blade on the reverse trip. Since young grass, particularly when wet, bruises and tears up easily, it should be dry when cut, using a grass catcher for the first few cuttings.

(F) Adjustment of Mower

4.49 Place the mower on a flat surface, such as a walk or concrete driveway, then loosen the side brackets at the end of the wooden roller. As the roller bracket is extended downward, the roller is lowered and the bed knife in front is tilted up. Measure 1-1/2 to 2 inches from the cutting edge of this bed knife to the floor and tighten the bracket bolts. Many mowers can not be set to cut high enough so it is necessary to obtain longer roller brackets from the manufacturer or have them made at a local machine shop. Another solution is to wrap a 1/2" rope around the roller or replace it with one having a larger diameter.

(G) Rolling

4.50 It is damaging to soil to roll a lawn while it is soaking wet and just as damaging to use a roller so heavy that it actually mashes into the ground. The soil should be moderately moist and a roller of water or sand ballast type used, so the weight can be adjusted to the soil conditions. Some lawns newly planted in late fall or during the winter have only a short growth of seedlings by rolling time in the spring. Even so, if the ground is badly heaved it should be rolled. No harm is done to the young tender grass unless the soil is so wet and sticky it makes the roller pull out the plants. Care should, of course, be exercised in making turns with the roller so as not to disturb the soil too much.

4.51 The heavier and wetter the soil, the lighter the roller should be. A sandy soil can withstand more weight than a clay soil. As a general rule a ballast roller should be less than one-half full so the weight is around 75 to 100 pounds per foot in width. If in doubt use a very light roller or none at all. There is a mistaken idea that the function of the rolling is to level out or iron out high and low spots in the lawn. A severe rolling will puddle and compact the soil so the grass roots are suffocated. To correct extreme high and low spots, lift the sod and adjust the undersoil to the proper grade and then replace the sod. Moderately low places may be gradually built up by top dressing them with 1/4" of good screened soil at frequent intervals until the proper level is reached.

(H) Lawn Insect and Fungas Diseases

4.52 Lawns are subject to insect and fungas diseases. These at times become serious and prompt action is required to control them.

4.53 Japanese Beetle grubs during late May and June feed on the grass roots just below the surface of the ground. With the first dry weather in June and July, the grass begins to die in large patches as if killed by the drought. Grass injured by grubs will peel off in layers as if cut below the surface by a knife, and may be so distinguished from grass killed by drought.

4.54 The beetle grub may be controlled readily by arsenate of lead dusted on the lawn at the rate of 10 lbs. per 1000 sq. ft. It will remain in the soil for three or four years and

will also retard the development of some weeds and stop the invasion of the lawn by moles.

4.55 Chinch bugs are very small, active and difficult to see even though the lawn is badly infested. They are about 1/6 inch long. They are red when young becoming black and white when mature. They suck the juices out of the grass and seem to have a toxic effect on grass, killing out large areas which appear to have been killed by drought. They can be killed by spraying or dusting with rotenone or nicotine; or by spreading 1/2 lb. per 1000 sq. ft. of 5 per cent chlordane dust mixed with any convenient quantity of soil, sandy compost, or sand to enable ease of distribution. When dusting or spraying, give two treatments, on the same day a few hours apart, as many of the bugs are missed by the first.

4.56 Snow Mold, Dollar Spot and Brown Patch are the most common lawn diseases with which to contend. All of these can be controlled by one of the mercurial compounds. P.M.A.S. - phenyl-mercuric-acetate-soluble is effective and is sprayed at the rate of 1-1/4 fluid ounces of 10 per cent P.M.A.S. to 2-1/2 gallons of water over an area of 500 sq. ft. As many as nine treatments in a season may be given when used to prevent disease.

(I) Lawn Weed Control

4.57 The best weed control is a good fertilizer program. A good lawn requires deep, mellow and well-drained soil.

4.58 The best way to eliminate weeds is to dig them out. Chemicals are necessary when weeds are too numerous or the lawn is large.

4.59 Manufacturers' instructions in the use of any of the selective chemical controls must be followed precisely to accomplish weed eradication.

4.60 Broad-leaved weeds such as dandelion, plantain, buckhorn, thistle and ground ivy, are easily destroyed by 2,4-D. A convenient formulation of 2,4-D is Tufor, prepared by the U. S. Rubber Company. Add one ounce of Tufor to four gallons of water and spray onto each 800 sq. ft. Other good preparations containing 2,4-D are Weeder 64, Weedone 48, Weed-no-more, and Barweed.

4.61 Spring, when the weeds are young and tender, is the best period for chemical weed killing; early autumn is next best. Spraying should be done on a calm day as a light drifting spray is very liable to kill near-by shrubbery or trees. Spraying equipment used for 2,4-D should never be used for shrubbery or tree spraying until the tank, hoses, and spray nozzle have been thoroughly cleaned with a sal-soda solution.

4.62 Crabgrass which infests many lawns, makes active growth starting with the hot weather in June and continuing throughout the summer. Keeping a thick, healthy turf and mowing at regular intervals, with the machine set to leave the turf long, are the best means of keeping it out. Elimination of beetle grubs and avoiding turf diseases also helps. Early recognition and early weeding are important. If these fail, spraying with P.M.A.S. is an effective control. Several applications, of the same strength and rate as in Paragraph 4.56, must be used for it to be effective and the effect is not immediately observed. It is quite safe to use, is beneficial as a fungicide, and there is an obvious reduction in Crabgrass the year after it has been used.

4.63 Potassium cyanate will kill Crabgrass, but will not destroy its seeds, and must be used with caution or it will burn the grass. It is particularly efficient in getting rid of chicken weed.

4.64 Caution: All insecticides, herbicides and fungicides mentioned in this section are deadly poison as are practically all others. Care should, therefore, be used in their handling and storing.

5. TREES AND SHRUBS

(A) General Classification

5.01 Trees are generally grouped into two classifications:

(a) Deciduous - those from which the foliage falls after the growing season.

(b) Evergreens - those on which the foliage remains verdant throughout the year.

5.02 Due to the more general use of evergreens for central office grounds, the major portion of these instructions has been limited to this class of tree.

(B) Evergreens

5.03 Evergreens fall into two principal groups:

(a) Conifers - those bearing cones, include pines, spruces, yews, firs, hemlocks, and arborvitae.

(b) Broad Leaf - those not bearing cones, include rhododendrons, mountain laurel, hollies, barberries, heathers, and boxwood.

5.04 The following groupings of evergreens are classified according to shape and habit of growth. These groups are typified by Figs. 1 to 6 inclusive.

Group 1

5.05 Tall pyramidal forms; adaptable for specimen plantings on the lawn, massing in groups or for screen plantings. Includes White Fir, Scotch Pine, Douglas Fir, Canada Hemlock, Black Hills Spruce, Norway Spruce and Colorado Blue Spruce. The typical shape of the latter is illustrated by Fig. 1-A.

Fig. 1

Fig. 1-A

Group 1

Group 2

5.06 Medium height; suitable for foundation plantings to give height at corners and entrances and for screen or informal plantings. Includes Silver Colorado Juniper, Red Cedar, Upright Yew, American Arborvitae.

Fig. 2 - Group 2

Group 3

5.07 Upright columnar varieties, for accent purposes and formal effects in the foundation or garden plantings. Includes Column Chinese Juniper, Hicks Yew, Pyramidal Arborvitae.

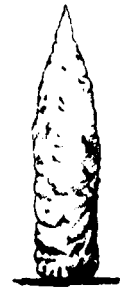

Fig. 3 - Group 3

Group 4

5.08 Dwarf, round or globular forms; useful for foundation planting or for in front of taller growing varieties. Includes Mugho Pine, Dwarf Japanese Yew, Globe Arborvitae.

Fig. 4 - Group 4

Group 5

5.09 Half erect variety; desirable for foundation or rock garden. Includes Pfitzer Juniper, Japanese Juniper.

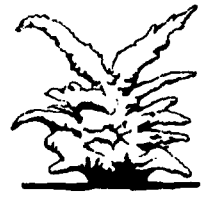

Fig. 5 - Group 5

Group 6

5.10 Creeping varieties; suitable for slopes, rockeries and where a low carpet of evergreen foliage is desired. Includes the following junipers: Chinese, Prostrate, Andora, Sargent, Creeping.

Fig. 6 - Group 6

5.11 The common and botanical names of some of the more popular evergreens are listed below together with a brief description of their characteristics and habits:

(a) Arborvitae (Thuja): Is of regular symmetrical habit but varies greatly in form and in color of foliage which is very flat, soft and flexible; endures shearing well and thus may be kept any shape or height desired; thrives well on a wide range of soils, although somewhat moist location is preferred.

(b) Fir (Abies): Has sharp spreading foliage of varying shades of dark green (silvery white underneath) and blue; needles grow around the branch; grows rapidly, forming a symmetrical pyramidal tree of immense size; is hardy.

(c) Hemlock (Tsuga): A tall growing, broadly pyramidal tree with drooping branches and rich dark green foliage, lacy in effect; good for lawn specimen or for foundation planting as it withstands severe prunings; should not be planted in extremely dry soils but rather in semishady positions where it is not exposed to drying winds.

(d) Juniper (Juniperus): Vary greatly in habit from tall pyramidal trees to low prostrate or trailing shrubs and have small neddleshaped or scalelike foliage, insignificant flowers and small berry-like fruits, usually bluish black and often silvery; thrive in all except heavy wet soils; most prefer a sunny location, although they will succeed in moderate shade.

(e) Pine (Pinus): Usually tall trees which are grown for their handsome evergreen foliage and symmetrical or picturesque habit, some also for their conspicuous large cones. They are perfectly hardy in the coldest exposures and will thrive in any ordinary soil and in more or less unfavorable situations.

(f) Spruce (Picea): Grows to a large size of pyramidal shape, noted for extreme hardiness and will thrive in all except extremely wet and dry soils.

(g) Yew (Taxus): Leaves are flat needles arranged in two ranks to right and left of stem but in horizontal plane. It is readily recognizable by its lustrous foliage, so dark green as to appear velvety and almost black in the shadows; bears scarlet berries; one of the few evergreens that will thrive on the north side of a building. When young the typical yew has a broadly pyramidal head but in old age it becomes ragged and broken. The Irish Yew has tapering branches and columnar habit. The Golden Yew has yellow foliage. The Japanese Yew is of bushy habit and is hardy.

(C) Feeding

5.12 The ground around trees should be cultivated occasionally and the trees fertilized yearly. Feeding is better done before a rain; the ground should be well watered after the application.

5.13 The purpose of employing a commercial plant food is to supply necessary food in a readily available form for the nourishment of the plants. The methods of application of plant foods differ according to the type of plants to be nourished.

5.14 Trees whose feeding rootlets are well established in the ground do not respond favorably to a plant food broadcast on the surface of the soil. That method tends to attract the feeding rootlets to the surface where they are likely to dry out or suffer damage from frost. The most practicable method is to bore a number of holes in the ground about 18 inches deep and two feet apart in a circle under the branch extremities. Then a handful of plant food can be put in each hole and the soil or turf pressed back in position with the foot. Other holes should be made between the circle already made and the trunk of the tree, but not nearer than six feet to the trunk.

5.15 Young trees do not require as much feeding attention as the older and often more neglected ones. In planting deciduous trees, a little bone meal should be mixed in with the soil that goes around the roots, but for evergreens just planted some liquefied barnyard manure is good.

(D) Planting

5.16 Care should be taken in planting trees that the holes are large enough to take the root system in its entirety without twisting or doubling back the roots. Often when there is no obvious reason for a tree's ill health, it may be traceable to the root system. Causes may be due to the following conditions:

(1) One or more of the roots is girdled.

(2) Soil is so rocky that the roots are checked in their growth.

(3) Roots have been affected by borers.

(4) Roots were injured when the tree was planted.

(E) Transplanting

5.17 Any tree with a trunk larger than six inches in diameter should be transplanted with ball and burlap. Small sizes of the following trees should also be transplanted by this method:

Japanese Maple
Sugar Maple
Hickory
Beech
Walnut
Tulip Tree
Birch
Magnolia
Dogwood
Oaks (nearly all)
Evergreens

5.18 Most trees and shrubs transplant best in the fall season when resting, for the following reasons:

(1) Transpiration or evaporation from leaves is negligible.

(2) Soil is warm and easily worked.

(3) Plenty of moisture is available but soil is not as soggy as in the spring.

(4) Long season of planting; spring comes with a rush; autumn lingers into winter. Transplanting can be done after leaves have had a hard frost and growth has been checked or made dormant.

(5) Shrubs are established and ready to grow when spring arrives.

(F) Pruning

5.19 Pruning is the removal of surplus or undesirable growth at the proper time of the year. Chopping back trees and shrubs indiscriminately, regardless of their needs or habits of growth, is not the proper procedure for pruning.

5.20 The following are reasons for pruning:

(1) To remove diseased, dead, broken or crossed branches.

(2) To renew and rejuvenate old plants.

(3) To shape a plant for some special purpose, such as a hedge or sheared specimen.

5.21 Nearly all ornamental shrubs renew their top growth by new shoots which develop each year from the ground around the older stems. Unless some of these shoots are thinned out, the plant is likely to be choked, thus becoming scraggly. By gradually replacing the older stems with new, the plant may be rejuvenated in a cycle of from 4 to 10 years. The natural shape of the plant can be maintained during this time by having the older stems form the framework as the newer growth fills the gaps.

5.22 Shrubs which mature quickly, such as most of the species Roses, the shrubs Dogwoods, Deutzias, Forsythias and Nine Bark, may be renewed every 4 to 6 years; very slow growing kinds, like Azaleas, Flowering Quince, Summer Sweet and Witchhazels may take as long as ten years. In between these there are numerous popular shrubs Barberries, Cotoneasters, Honeysuckles, Lilacs, Mock Oranges, Privets and Viburnums.

5.23 There are several principles of pruning which have been developed:

(1) When heading back twigs cut just above a healthy bud pointing in the desired direction. (See Fig. 8.)

(2) Heavy top pruning causes more leaves and branches. (See Fig. 9.)

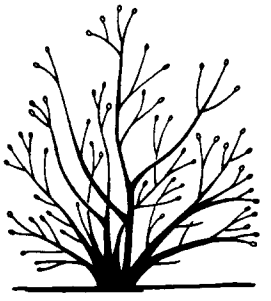

Fig. 7 - Unpruned

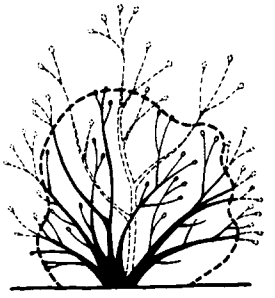

Fig. 8 - Properly Pruned

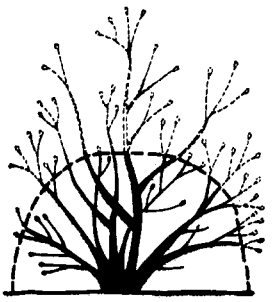

Fig. 9 - Improperly Pruned

(3) Heavy root pruning during transplanting lessens vegetative growth but increases production of flowers.

(4) A pruned plant always tends to resume its natural habit.

(5) The uppermost buds of plant grow first.

(6) Heading back of young growth forces development of side buds.

5.24 Following are several accepted pruning operations illustrated by Fig. 10:

(1) Make all wounds clean.

(2) Make all cuts parallel and close to branch that is left.

(3) Never leave a stub if it is possible to avoid it.

(4) In removing large branches, first undercut until saw binds, then cut down from top until branch snaps off. Wounds should be painted with an antiseptic dressing, particularly those over 2" across.

(5) Wounds made in spring heal faster than those during summer.

(6) Privet hedges should not be trimmed late in the year since the new growth freezes in the winter. Hedges becoming bare at the base should be cut down to the soil and allowed to sprout anew.

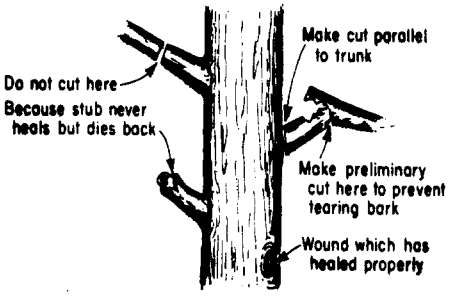

Fig. 10 - Pruning Cuts

5.25 A general pruning rule to be observed is that shrubs blossoming early, bloom on last year's growth, and should be pruned, if at all, just after this bloom. If trimmed in the fall or spring, buds will be destroyed. Forsythias, Spirea Van Houttei and Lilacs are examples of early blooming shrubs.

5.26 Shrubs that blossom late in the summer or in the fall, bloom on twig growth of that summer and should be trimmed, if at all, in late winter or early spring before any growth starts. Anthony Waterer Spirea and Althras are examples of late blooming shrubs.

5.27 Another rule to observe is that any late summer pruning of shrubs is unsafe, because it induces a new growth of wood that rarely becomes hardened enough to withstand severe winter. In such cases tips of branches and sometimes all the wood that grows after the pruning will be winterkilled or weakened.

5.28 The following comments pertain to pruning of some of the more common shrubs:

Barberry: Except when used as formal hedge, do not prune at all unless there is dead wood.

Butterfly Bush: Dies back nearly to ground in winter. In the spring, cut all branches back to live wood.

Cranberry, High Bush: Should be pruned very little as pruning destroys either flowers or berries, or both.

Forsythia: Trim as desired directly after blooming.

Honeysuckle, Tartarian: Prune sparingly and as desired. Both blossoms and berries should be preserved.

Hydrangea P.G.: The tree form should be pruned sparingly and the main branch, or trunk, not at all, to permit its development into a larger tree form. Pruning should be done in March before any growth starts.

Lilac: Do what little pruning is necessary just after blooming.

Privet: It should be sheared in the spring, again in June or July and again later as desired. When used as a hedge and allowed to grow to a height of around three feet, it should be sheared only enough to keep it symmetrical and regular. It may then be squared at the top or sheared to a conical form.

Snowball: Do not trim except to snip off the little dead ends.

Japanese Quince: Needs but slight pruning to keep it in desired form. Do this a little at a time as desired.

Spirea Van Houttei: Ordinarily do not prune at all. If pruned, however, it should be done just after blooming.

Syringa: All varieties may be treated alike. It spoils their natural form to trim them. If any pruning is done it should be directly after blooming period.

Weigela: Requires very little, if any, pruning. Snip off a little to keep in form but much trimming ruins it.

Evergreens: In general, these require but very little pruning and it should not be attempted without knowledge of the principles involved which are listed in earlier paragraphs under the subject of pruning. Whatever pruning is done to evergreens planted around foundations is to promote compactness. Certain of the species, such as Firs and Pines become more compact if, with the finger nail or a small knife, the center bud on each twig is removed early in the spring. Beneath this bud there are many dormant ones which are induced to grow and the pinching off practice encourages compactness.

5.29 On the other hand, the Arborvitaes, Junipers, Retinosporas, and Hemlocks have finer foliage and the removal operation can be done with hedge shears. The period between July and September is the correct season to carry out this clipping.

5.30 In the case of such plants as rhododendrons and mountain laurel, the cutting away of an occasional straggling root will be sufficient. Spruce trees (Blue, Colorado, and Norway) should not be pruned at any time. Although other evergreens may be pruned, such pruning should only consist of cutting the end of branches or leaves to preserve its original shape. Such pruning should only be done late in March or early in April. In no case should branches be removed from the trunk or main stem.

5.31 The following evergreens are among the few which will respond to repeated clipping and pruning into shape:

Box, Japanese
Box, Common
Cotoneaster, various
Cypress,
Hemlock
Holly, American
Holly, Japanese
Honeysuckle, Box
Wintercreeper, Bigleaf
Yew, Japanese
Yew, Dwarf

5.32 All cuts must be made cleanly with a sharp knife or pruning shear leaving no projecting stubs or branches. If a large branch is removed, it is well to cover the exposed wood with an asphalt chromate emulsion. This treatment will prevent the entrance of decay. If the wood is kept sound and healthy the bark will gradually grow over the wound, finally closing it completely.

5.33 The pruning of small tree twigs should be done with sharp pruning shears. Heavy branches may be cut away with a pair of lopping shears or a saw. Never use an axe or hatchet for pruning. Branches should never be broken off, as the broken ends offer an excellent opportunity for disease to enter.

6. PLANT INSECT PESTS

(A) General

6.01 Shrubs are seldom free of insects which either eat the leaves or weaken them by sucking the sap from the leaves. Should these become numerous enough to jeopardize the health and appearance of the plant, action should be taken to remove them. Observation of the type of damage being done will indicate the course of action.

6.02 Insects or larvae that eat leaves can generally be checked by a spray of an internal poison type such as arsenate of lead.

6.03 Sucking insects may be killed with a contact poison, such as Black Leaf "40" (nicotine sulphate), Kerosene Emulsion, etc.

(B) Varieties and Methods of Exterminating

6.04 Red Spider is a very small insect, hardly discernible with the naked eye, which turns evergreen foliage yellow or ashy. It is frequently found in August and September and attacks Arborvitaes particularly. Washing the plant with water at strongest pressure several times is very good. Sulphur, lime and arsenate of lead in equal proportions applied as a dust is also effective.

6.05 Bag Worm is a little insect that encloses itself in a sack partly made of foliage of evergreens. The eggs in this bag hatch out

in the spring and the young worms crawl out and start eating. The most effective method of extermination is to pick them off and burn. They are difficult to locate at times but are most apparent in the cool of the morning or evening.

6.06 The fall web worm feeds on a large list of shade trees, such as Elms, Willows, Poplars and Butternuts. It flies during June, July and early August and lays its eggs, several hundred in a cluster on the underside of a leaf. These eggs soon hatch and the caterpillars begin to spin a web under which they feed. This web is extended as they grow and need more food enclosing more of the leaves until quite a part or all of the branch may thus be enclosed. After feeding thus for a month or more the caterpillars leave the web, spin their cocoons either in the ground or in crevices of the bark of the trees. The moths may emerge from these cocoons the same year and lay eggs for a second generation, the caterpillars of which may feed the same fall. As the caterpillars of this insect feed together under a web it is easy to cut off this and kill the caterpillars particularly when the webs first appear and are small. Burning the webs on the tree is sometimes resorted to but most of the caterpillars are liable to escape and the tree is subject to injury by this method. Spraying with arsenate of lead close around the web so that the leaves next to be enclosed shall have been poisoned is also a good method of control.

6.07 Aphis are small green, red, black, yellow or white plant lice which cling in more or less large groups on twigs, stems or leaves of plants. No matter what plant they are on or what color, they are controlled in the same manner by a contact spray; that is, one that actually hits them. Use either a nicotine or a pyrethrum extract spray, 1-1/4 teaspoonfuls to one gallon of water; add one ounce of soap to each gallon to insure adherence to the insect. There are many generations per year and the plants must be sprayed as often as the insects return.

6.08 Oyster shell scale is a small encrustation which appears on the branches of lilacs and ash trees. The eggs beneath these old scales may be killed by spraying with an oil during the winter when the buds are dormant. Use one cupful of miscible* oil to 15 cupfuls of water. Be careful not to get this on evergreens as it is injurious to them.

* Capable of suspension in water.