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**An illustrated guide to care of ornamental trees and shrubs|cby  
F.S. Batson, R.O. Monosmith.**

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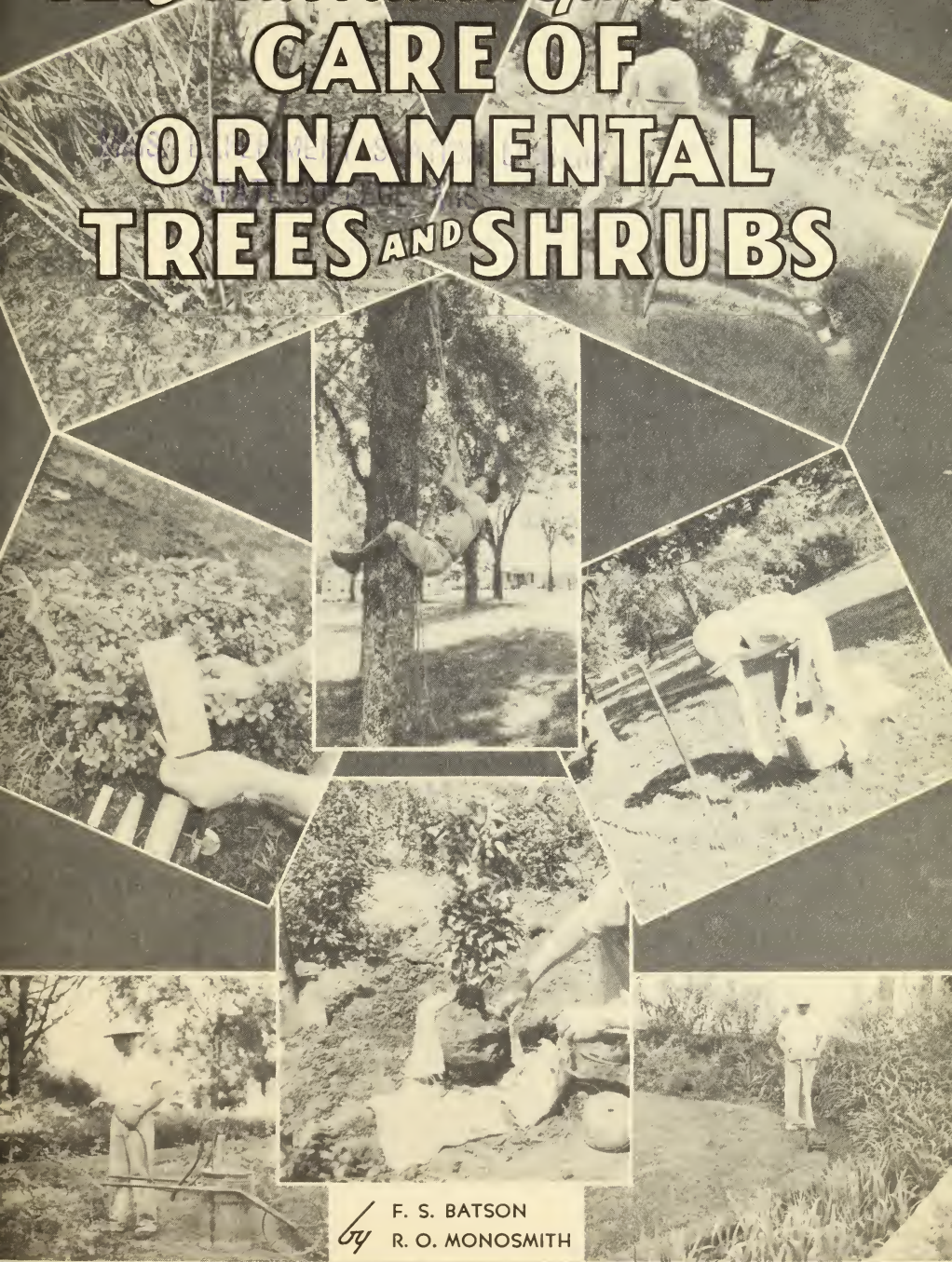
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# AN *Illustrated Guide* TO CARE OF ORNAMENTAL TREES AND SHRUBS



by F. S. BATSON  
R. O. MONOSMITH



AN ILLUSTRATED GUIDE  
TO  
CARE OF ORNAMENTAL  
TREES AND SHRUBS

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# An Illustrated Guide to Care of Ornamental Trees and Shrubs

## INTRODUCTION

Trees and shrubs respond readily to proper care. Plants having vigor, sturdy stems, rich green foliage and a profusion of flowers and fruits are essential parts of successful landscape gardening. Healthy plants can be obtained only when well adapted plants are selected, care is taken in transplanting, and correct maintenance is practiced. The landscape planting is a growing, constantly changing picture that requires some care each season such as fertilization, pruning, watering, cultivation, and mulching. Careful planning preceding actual planting will greatly simplify much of this seasonal maintenance.

Planning of plantings should include the selection of adapted plants with special reference to hardiness, light, soil and moisture requirement. The selection of the planting site should be considered from the standpoint of both planting design and growth of the plants. Proper plant spacing is absolutely essential for the continued success of the planting; a crowded planting is never attractive. Careful thought should be given in the selection of plants, to the height they will grow. Pruning plants severely several times each season is not a satisfactory solution of the problem created when a large, rapid growing shrub is placed under a low window or some other location where a low growing plant is needed.

Transplanting is the moving of a plant bodily from one location to another. This subjects plants to a rather severe shock even when proper precautions are taken. There are several factors to consider if a high percentage of transplanted plants are to live. Some of these factors which apply to both trees and shrubs are: time of year, size of plant to move, careful digging, transporting, soil preparation, planting, pruning, and watering. Trees require still further treatment when transplanted, such as guying and trunk protection.

Maintenance or perpetual care is necessary for final success in growing ornamental plants. Landscape plantings reflect neglect in magnified proportions.

A properly planned, planted and maintained planting on the grounds of every home and public building in Mississippi would reflect credit upon our entire population. This illustrated guide is offered to aid Mississippians in attaining this goal.

## ORNAMENTAL PLANTS AND THEIR REQUIREMENTS

There are over 150 different species of woody plants commonly used in ornamental plantings in Mississippi. This list includes both evergreen and deciduous trees, shrubs and vines. In this group of plants great variations in plant requirements will be found. Certain groups of plants have specific temperature, soil, light, and moisture requirements. Plants will not grow successfully unless these requirements are provided.

### HARDINESS

The climate in this state is generally mild. This permits the use of many semi-hardy plants in the southern half of the state. The desirability of using these tender plants in north Mississippi is doubtful. This applies to such plants as cape jasmine, camellia, Indian azaleas, ardisia, cleyera, feijoa, oleander, Japanese privet, sweet olive, pittosporum, and flowering pomegranate. Substitutes can be found for these among the hardy plants. Occasionally a severe winter occurs with temperature as low as zero. Plants usually listed as hardy are injured by these temperatures. Included are such plants as: cherry-laurels, firethorns, laurestinus, nandina, glossy abelia, photinias, glossy privet; nevertheless, these plants are recommended for use throughout Mississippi because these temperatures are unusual and because each of these plants will grow back to desired size quickly after being frozen to the ground.

### SOIL

Most ornamental plants thrive best in sandy or clay loam soil containing liberal quantities of organic matter such as decayed leaves, peat moss, or well rotted manure. Trees need a deep, friable sub-soil. A hard-pan near the surface usually results in the early death of trees. Soil reaction influences all plant growth. With the exception of azaleas, camellias and their plant relatives in the ericaceous family most plants have a wide range of adaptability, growing in a moderately sweet or acid soil with equal success. Azaleas and camellias require an acid soil in which to grow. This subject of soil reaction is discussed in more detail elsewhere in this bulletin.

### LIGHT

Of the ornamental plants grown in Mississippi a small percentage grow well in shady places, many like full sun, and others grow best in partial shade. Shade loving plants should be selected for shady places. Some of the plants that grow well in the shade are: boxwood, Japanese holly, nandina, mahonia, euonymus, winter honeysuckle, camellias, azaleas, elder, pearl-bush, spiraeas, goldenbell, sweetshrub, snowball, hydrangea, wild azalea (pink honeysuckle), yaupon holly, vinca and English ivy. No plants grow well when tree root competition is severe. Avoid planting under trees if possible.

### MOISTURE

Thorough drainage of shrub beds and tree locations is absolutely necessary. Soggy soil and standing water at the base of the plant will cause the roots to rot very quickly.

When necessary drain soil around plants by using tile, elevated planting beds, or gravel base.

SPACING OF PLANTS

“Plant thick and thin quick” is not a good rule for general use. Thick plantings give quick effects, but unless the other part of the rule is applied and thinning is done soon after planting this effect is short lived. The best rule to follow is to place plants in permanent positions at first planting with adequate room to grow to mature size without crowding.

The drawing below shows correct spacing for large and small trees, very large, large, medium and low shrubs, as well as four types of evergreens. Large trees would include besides oak and pecan, the hackberry, pine, elm, maple, magnolia, and sycamore. Small trees include willow, dogwood, redbud, mimosa, flowering crabs, soapberry and holly. Examples of the size of plant referred to in the shrub spacing are: very large shrub, crepe myrtle; large shrub, althea; medium shrub, vanhout spirea; low shrub, thunberg spirea.

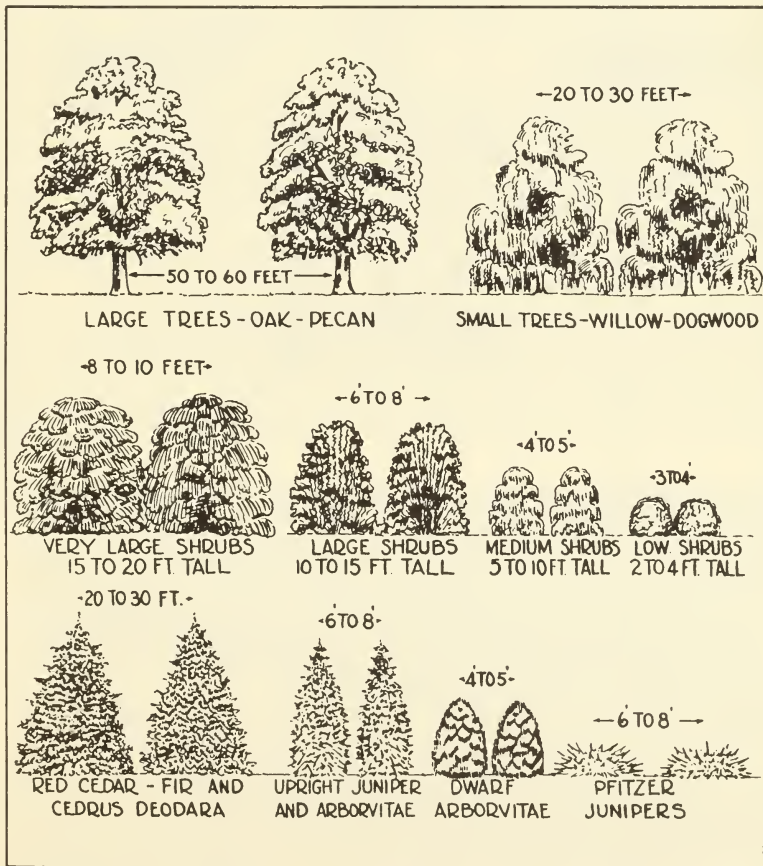


Figure 1—Spacing of plants



## SELECTION OF TREES

Nursery grown trees are more desirable than trees collected from the woods because nursery grown plants have a more compact root system and the tops are usually trained to a desirable shape by nurserymen. If trees are selected from the woods care should be exercised in the selection of the plant to be moved. The plants selected should be vigorous and well shaped. A fibrous, compact root system is more likely to be found on plants growing in a fertile soil. Any tree to be dug should be in the open so that it may be dug without interference from roots of surrounding plants.

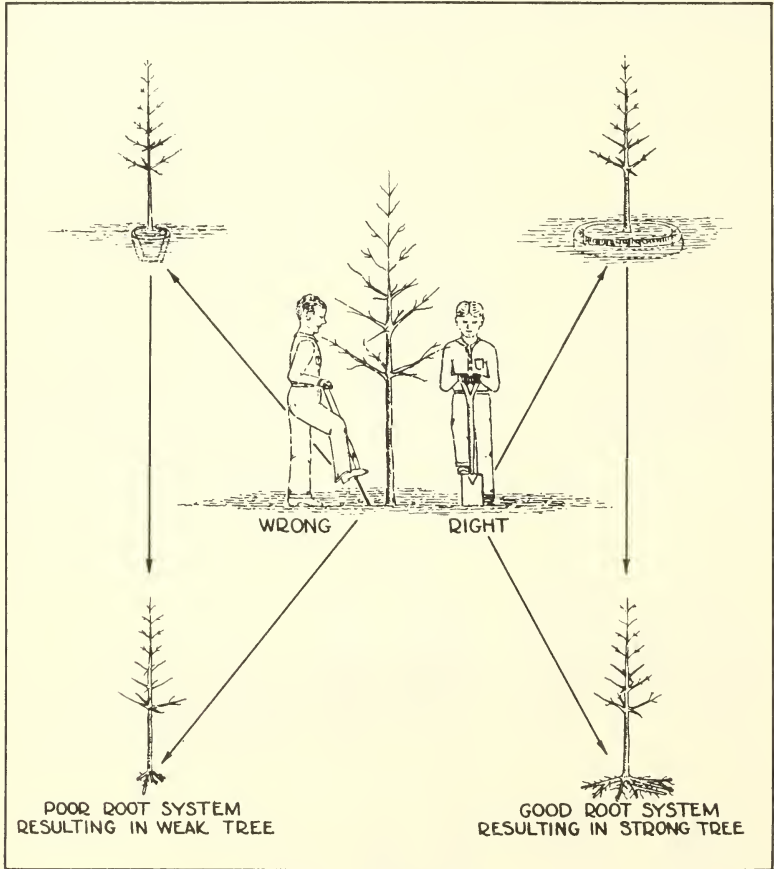


Figure 2—Digging a tree

Careful digging is important in transplanting trees. Care should be taken to get all roots possible in uninjured conditions. This can be done most successfully when the soil is loosened and main roots located before being cut. In the diagram "Digging a Tree" the right and wrong way is shown. This method is particularly desirable in moving oaks, dogwood and other trees difficult to move.

## TRANSPLANTING TREES AND SHRUBS

## TREES

Trees may be transplanted any time during the dormant season, which is ordinarily from November to March or April. Trees can be moved earlier or later if great care is taken, but such a practice is hazardous and not recommended except for experienced tree movers.

Small trees, ranging in size from 6 to 12 feet tall and having a diameter of 1 to 3 inches at the ground level, are recommended for successful transplanting. The amateur is often inclined to transplant relatively large trees, expecting to produce a large tree in a short time. This may be done if the tree is dug with a good root system and a ball of earth, but it requires skill and equipment in digging and transporting.

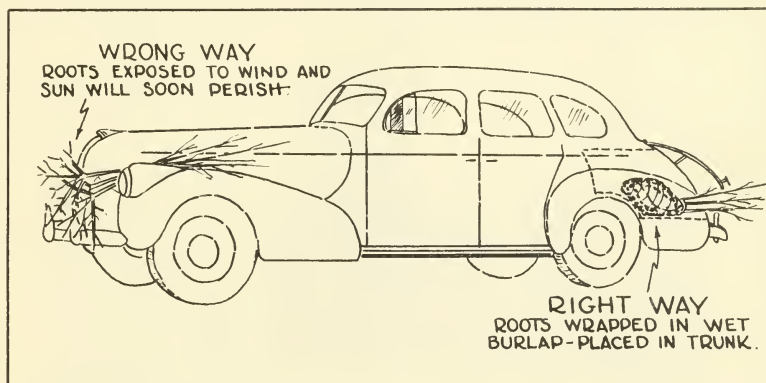


Figure 3—Right and wrong way to carry plants

The roots of plants being transplanted need protection from wind and sun. Do not expose the roots to drying influence of wind on the front of the car as shown in the diagram above, or to the hot sun's rays along the side of the road as shown in the photograph below. Wrap the roots in wet burlap, sphagnum moss or other material to protect them as much as possible until plants are set in a new location.



Figure 4

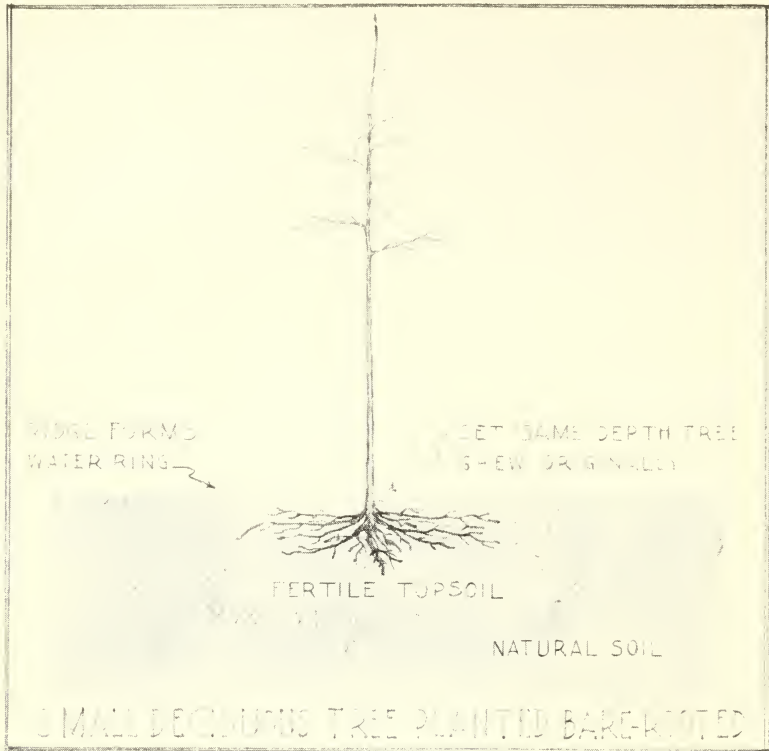


Figure 5

## PLANTING TREES

The sooner trees can be replanted after digging, the greater their chance of survival. If trees cannot be planted as soon as they reach their destination, they should be "heeled in" by placing them upright, close together in a trench dug in moist loamy soil, and the dirt packed around the roots.

In planting a tree dig the hole large enough so the roots can be spread to a natural position without cramping them. If the trees are being planted in poor soil an effort should be made to secure good soil to place about the roots, discarding the soil removed from the hole.

Trees should be planted at the same depth they were growing originally. The soil ring on the tree trunks will guide the careful observer in this. Dig the hole several inches deeper than the roots will be placed in order that fertile top soil can be placed under the roots. Before planting the tree any bruised root tips should be removed with pruning shears or knife. The roots should be spread out in the hole so as to be evenly distributed. Well-rotted manure can be mixed with the soil to be placed around the roots, but no fresh

manure should come in contact with the roots. Place the soil around the roots in layers of several inches and pack each layer firmly. Adequate soil should be worked under the crown.

Water should be poured in the hole after it has been three-fourths filled with soil. When this water has soaked in, fill the hole with soil to the level of the surrounding ground and make a water basin by providing a circular ridge placed 2 or 3 feet from the trunk of the tree. Fill this basin with water and allow to soak into the soil. If settling occurs refill the depression to original level.



Figure 6

Evergreens should be dug with a ball of earth around the roots. Trees growing in silt or clay soil can be dug with a ball much easier than trees in a sandy soil. The size of the ball of earth to dig with the tree varies somewhat depending on the species of plant and the type of soil. In most instances this ball should be about 1 foot in diameter for each inch diameter of the tree trunk. Ordinarily trees one-half to 1 inch trunk diameter require a depth of ball of about 9 to 12 inches. Trees having 2 to 3 inch trunk diameter should be dug to a depth of about 12 to 18 inches. See page 14 figures 12 and 13 for illustration of burlapping.

Most deciduous trees dug during the dormant season do not require a ball of earth in transplanting; however, a few species such as dogwoods, magnolias, and oaks are more likely to live when dug with a ball of earth.

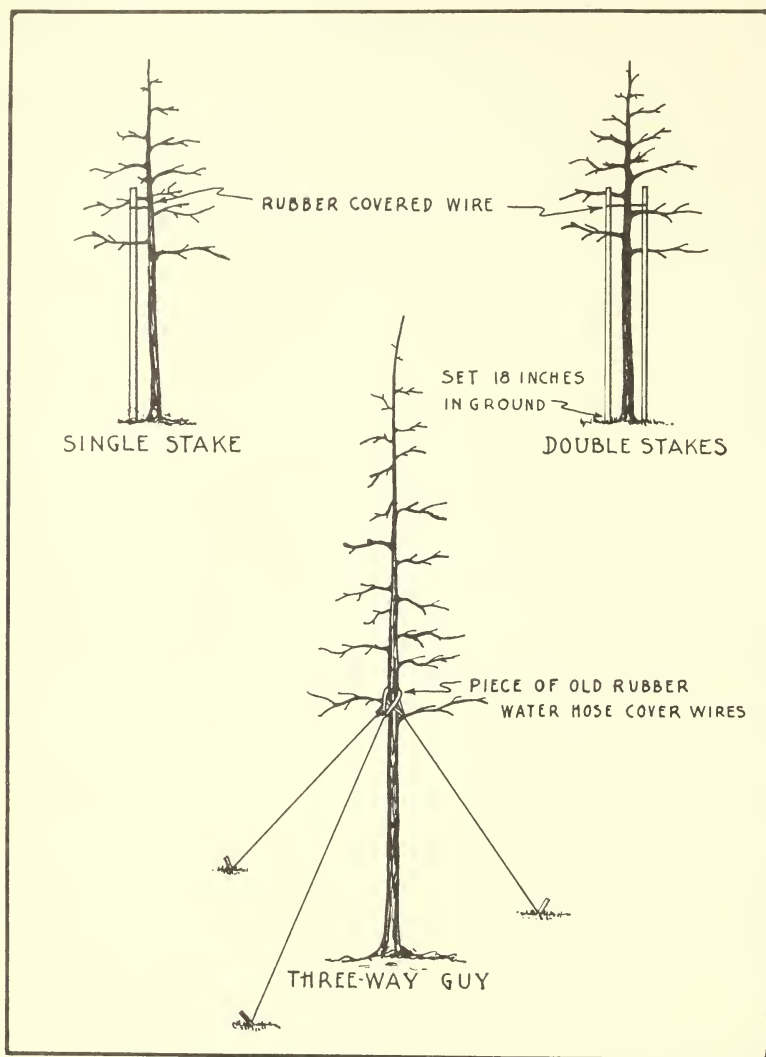


Figure 7—Guying trees

## GUYING TREES

Newly transplanted trees eight feet tall and taller need support until the new roots can become firmly established. Three methods are suggested in figure 7. The single stake is sufficient for smaller trees whereas the double stake or three way wire guy is recommended for larger sizes. In each method a soft surface such as rubber should protect the tree trunk from the supporting wires. A section of discarded water hose, slipped over the wire is satisfactory. Some sway is to be expected even with guyed trees and care should be taken to keep the soil packed around the trunk.



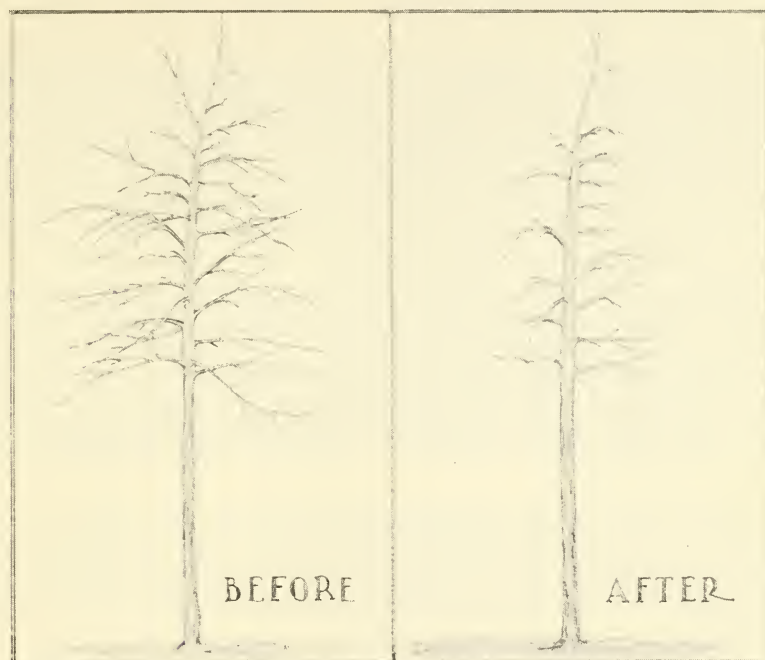


Figure 8—Correct method of pruning for transplanting

### PRUNING TRANSPLANTED TREES

The reduction of root system caused in digging a tree for transplanting necessitates a comparable reduction in top. One-half to two-thirds of the branches of a transplanted tree should be pruned out as shown in figure 8. A common mistake in transplanting trees is that of moving a tree that is too large, then cutting the top by the "de-horning" method as shown in figure 9. A very low percentage of these severely pruned, oversized trees live, and those that do are usually stunted and have poorly shaped crowns.



Figure 9—Common mistakes in pruning for transplanting

## CARE OF TRANSPLANTED TREES

Subsequent care of trees after moving includes adequate watering, regular cultivation, or mulching. New roots can form only when sufficient moisture is present in the soil. Severe wilting of the leaves will occur if the soil becomes dry, and the plant will probably die. Water the tree with a slow stream of water that flows slowly enough to allow all the water to soak into the ground. Light sprinklings of water do more harm than good. Keep the ground cultivated within 3 or 4 feet of the tree or mulch this area with 3 or 4 inches of leaves, straw or peat moss, because weeds take needed moisture from the soil to the detriment of the plant.

Wrapping the trunk of the tree with heavy prepared paper or burlap to protect it from insect injury and sunscald is needed in after-transplanting tree care. Figure 10 shows how the material is applied to minimize injury from the flatheaded borer. This paper or burlap should be placed on the tree in February or early March and allowed to stay on the tree throughout the summer. If not torn it will prevent beetles from laying eggs in the trunk of the tree. Trees weakened by transplanting are particularly susceptible to such injury.

When pecans and other trees difficult to move are transplanted the roots are sometimes treated with root promoting dusts made of indolebutyric acid and talc to stimulate root growth. Such treatment is in the experimental stage at present, but it shows promise and may be used more extensively in the future.

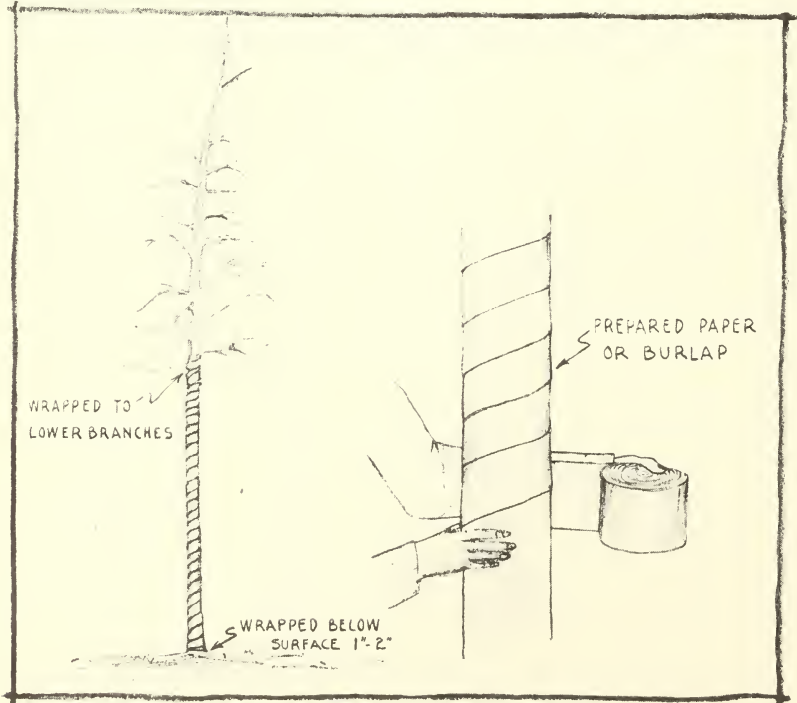


Figure 10—Tree trunk wrapped to prevent sunscald and insect injury

## TRANSPLANTING SHRUBS

There are two general types of shrubs used in landscape plantings — deciduous, those that shed their leaves in winter; and evergreens, those that retain their foliage all year. The deciduous shrubs are usually easier to transplant than evergreen species, requiring less care in handling. Deciduous shrubs are usually moved barerooted, and practically all evergreens shrubs are moved with a ball of earth.

The most satisfactory time to transplant shrubs is during the months of November and December. Second choice as to time of transplanting is January, February and March. Shrubs can be moved in April, May and early June, but more care is necessary in providing large balls of earth on both deciduous and evergreen shrubs, watering frequently, and shading plants in the heat of the day. Even with this additional care a high death rate can be expected ordinarily in plants transplanted after growth has started, especially in May and June.

In digging both nursery and native shrubs care should be taken to secure an adequate root system. Figure 11 tells a graphic story. Root strength determines the quality of a plant. Notice the two plants in the picture. They are the same age; both are young 3 year old spireas. The root system of the plant on the left is vigorous and well branched while the root system of the other is weak and half dead. The plant with the poor root system was growing in the same row in the nursery as the good root system, but in a poorly drained place on the row. The lower roots had been killed by poor drainage. It takes a good root system to make a healthy long lived plant. Get root strength in your plants.



Figure 11—Shrub with good root system on left; poor root system on right



## DIGGING EVERGREENS



Figure 12

An evergreen shrub dug with a ball of earth ready to be placed on burlap that has been cut to receive the ball.



Figure 13

After the branches have been tied with a cord to facilitate handling, the ball of soil is wrapped with burlap. The completed job shows the cord used to make a neat package and keep the ball of earth from breaking apart. When the plant is set in the hole of the planting bed the cord and burlap should be removed or thoroughly slit sides before filling around the ball with soil.

## PREPARATION OF PLANTING BED FOR SHRUBS

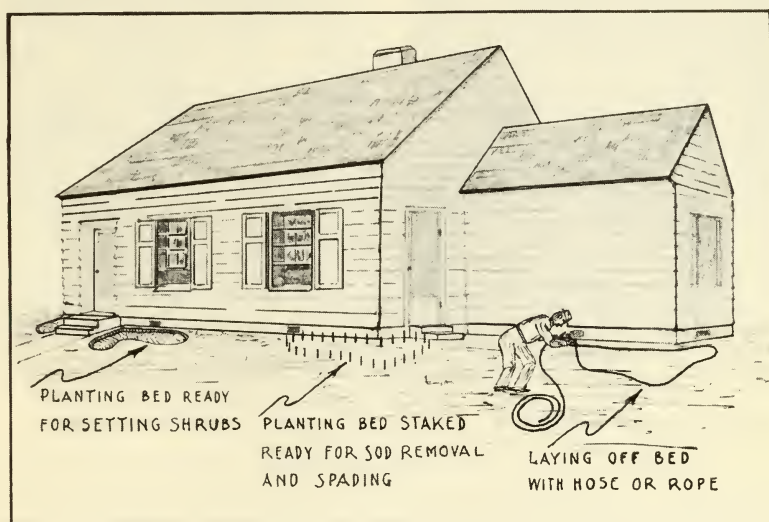


Figure 14—Steps in preparation of planting bed for shrubs

Shrubs should be planted in well prepared planting beds, not small pocket holes that have been hollowed out of the sod. Planting beds serve several purposes. First, they provide the necessary soil conditions for healthy shrub growth since the soil can be fertilized and thoroughly spaded when the beds are made. Secondly, the neat, trim outlines of these beds add to the attractive appearance of the planting. Thirdly, the vertical edge of the bed affords a means of keeping the lawn grass out of the shrub planting.

Planting beds can be designed most successfully on paper. A plan properly applied as shown in figure 14 creates attractive flowing curves and proper proportions. In the absence of a plan, however, graceful curves can be had in planting bed outlines by following the suggestions given in figure 14, designing the beds on the ground with a hose or heavy rope. Small temporary stakes are set along the inside of the hose after it has been finally placed, near enough together to give the outline of the curves. Using this line of stakes as a guide, the outline of the bed is cut in the turf or ground and all sod removed within the area. The soil should then be fertilized with 1 or 2 inches of thoroughly rotted manure and 10 pounds of superphosphate to each 100 square feet of bed and the area spaded to a depth of 10 inches. It will be necessary to remove every third shovelful of earth from the bed to prevent excessive heaping of the soil in the bed. Rake the surface until smooth, edge the bed by throwing dirt toward the middle away from sharp edge in sod, and the planting bed is ready to receive the shrubs.





A

Figure 15—Planting a native shrub



B

### PLANTING SHRUBS:

Dig a hole that will accommodate all the roots without crowding, loosening the soil to a depth of 12 to 18 inches. Set the plant at same depth it was growing in nursery or woods, spreading the roots in all directions as shown

in figure 15A. If the top is poorly developed a more attractive shrub will be formed, especially in deciduous native shrubs if the top is pruned back to the ground as shown in figure 15B. Place the soil over the roots, slowly tamping each shovelful to firm the soil about the roots. Fill the hole level full of soil and make a water ring as shown in figure 16. Water thoroughly. A loose mulch of soil, leaves, or straw placed over the shrub bed will help hold the moisture in the soil.



Figure 16—Watering a shrub

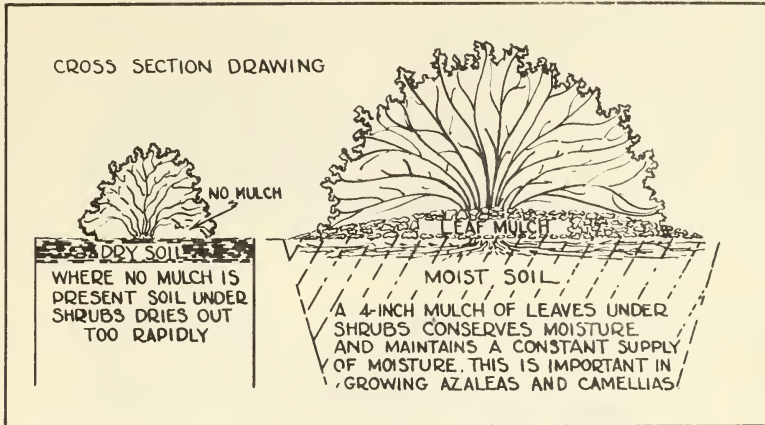


Figure 17—Growth increase due to mulching shrubs

### CULTIVATION AND MULCHING SHRUBS

The subjects of cultivation and mulching are discussed together since both practices keep down weeds, conserve soil moisture, and improve soil texture. One and 2 year old shrub beds should be cultivated after each rain, or in the case of prolonged dry spells the beds should be hoed once a month to kill weeds and keep a 1-inch dust mulch on the surface of the soil. Well established shrub beds should be mulched and not cultivated. Weeds in such beds can be pulled by hand.



Figure 18—Loose soil mulch

Mulch is the term applied to a loose layer of one of several materials on the surface of the soil. This material might be leaves, leaf mold, peat moss, clean straw, or cotton seed hulls. Pine straw, which is available in many parts of the state, is very desirable for mulching shrub beds. A 3- or 4-inch layer of this material on shrub beds will keep down weeds, conserve moisture, and improve the soil when spaded into the bed after decaying. Mulching is a necessary practice in growing azaleas, camellias, boxwood and other shallow rooted plants that require constant moisture in the soil. It is also beneficial when used on many other species of plants.

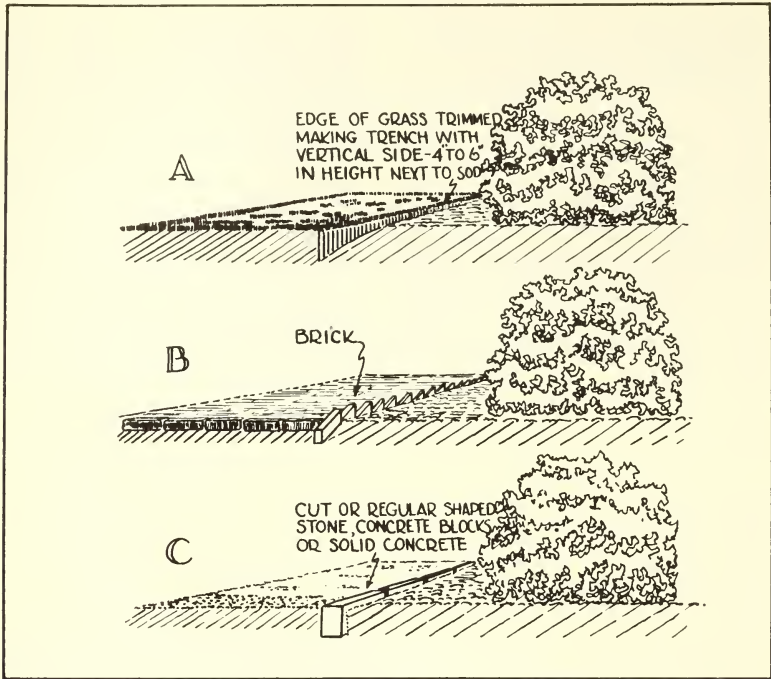


Figure 19—How to edge shrub beds

### EDGING SHRUB BEDS

Neat edges are necessary if the shrub bed is to contribute to the beauty of a landscape planting. These edges can be defined in three ways, as illustrated above in figure 19. The trench (A) with vertical side next to sod is least expensive and highly recommended. It is maintained as shown in photographs below. Bricks (B) placed on edge at 45 degree angle make a very neat edging in small gardens or around foundation plantings. Regular shaped stones (C), concrete blocks, brick, or a 3-inch solid concrete curb make satisfactory edging materials. Do not use rough, jagged, irregular stones as they create anything but a tidy appearance.



Figure 20—Shrub beds neatly edged adds greatly to the attractiveness of planting



## FERTILIZATION OF TREES AND SHRUBS

Facts concerning nutrient requirements of plants comprise a complicated science, but feeding ornamental trees and shrubs can be a relatively simple practice that any gardener will find easy. The most efficient use of commercial fertilizer requires careful consideration of soil types and soil analyses. Satisfactory results can be secured, however, by making simple soil reaction tests, using a few standard fertilizer mixtures and carefully observing plant response.

Manure is an excellent fertilizer and soil conditioner, but is no longer considered the only fertilizer material to be used. Commercial fertilizers can be used effectively with no damage to the plants after a simple working knowledge of their effect on plants has been obtained.

Ten elements have been considered for many years to be essential to plant growth. Of these, only nitrogen, phosphorus and potassium are present in so-called complete fertilizers, and are thought to be the ones most often limiting plant growth. Carbon, hydrogen, and oxygen are present normally in the air in sufficient quantities for normal plant growth. Calcium, iron, magnesium, and sulphur may be deficient in some soils under which conditions they must be added to fertilizer mixtures or applied separately as salt or salts of the needed element. Recent experiments show that some minor elements as boron, manganese and possibly copper and zinc are necessary in extremely small quantities for proper development of certain plants.

The effects of all elements on plant growth should be more generally known by gardeners.

**Nitrogen** stimulates leaf and stem growth and is the element that gives the "push" to plants. Nitrogen should be added to the soil at periods when the plant is in active growth. Overdoses may cause burning and this valuable plant nutrient should be handled with care. Chemical sources of nitrogen are nitrate of soda, ammonium sulphate, mixed fertilizers such as 4-8-4. In mixed fertilizer formulae the numbers indicate, in the order given, the percentages of nitrogen, phosphorus and potash. Nitrogen is also present in such organic fertilizers as cotton seed meal and animal manures.

**Phosphorus** keeps a check on the stimulation when undue amounts of nitrogen are applied. It hastens maturity, stimulates flower and seed production and aids in root development. Since it penetrates the soil slowly when applied to the surface it should, when possible, be incorporated thoroughly with the soil at the time of bed preparation, or if applied later it should be worked into the soil as much as possible. Usual sources are superphosphate (acid phosphate), basic slag, and mixed fertilizers.

**Potassium** or potash is a general plant conditioner. It aids plants in overcoming brittleness, hastens maturity and intensifies flower color. It also aids in disease resistance and seed production. Sources are muriate of potash, sulphate of potash, wood ashes, and mixed fertilizers.

**Calcium** influences soil reaction, liberates nitrogen, phosphorus and potassium in the soil, aids bacterial growth, and performs many functions in the plant such as building healthy cell walls, and increasing absorptive capacity of roots.

**Magnesium** functions in seed formation, cell growth, and chlorophyll formation (green coloring in leaf).

Sulphur is a constituent of plant protein.

Iron is an important part of chlorophyll.

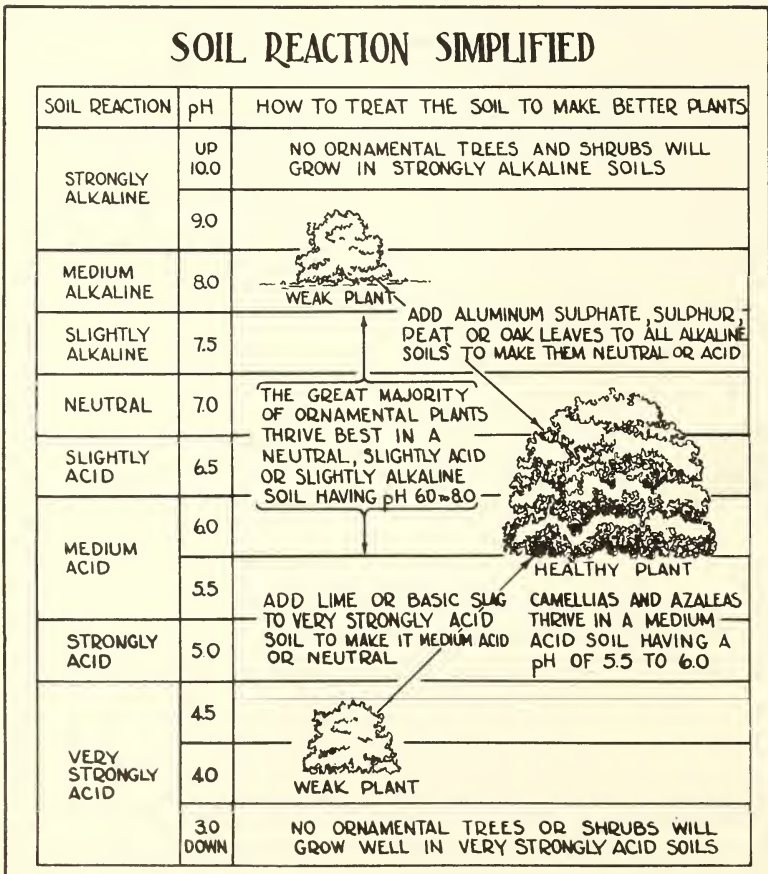


Figure 21—Soil reaction simplified



## SOIL TESTING

Soils can be tested by a quick test color method to determine the relative amounts of total nitrogen, phosphorus, potash, iron, magnesium, manganese and calcium in the soil. This method of soil testing is easily learned and the test is easy to make, but more equipment is required than the average home gardener would wish to buy, and the results secured in these tests can be interpreted only by someone with considerable experience. Therefore, it is suggested that the amateur be guided by general fertilizer recommendations given in this bulletin, page 23, by a keen observation of plant growth and of plant response to fertilizer applications, and by making tests for soil reaction.



Figure 22—Testing soil reaction for Azaleas

Soil reaction (acidity or alkalinity) can be tested using a simple inexpensive set such as the one shown in figure 22. The results of this test can guide one in changing the soil reaction if necessary by the addition of lime or sulphur, aluminum sulphate or peat to fit the needs of certain plants. Soil reaction effects the availability of the nutrients in the soil. While the reaction of the soil is not the only factor influencing the availability of nutrients it is an important one. Considering the elements as a group, the striking fact is that a medium acid reaction is necessary for adequate availability of all the essential elements except calcium and magnesium. Acidity is expressed in terms of pH values. In the pH reaction scale pH 7.0 represents a

neutral reaction. Any pH number from 0 to 7 indicates an acid reaction, with decreasing acidity as the number increases. Any pH value from 7 to 14 indicates an alkaline soil, with increasing alkalinity as the size of the number increases. Available data indicates that a reaction of the soil between pH 6.0 and 6.5 is the most favorable to maintain in a great majority of ornamental plants. Medium acid soils are necessary for azaleas and camellias. A few woody ornamental plants grow more successfully in a neutral or slightly alkaline soil. Among this group are redbud, deutzia, winter honey-suckle, mockorange, lilacs and common snowball.

Soil reaction determines the color of hydrangea blooms. In an acid soil hydrangea flowers are blue, while in a neutral or slightly alkaline soil the flowers are pink. The color of flowers to be produced in any bearing season is determined by the soil reaction.

The soil reaction can be changed from acid to alkaline by adding lime. It can be changed from alkaline to acid by adding sulphur, aluminum sulphate or peat. (See page 24 for method of changing alkaline soils to acid reactions.

When necessary, ground limestone can be added to the soil to increase alkalinity as indicated in the following table:

Present pH of Soil	Pounds of Agricultural Ground Limestone Needed for Each 100 sq. ft. to raise:					
	Sandy Loam Soils		Silt Loam Soils		Silty-Clay Loam Soils	
	To pH 6.0	To pH 6.5	To pH 6.0	To pH 6.5	To pH 6.0	To pH 6.5
6.0	None	23	None	41	None	58
5.5	23	46	41	83	55	115
5.0	46	69	83	124	115	173
4.8	55	78	97	138	138	196

#### \*Key to Nutrient Deficiencies:

The following abbreviated key is a guide to aid home gardeners in determining what plant nutrients are lacking in the soil when plants show decreased growth that is general on the whole plant or localized when insects and diseases are absent.

\* "Key To Nutrient Deficiencies" from Nursery Notes by L. C. Chadwick, Ohio State University, Columbus, Ohio.

1. Effects general on whole plant or localized on older, lower leaves.
  2. Effects usually general on whole plant
    3. Foliage light green. Growth stunted, stalks slender, leaves small, lower ones lighter yellow than upper. Soil needs **nitrogen**
    3. Foliage dark green. Delayed growth. Lower leaves sometimes yellow between veins but more often show a tendency to develop purplish coloration. Leaves dropping early. Soil needs **phosphorus**
  2. Effects usually local on older, lower leaves
    4. Lower leaves mottled. Yellowing begins at margins and continues toward center. Margins of leaf later become brown, curve under, and older leaves drop. Soil needs **potash**.
    4. Lower leaves yellow but usually show no spotting until late stages. Yellowing begins at leaf tip and progresses downward and inward. Leaf margins may curve upward or develop a puckering effect. Seldom seen in soils testing pH 5.5 or above. Soil needs **magnesium**.
1. Effects localized on new leaves
  5. Terminal buds remaining alive
    6. Leaves yellow between the veins, veins remain green
      7. Leaf spots usually absent. Soil needs **iron**
      7. Leaf spots usually present. Soil needs **manganese**
    6. Leaves light green, veins lighter than other parts of leaf. Soil needs **Sulphur**
  5. Terminal bud usually dies
    8. Break down at tip and margin of young leaves. Young leaves often definitely hooked at tip. Soil needs **calcium**
    8. Break down at base of young leaves. Stems and petiole brittle. Soil needs **boron**

#### How to fertilize shrubs.

There is a great deal of variation in soil requirements. Thorough preparation of soil and the incorporation of well rotted manure and superphosphate, 10 pounds per 100 sq. ft. are desirable before planting. Top dress established shrub beds with 2 to 5 pounds of a fertilizer having an analysis of 6-8-8 or 4-12-4, each spring. Use 1 to 2 pounds of a mixed fertilizer around each specimen shrub when planted singly. Further application can be made, based on plant response or soil tests.

### How to fertilize evergreens.

Incorporate well-rotted manure or peat moss at time soil is prepared. Well-rotted manure or peat used as a mulch during winter may be incorporated into the soil each spring.

**Narrowleaf evergreens. Small plants.** — Tankage or cottonseed meal, 5 to 6 lbs. per 100 sq. ft. of bed area each spring.

**Larger plants** — 6-8-8 or 4-12-4, 2 to 4 lbs. per 100 sq. ft. of bed areas each spring. Hoe or "water-in" the fertilizer. Specimen plants of shrubby type one-half to 1 pound per plant twice a year, early spring and about June 15. Specimen trees, 2 to 2½ lbs. per each inch in diameter of the trunk.

**Broadleaf evergreens** — Many plants of this type require an acid soil. Materials which tend to make soil neutral or alkaline should not be used.

1. Supply liberal quantities of humus by incorporation, and adding as a mulch, acid peat moss or half rotted oak leaves. In poor soils where additional fertilization is necessary, add well rotted manure and cottonseed meal. Cottonseed meal applied at the rate of 5 pounds to 100 square feet is excellent for small plants. For large plants use a 4-12-4 fertilizer in which cottonseed meal is used to supply one-half to three-fourths of the nitrogen. Apply at the rate of 2 to 4 pounds to 100 square feet of bed area. "Water-in" the fertilizer. For large specimen plants follow the same rate of 2 to 4 pounds to each 100 square feet of bed area. "Water-in" the fertilizer.

2. To maintain an acid reaction (pH 4.5 to 6.5) add finely ground sulphur or aluminum sulphate. The following approximate amounts of sulphur for each 100 square feet will be necessary to increase the acidity in a silt loam soil from:

	Sulphur pounds		Sulphur pounds
pH 8.0 to 7.0	2.0	pH 7.0 to 6.5	1.5
8.0 to 6.5	3.0	7.0 to 6.0	2.0
8.0 to 6.0	4.0	7.0 to 5.5	3.5
8.0 to 5.5	5.5	7.0 to 5.0	5.0
8.0 to 5.0	7.0	6.5 to 6.0	1.5
7.5 to 7.0	1.75	6.5 to 5.5	2.5
7.5 to 6.5	2.0	6.5 to 5.0	4.0
7.5 to 5.5	5.0	6.0 to 5.0	3.0
7.5 to 5.0	6.5	5.5 to 5.0	1.5

3. Maintain a cool, moist soil by providing partial shade and mulches.

4. Provide some protection in the winter from hard drying winds and excessive sun exposure. Mulch heavily.

5. Roots of most broadleaf evergreen plants are located very near the surface of the soil and should not be disturbed. Mulch rather than cultivate. Keep roots moist and cool.



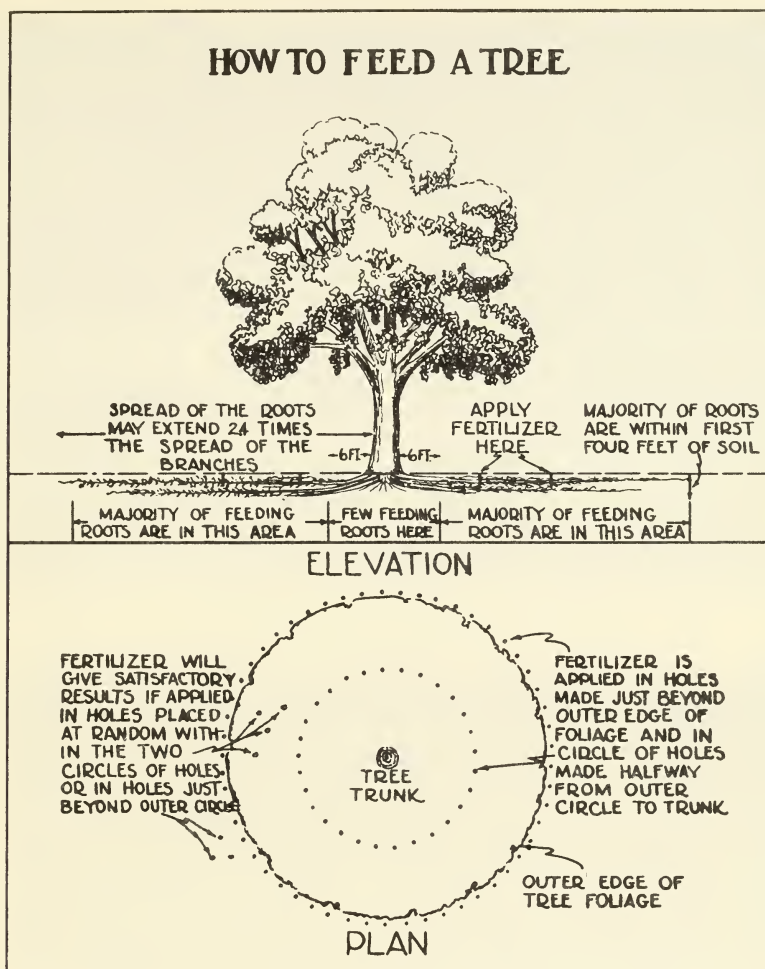


Figure 23

**How to Fertilize Trees.** Trees have a wide variation in soil requirements. Thorough preparation of the soil and the incorporation of well-rotted manure or peat moss and superphosphate (5 pounds per inch in diameter of tree trunk) are desirable before the planting of most trees. Proper aeration and adequate moisture are required for growth. Fertilizer applications are recommended as follows:

**Time** — Fall (Oct. 15 to Nov. 15) preferred, although spring satisfactory.

**Kind of fertilizer** — 10-6-4, ammo-phos (11-48-0) or 6-8-4. The complete fertilizer 10-6-4 is considered best, but at present is not generally available in Mississippi.





Figure 24—Punching hole with iron bar to receive fertilizer—bar raised



Figure 25—Punching hole with iron bar to receive fertilizer—bar inserted

### Rate of application

Small trees, less than 6 inches in diameter, approximately 4 lbs. 6-8-4 for each inch in diameter of tree trunk.

Large trees, more than 6 inches in diameter, approximately 8 lbs. 6-8-4 per inch in diameter of tree trunk. Nitrogen fertilizers such as nitrate of soda or ammonium sulphate when applied alone give good results when nitrogen is the only element lacking in soil. Apply 1 pound of either of these materials to each inch of diameter of tree on trees under 6 inches in trunk diameter and 2 lbs. for each inch diameter of tree greater than 6 inches in trunk diameter.

### Frequency of application

One to three years, depending on kind of tree and growth responses.

### Method of application

**Broadcast** — Small trees that have soil worked around them. Hoe or "water in" the fertilizer.

**Punch-bar** — Apply in holes distributed evenly beneath the extremities of the branches and over an area just beyond the spread of the branches. Approximately 10 holes for each one inch in diameter of the tree trunk. Make holes 15 to 18 inches deep with a soil auger or crowbar. Place fertilizer in the holes, finish filling them with soil and cap with sod.



Figure 26—Applying fertilizer



## PRUNING TREES

Pruning, which may be done at any time of the year, is one of the most important phases of tree care. When the tree is small, pruning is needed to start the branching habit in order to produce a well shaped crown and eliminate the possibility of later developing bad crotches. Older vigorous growing trees often produce an extremely dense crown which causes branches to die or become weakened due to a lack of sunlight. Thinning the branches in a dense crown allows more sunlight to penetrate thus producing more vigorous healthy branches. Dead branches allowed to remain in a tree are unsightly, sometimes dangerous to lives and property, and often injurious to the tree. Large dead branches which are allowed to remain in non-resinous trees soon begin to decay. The rot fungi spread into the trunk of the tree often resulting in large cavities that weaken it. If dead branches are removed before rot begins, the health of the tree may be preserved. The lower branches of trees along streets or near buildings may be removed so as to provide free circulation of air, open views, and allow greater freedom for traffic along streets. Trees planted on the lawn are often more attractive and useful if the lower branches are not removed and the branches are allowed to grow to the ground. Old slow growing trees may be rejuvenated by heading back to induce new growth. It should be remembered that every species of tree has its own characteristic habit of growth and it is usually

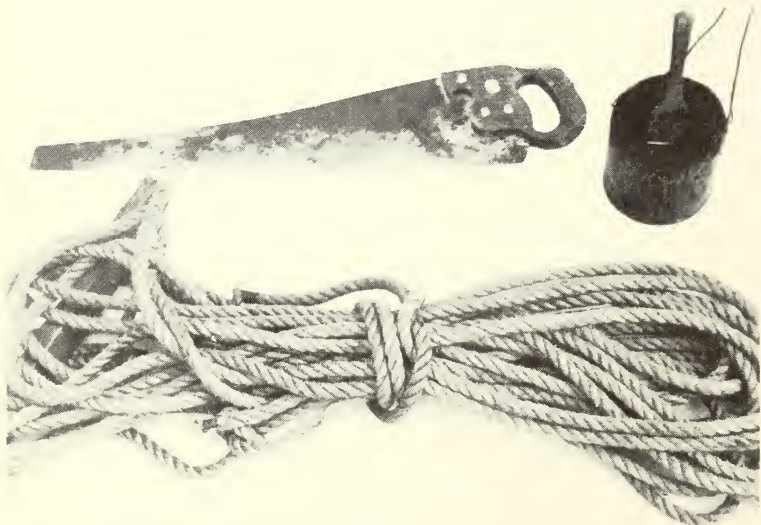


Figure 27

Tools and materials needed in pruning trees: safety rope, pruning saw, can of tree dressing and paint brush.

best not to try to change this habit of growth. Topping tall growing trees to reduce the height often causes the crown to be poorly shaped, production of dense weak growing branches which are easily broken by wind and leaves large wounds that heal slowly at the point where the top is sawed off.

### Tree Climbing

Extensive tree pruning necessitates the climbing of trees. Since tree climbing is dangerous work it is usually done by professional men who have the necessary equipment and experience. Workmen should take such precaution as may be necessary to reduce the danger of accidents.

### Clothing

A tight fitting cap, boots with composition soles (not leather), breeches made of strong material and tight fitting jacket or shirt of strong material, are much more satisfactory than ordinary work clothes for tree climbing.

### Rope

A 3-strand, rot treated one-half inch manila rope 120 to 150 feet long should be used. Avoid weakening the rope by cuts and abrasion, kinking, burning when run through a crotch too rapidly, and deterioration from improperly drying after being saturated with water. When used after a long period of storage the rope should be thoroughly inspected, and if its strength is questionable it should be tested by the weight of three men.

Using the rope with a safety saddle and figure-eight slip knot as shown at right makes tree pruning safer, allows movement

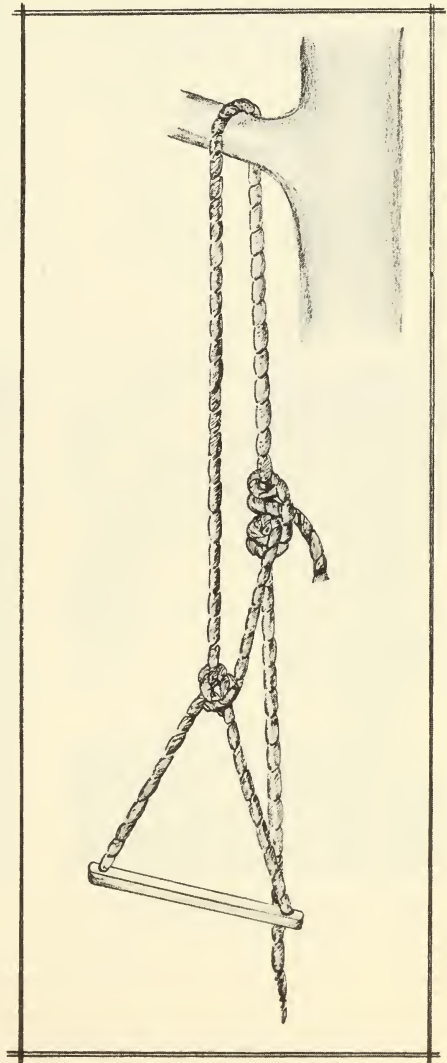


Figure 28—Safety sling for tree climbing



from one part of tree to another more quickly and permits the workman to reach parts of the tree that are often inaccessible without a safety sling. The procedure in pruning a tree is to climb toward the top of the tree, place the rope over a strong crotch near the top of the tree and tie the safety sling immediately so the workman can be safe in the saddle. Starting at the top of the tree with the pruning operation, work downward to the bottom of the tree. The workman should stay in the safety sling all the time he is working and keep all slack out of the rope.



Figure 29—Rope ready to throw over lower branch



Figure 30—Climbing by rope to lower branches



Figure 31—In the safety sling

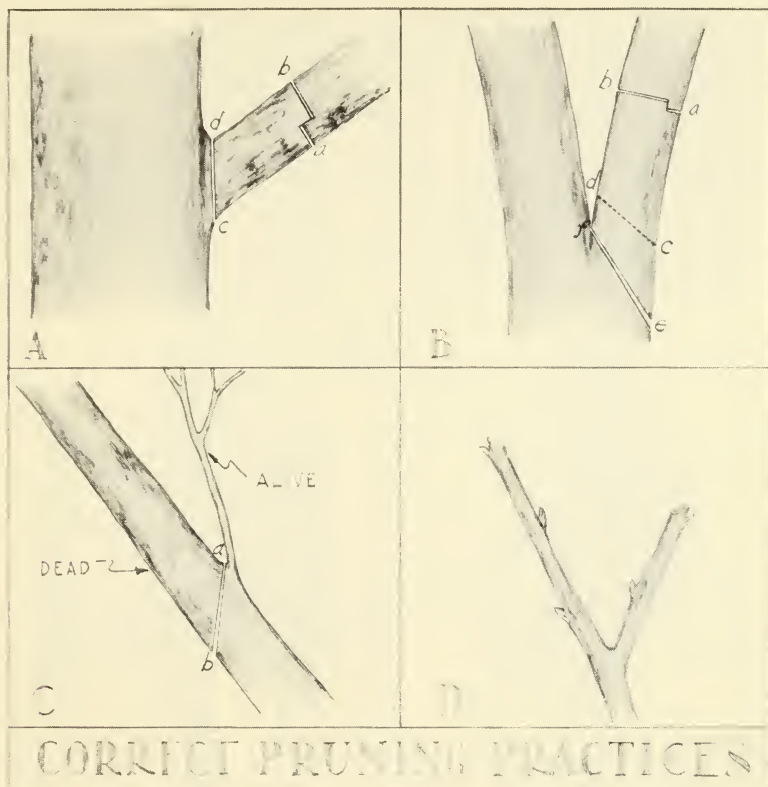


Figure 32

### HOW TO CUT OFF BRANCHES

Pruning properly executed avoids expensive repair work later and danger of earlier death of the tree. The illustration shows desirable methods of making cuts in removal of branches 2 inches in diameter or above.

- A. A preliminary cut (a) should be made about 1 foot from the final cut (cd). Saw at point (a) until the saw binds, when a second cut (b) is made. Saw about 1 inch at (c) to prevent the bark from peeling off when the final cut is made from (d) to (c).
- B. Pruning a V-crotch should be done when the tree is small if possible. Preliminary cuts are made first at (a), then at (b). A cut at (cd) is desirable on larger trees since the weight of the falling branch is likely to tear a long strip of bark from the trunk. A final cut should be made from point (e) sawing in the direction of (f).
- C. In removing a part of a large branch cut just above a lateral branch making a slanting cut (ab) so that the wood will heal quickly.
- D. Cut small branches about one-fourth inch above bud.

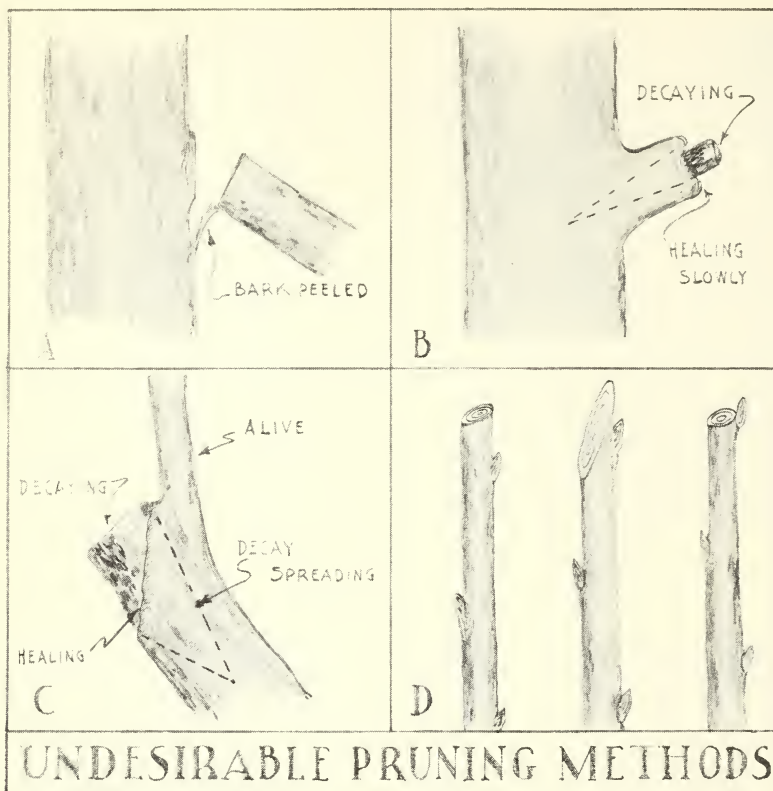


Figure 33

### COMMON MISTAKES IN PRUNING

When trees are pruned, wounds are made where branches are removed. It is very important that the wounds are made in such a way that the exposed surfaces will heal quickly by providing a covering of bark for protection. Without the protection of bark, rot fungi are more likely to attack the tree. Lack of knowledge of how to remove a branch so as to facilitate quick healing has been the cause of the loss of many valuable trees in Mississippi. The illustration above shows some of the common mistakes that should be avoided.

A. The weight of the branch peels a long strip of bark off the tree trunk making a larger wound than necessary. The branch should be removed in two cuts as shown in figure 32, page 31.

B. Removing branches several inches from the trunk should be avoided. The flow of sap into the branch stub which remains is reduced to such an extent that the wounded surface heals slowly. Since many years are usually required for healing a wound under these conditions rot fungi usually attack the plant through the wounded surface. See figure 32, page 31, for correct place to make cut.

C. The sap flows the shortest distance through the branches from the leaves. The cut should have been made along the line indicated as healing. In this picture the end of the limb has died, the exposed wood is rotting and wound will not heal before the rot has spread into the branch and other parts of the tree. See figure 32, page 31, for correct method of removal.

D. The ends of small twigs die if not properly cut. From left to right twig cut too far above bud, cut at an angle so that bud dries out, and cut made too close to bud.

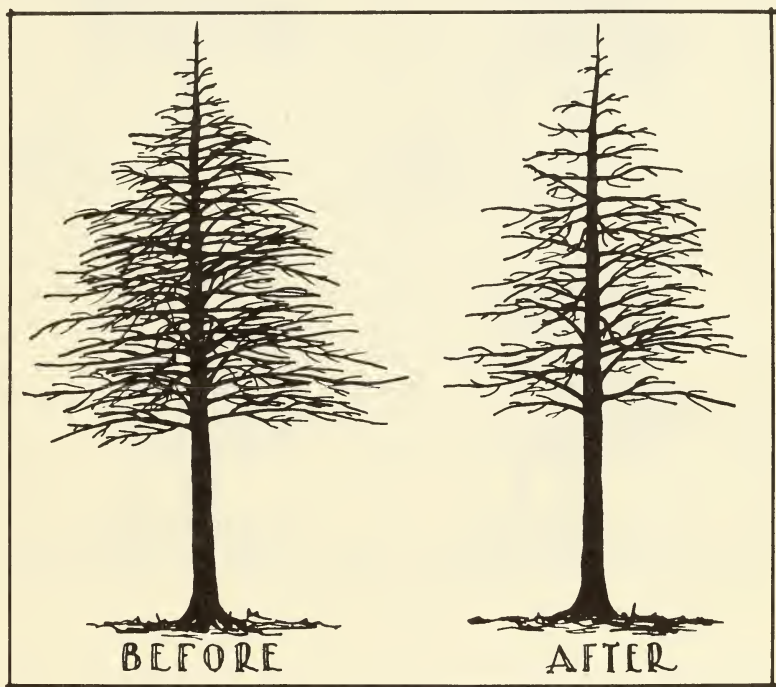


Figure 34

#### Pruning to Thin the Crown of Tree

Young shade trees which are growing vigorously usually need to be pruned to remove dead branches and thin out the weak branches where the growth is thick. A typical example of a tree which needs thinning is shown in the figure above at left. Usually entire branches are removed where the branches are crowded by sawing off at the main trunk. The thinning of weak branches allows sunlight to penetrate the crown of the tree. The removal of dead branches improves the appearance, removes rot producing fungi that may spread into the tree trunk and avoids the continual falling of small dead branches on the lawn.



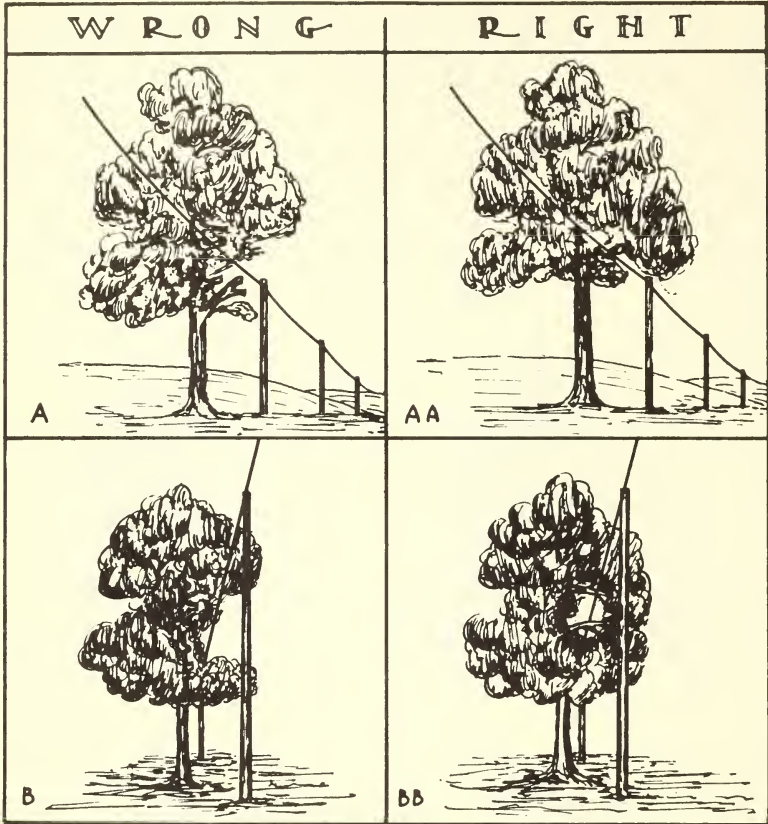


Figure 35

### Right and Wrong Methods of Pruning for Low Voltage Power Lines

A More branches removed than needed for the necessary clearance; also branches cut in the wrong place. Final cuts should be made at the trunk of the tree so that wounds made by the cut can heal. Never leave stubs of branches where rot often begins and later spreads into the trunk of the tree.

AA Remove only lower branches to provide the necessary 2 to 3 foot clearance. Lower branches removed on all sides to give a well shaped crown. This method of under pruning is adapted only where the wire is low or the tree is tall with a majority of its branches above the wire.

B Poorly shaped crown results from removal of several large lateral branches which is not necessary for low voltage lines.

BB Only one large lateral branch and several small branches removed to provide the necessary clearance of 2 to 3 feet.

## PRUNING FOR POWER LINES

Where a power line passes through a tree crown pruning is necessary to provide ample clearance. Such pruning can usually be done in such a manner that it will not disfigure the tree or imperil its existence. Transmission lines carrying less than 8000 volts require only 2 to 3 foot clearance. Removal of only one or two lateral branches will generally provide the necessary clearance without making a conspicuous opening through the crown that would mar its shape. High voltage lines which act as feeder lines to cities, towns, and communities require 6 feet or more clearance on all sides. This often necessitates the opening of a right-of-way in which entire trees must be removed. A small clearance for low voltage lines makes frequent pruning necessary and trees are often pruned so heavily that their usefulness is greatly impaired in order to save the expense of frequent pruning. Careless unskilled workmen often damage beyond repair street trees as well as trees growing on private property. Those who recognize the value of trees on the home grounds as well as public property should take definite steps to prevent unrestricted pruning practices.

## WOUND TREATMENT

The bark of a tree protects the sap wood and heart wood against the invasion of rot fungi. Ordinary tree wounds more than 2 inches in diameter should be treated to prevent the entrance of rot fungi until bark can grow over the wound.

Wound treatment ordinarily consists of treating the exposed wood with a waterproof material. The wound dressing that is considered most satisfactory for general use is asphalt tree dressing which contains an asphalt base and antiseptic ingredients that disinfect the wound. This material can be easily applied with an ordinary paint brush. Although it sticks to the wood relatively well, usually the wound should be painted at least once each year until the wound has healed.

Linseed oil mixed with Bordeaux mixture to make a paste and applied with a brush often is used as a wound dressing. Although the ingredients are inexpensive and readily available it is not used extensively because the material does not stick to the wood well and must be applied repeatedly every few months to be effective.

Ordinary house paint is sometimes used but this material is thin, has no antiseptic ingredients and does not stick to the wood satisfactorily.

It is not advisable to paint fresh wounds if the surface is wet as the dressing will rarely stick. Better practice is to wait until the surface is dry and apply the dressing then. Occasionally cuts continue to drain after a long period. This is particularly true in the case of the American Elm.

This condition is commonly called slime flux which is often difficult to correct. By tapping the tree at the base using a one-half inch bit and boring to the heartwood the pressure is decreased as the sap flows out at the base of the plant.

Coniferous evergreens such as pines, cedars, and junipers produce resin and are not often attacked by rot. Wound treatment is not imperative in such instances.

The shape of wounds made by removing branches when pruning a tree are usually oval and ordinarily do not need to be reshaped to facilitate quick healing. The photographs on the page show how an irregular bark injury should be shaped to facilitate healing.



Figure 36

Irregularly shaped wound should be shaped like a boat so that the edge of the wound will be parallel to the flow of the sap.



Figure 37

Use a chisel and mallet to remove all bark within the area outlined by the white crayon mark.



Figure 38

Apply shellac to the cambium for protection and then paint the surface of the wound with asphalt dressing or some other material.



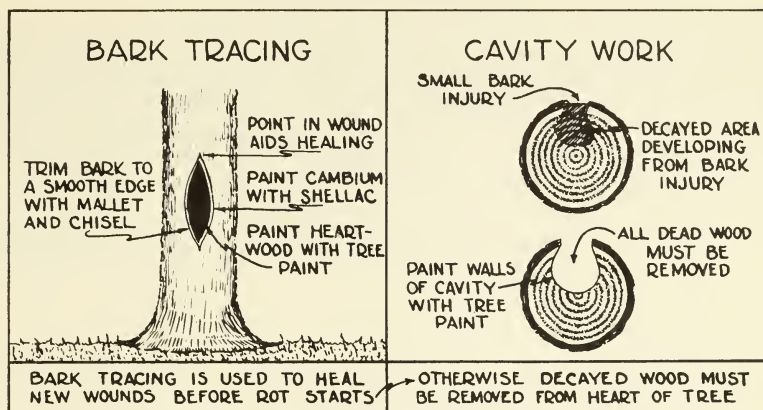


Figure 39

## CAVITIES

Most tree cavities result from lack of proper care of bark wounds. Rot often spreads rapidly causing large decayed areas in the sap and heart wood of trees. By properly shaping a bark wound so that it will heal rapidly and by keeping the wound painted regularly so that the wood remains dry all the time, the danger of cavities developing is greatly reduced. A few cents spent in the care of a wound may save the life of the tree or many dollars in excavating rotten wood and filling a cavity. Excavating and filling cavities is slow and expensive because good work is done only by skilled workmen who have the equipment, training and experience to do such work.

No attempt will be made to explain how tree cavities should be treated because of the extensive discussion that would be required and because in most cases work of this nature should not be attempted by the amateur. A home owner can do a great deal to prevent tree cavities by following the suggestions given on wound treatment on pages 35 and 36.



## PRUNING SHRUBS

To maintain the beauty of a planting of shrubbery, proper pruning is necessary. Slow growing evergreens usually require little pruning; however, fast growing broadleaf evergreens and flowering shrubs should be pruned to remove surplus or undesirable growth at the proper time of year. Pruning is a dwarfing process and should be done for the following reasons:

1. To remove dead, diseased or injured branches
2. To remove old or surplus branches. Most vigorous growing shrubs should receive some pruning each year so that branches are removed when old and unsightly
3. Maintain a definite size or form
4. Influence flowering and fruiting
5. As an aid in transplanting by balancing the top with roots.

### TIME AND EXTENT OF PRUNING

Most shrub pruning is done in the winter when plants are dormant. Such a practice is not harmful to the plant, but if heavy flowering and fruiting is expected annually the time of pruning should be determined by the age of the wood on which flowers and fruit are produced. In general shrubs may be placed in four groups according to time and extent of pruning. The first group includes those which grow slowly and are pruned to remove dead wood only. Common examples are flowering almond, flowering quince, pearl-bush, viburnums and most broadleaf evergreens.

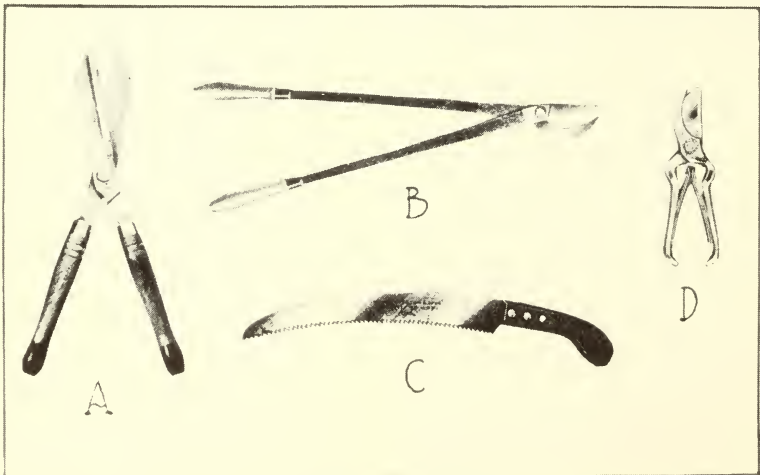


Figure 40

Tools. A. Hedge shears. B. Lopping shears for cutting large branches of shrubbery. C. Pruning saw. D. Pruning shears.

The second group includes plants which grow fairly rapidly and produce blooms on the previous year's growth and should be pruned immediately after blooming. Remove one-fifth to one-third of the previous year's growth. Included in the group are barberry, dogwoods, beautybush (kolkwitzia), deutzias, forsythias, jasmines (early blooming), spireas (early blooming), winter honeysuckle and weigelas.

The third group includes fairly rapidly growing plants which produce blooms on the current season's growth. These may be pruned at any time during the dormant season. Included in this group are althea, crepe myrtle, honeysuckle (except winter honeysuckle) and privets.

The fourth group includes plants that produce blooms on the current season's growth and may be pruned any time during the dormant season. These plants grow very rapidly, making it necessary to remove all two-year and older wood. Examples are butterflybush, coralberry, hydrangea, vitex, spirea (late blooming) and sumac.

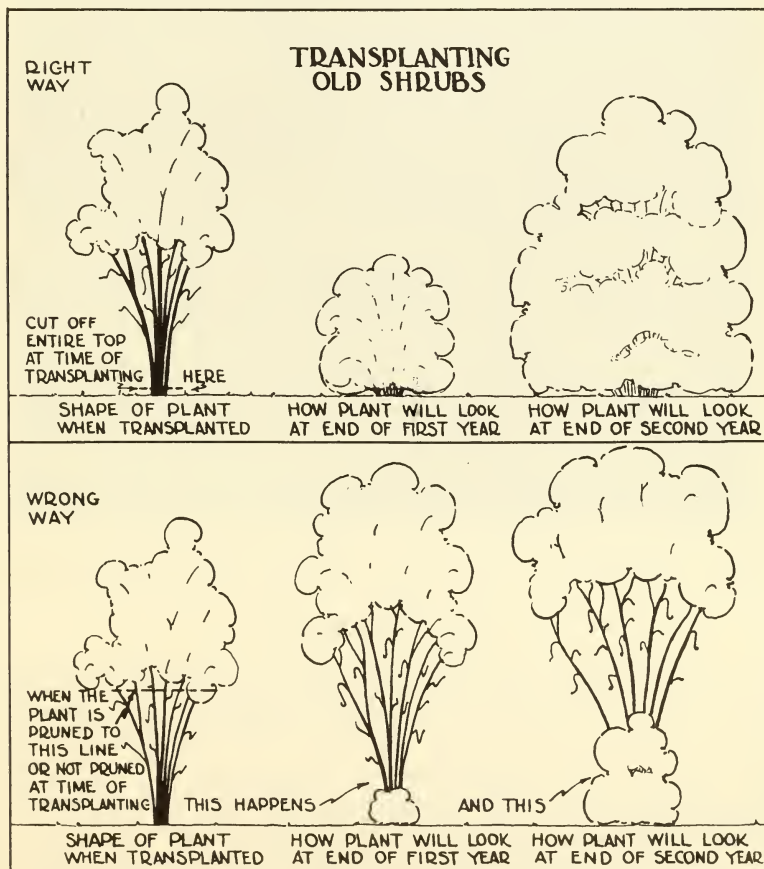


Figure 41



Figure 42—"Leggy" plants cut back to ground make well shaped shrubs the first year

## HOW TO PRUNE

Remove all top. The most drastic method of pruning is to cut back to the ground as shown above. Poorly shaped, "leggy" shrubs, winter killed plants, and plants which have grown too high for a particular situation are usually best cut back to the ground. New growth is fast when top is removed because an extensive root system is present to provide water and nutrients for the top.



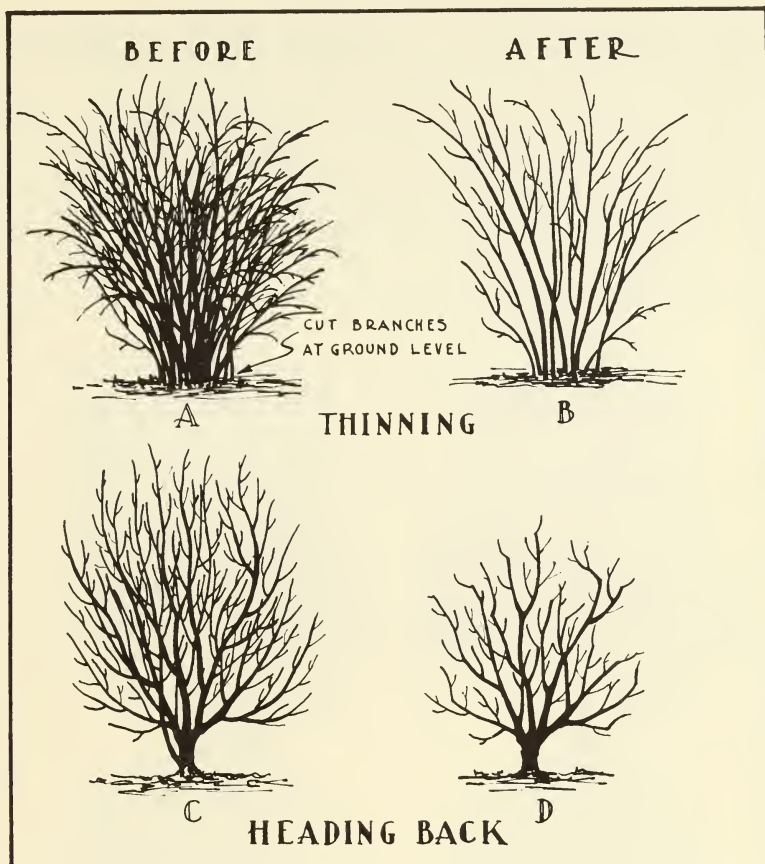


Figure 43

### THINNING

Many shrubs send out shoots each year from the base of plants. These shoots branch and give rise to numerous smaller branches. Each succeeding year the growth of new shoots from a branch becomes less vigorous; consequently, production of blooms will be reduced. If dead, diseased, and older branches are removed each year, the plant is constantly renewed. Whenever growth of shoots on a branch becomes so small that flowering is unsatisfactory or branches become crowded, older branches should be removed at the ground as shown in A and B above. After the first pruning, it is advisable to prune each year. This annual pruning avoids the necessity of severe pruning as shown above leaving the plant looking unsightly until it recovers its normal appearance.

### HEADING BACK

As shown above in C and D pruning is usually advisable when plants have grown too tall for a particular situation as in a foundation planting. Thin out some of older branches and cut back others at points where small shoots arise. Keep the natural shape of a plant as much as possible. New shoots will arise from all parts of the plant when pruning is done throughout the plant, thus producing a more desirable shape.



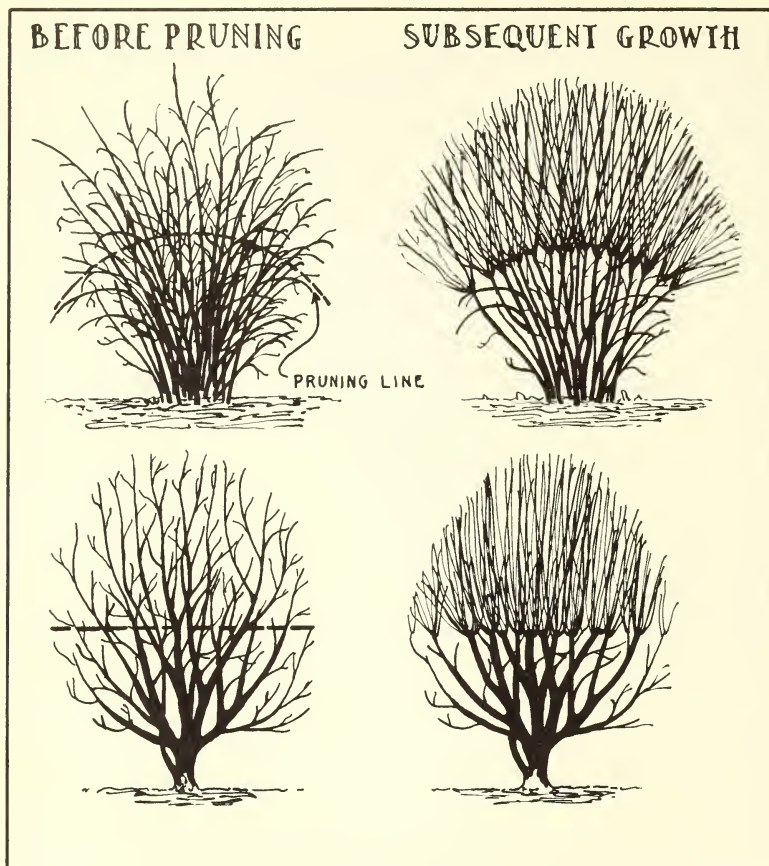


Figure 44—Common mistake in pruning

Heading back to a definite line as shown above produces a thick growth of new shoots at the top only and usually produces an unattractive "leggy" plant. See page 41 for correct methods of pruning.

#### PRUNING NARROWLEAF EVERGREENS

Narrowleaf evergreens are usually pruned only to influence the shape or compactness. Plants such as junipers, arborvitae, and cypresses are often sheared to make the plant more formal and increase the density of the growth. It is imperative that plants such as cannart red cedar and silver red cedar be pruned or sheared several times during the growing season to produce the desired compact growth. Heading back of the lateral branches of other narrow-leaved evergreens such as deodar cedar and pfitzer juniper produces a more compact desirably shaped plant. Plants which have a central leader such as the deodar cedar should be pruned to remove all leaders except one when the plant is small.

#### PRUNING HEDGES

Although the Chinese privet or amur privet is used commonly as clipped hedges in Mississippi there are many other plants adapted to the shaping and heavy shearing required of a formal hedge. Ordinarily the fine textured,

vigorous growing plants are best adapted for hedges. Plants suitable for hedges are by no means limited to shrubs since trees such as pine, and red cedar, make a very satisfactory hedge. Some of the common plants that make a satisfactory clipped hedge are small leaved privets, *Euonymus japonica*, boxwood, cleyera, firethorns, yaupon, carolina cherry laurel, arborvitae, red cedar, shortleaf pine, barberries, deutzias, and flowering quince.

Hedge shearing should start when the plants are not more than 6 to 8 inches high so that a thick growth will be produced at the bottom. If taller plants are used for a hedge the plants should be headed back to a height of about 4 to 6 inches unless the branching is thick near the ground. Old hedges that have become thin or V shaped may be cut back to the surface of the ground and started as a new hedge.

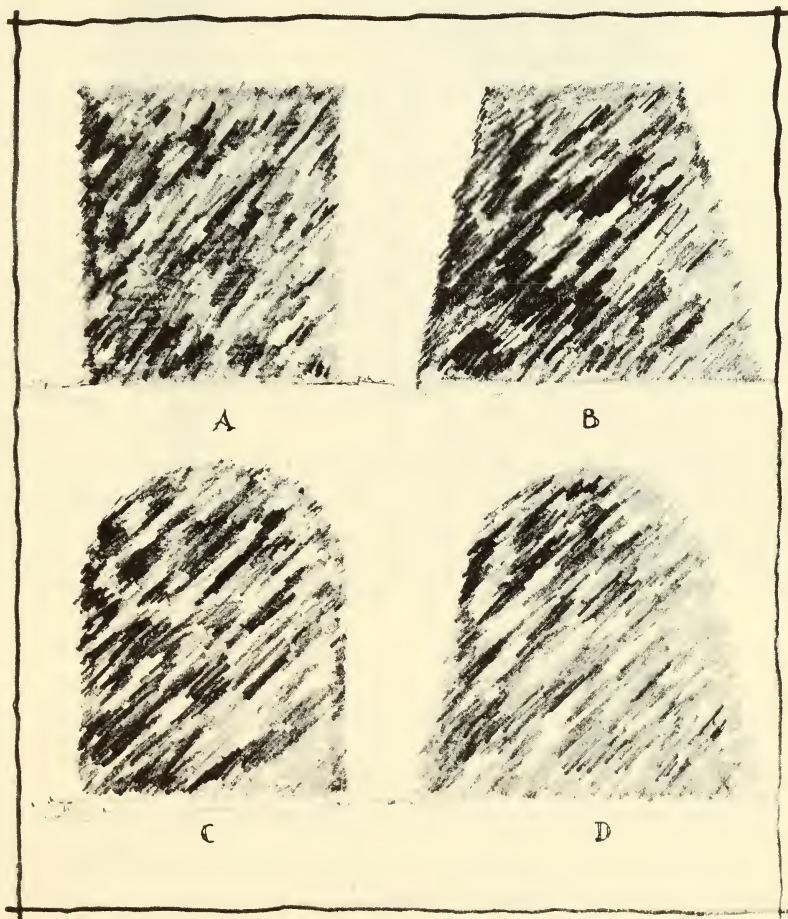
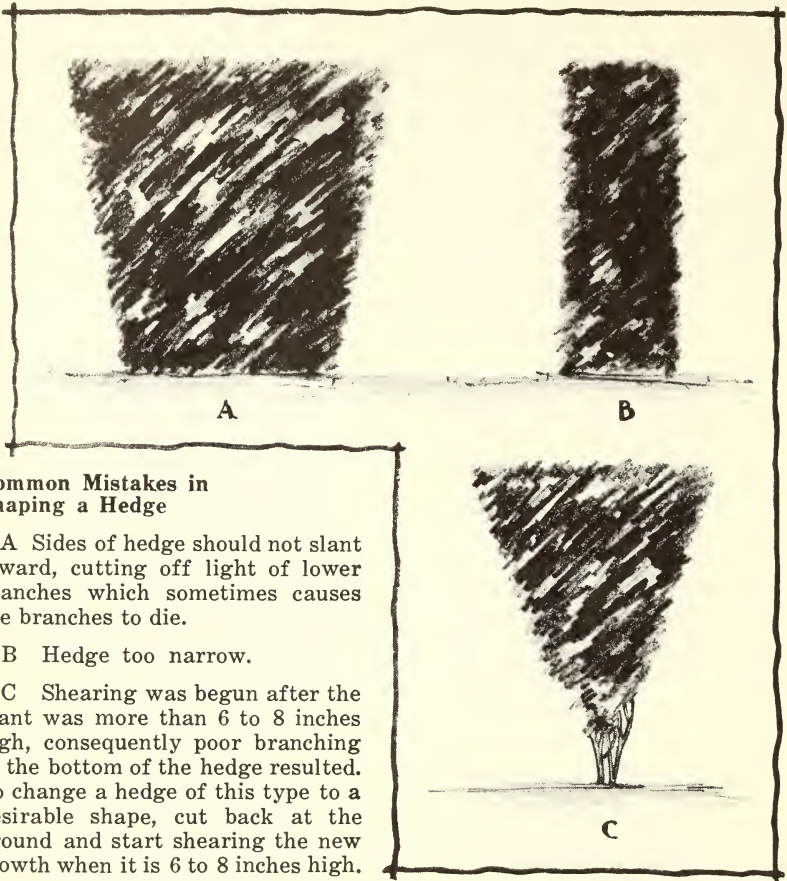


Figure 45—How to shape a hedge

#### How to Shape a Hedge

A hedge 3 to 6 feet wide at the base is more desirable than narrower hedges. Slanting sides as shown in B and D above are more desirable because the foliage gets more sunlight. The flat-topped hedge shown in A and B are easier to cut to a straight line consequently give a neater appearance than C and D.



### Common Mistakes in Shaping a Hedge

A Sides of hedge should not slant inward, cutting off light of lower branches which sometimes causes the branches to die.

B Hedge too narrow.

C Shearing was begun after the plant was more than 6 to 8 inches high, consequently poor branching at the bottom of the hedge resulted. To change a hedge of this type to a desirable shape, cut back at the ground and start shearing the new growth when it is 6 to 8 inches high.

Figure 46

## PRUNING ROSES

There are three general groups of roses and each require a different type of pruning. These general groups are: 1. Shrub roses; 2. Climbers and 3. Hybrid Tea, Tea and Hybrid Perpetual roses.

1. **Shrub roses** are used for landscape effects such as — rugosas, sweet-briars, cherokee and multiflora. Prune this group **after flowering**, remove only dead or diseased canes, and judiciously thin out entire canes when necessary. See thinning shrubs on page 41.

2. **Climbers, ramblers and pillar roses** should be pruned after flowering, removing all canes 3 years old and older. The 2-year wood can be shortened to 3 to 6 feet if the vine is on a low fence or trellis.

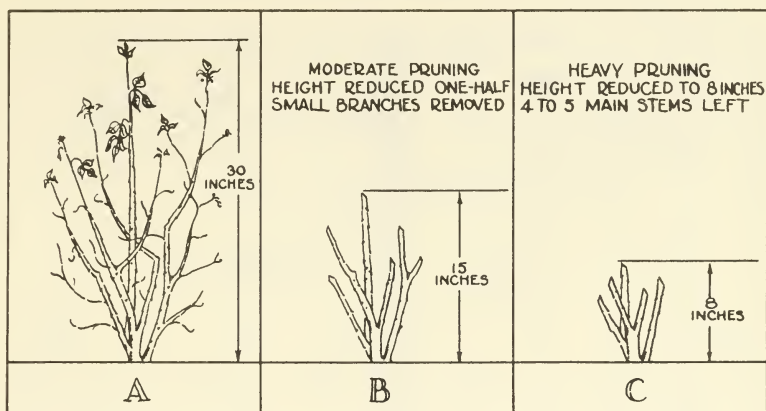


Figure 47—How to prune a hybrid tea rose

### 3. Pruning a Hybrid Tea Rose

The above diagram shows two desirable methods of pruning an established plant. If a few large specimen flowers are desired, with a long season of bloom, heavy pruning (C) should be done. If several flowers of medium size are desired, moderate pruning (B) should be done. Vigorous roses such as *Radiance* and *Etoile de Hollande* will produce large flowers with moderate pruning (B). Weak roses such as *Talisman* and *Lady Hillingdon* should always receive heavy pruning (C) to induce growth.

#### Time to Prune

1. Prune all roses when they are planted, cutting away all of top except 3 or 4 canes and these should be left 3 to 4 inches above the ground. Also cut away broken or bruised roots.
2. Prune hybrid teas, teas and hybrid perpetuals in late February and March.
3. Prune shrub roses and climbers after flowering.

#### Summer Pruning

In cutting a rose, always cut back to a 5-parted leaf as shown by mark labelled (B) and (C) in diagram at right. This position of cut will start several buds on the stem and produce two long-stemmed roses. Had the rose been cut at position shown by mark at (A), only one short-stemmed rose would have developed. If the entire branch bearing the rose is broken off, there is no way for continuing the bloom from that branch.

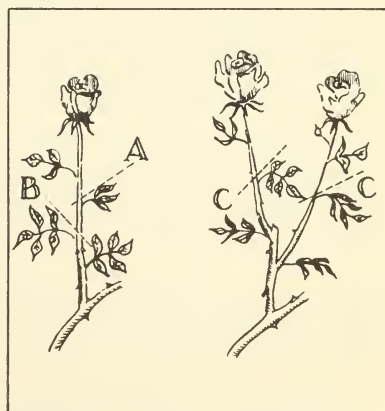


Figure 48



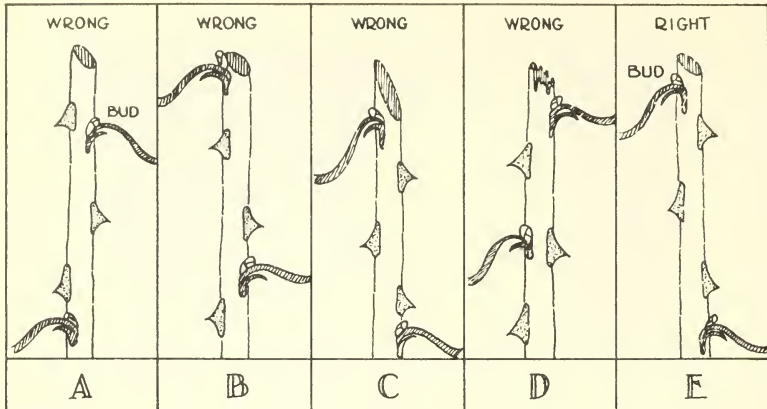


Figure 49

### Where to Cut a Rose Cane

A. Too far from bud. B. Too close to bud. C. Too much slope. D. Jagged cut, damaged bud. E. Correct. Cut one-fourth inch above bud perpendicular to stem.

## GRADING AROUND TREES

Since most of the roots of a tree are found near the surface of the ground, soil should not be excavated underneath the branch spread of a tree. A tree is likely to be injured in grading if as much as a few inches of additional soil is filled over the roots. A fill of heavy soil is likely to be more injurious than light soil. Filling without injuring the tree is difficult because a fill will greatly reduce the air supply for the roots and soil organisms which are found in the soil around the roots. Without an adequate supply of air in the soil around the roots, the roots die. If trees are to be saved it is necessary that provisions be made for an adequate supply of air to reach the roots after the fill is made and that the soil does not come in contact with the bark of the tree trunk above the original ground level.

A simple method of aerating the soil around the roots is to place a layer of large stones over the surface of the ground extending about as far from the trunk as the spread of the branches. Over this spread a layer of small stones or coarse gravel. Place vertical tiles at intervals of about 10 feet to permit circulation of air from the finished grade to the layer of coarse stones. About 2 feet from the trunk construct a well around the trunk to keep the soil from coming in contact with the bark. Soil allowed to remain in contact with the bark of a tree is likely to girdle and kill the tree. See diagram, figure 50, page 47.

Some of the trees most difficult to save in filling about them are evergreens, beeches, red oak and white oak. Some trees easiest to save are poplars, willows and sycamores.

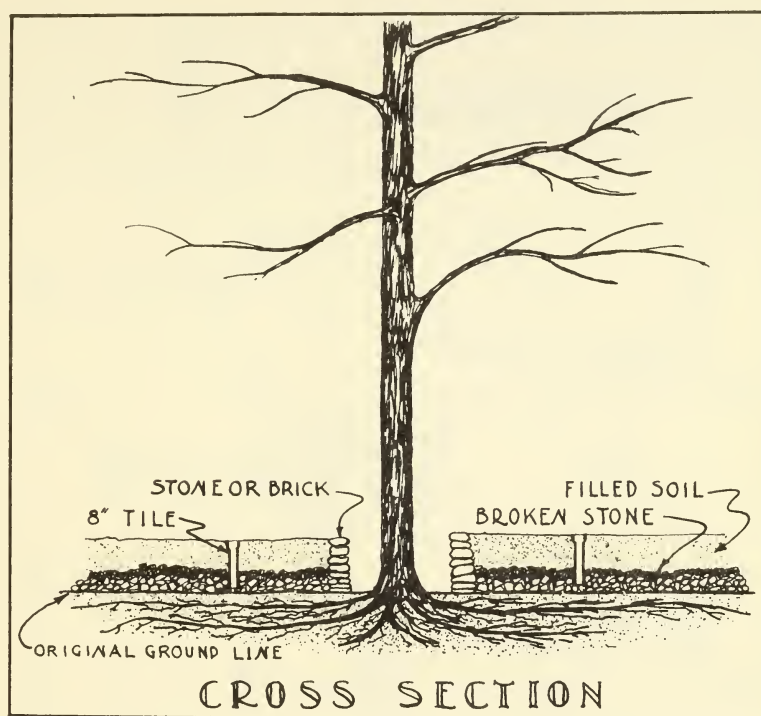


Figure 50—How to fill around a tree

Construct a "dry-well" around the trunk of tree to keep soil from coming in contact with bark of trees. Stone placed on ground to provide circulation of air from vertical tiles to soil around the roots.

## TREE BRACING

Tree bracing is an important phase of tree care and achieves its fullest purpose in preventing rather than correcting damage. Bracing not only prevents the breaking or splitting of parts of trees but prevents the making of wounds which are likely to be entrance areas for rot fungi. There are many situations in which braces should be installed; however, only braces that are fairly easy to install and more commonly needed will be discussed in this bulletin. There are such common needs for bracing as V shaped crotches, long heavy branches likely to be broken by wind, trees close to buildings and trees with inherently weak branches.

Incorrect bracing is often more harmful than helpful. One should use bracing materials which are strong; the installation should be correct from an engineering viewpoint; the installation should injure the tree as little as possible; and the braces should be inconspicuous in place.

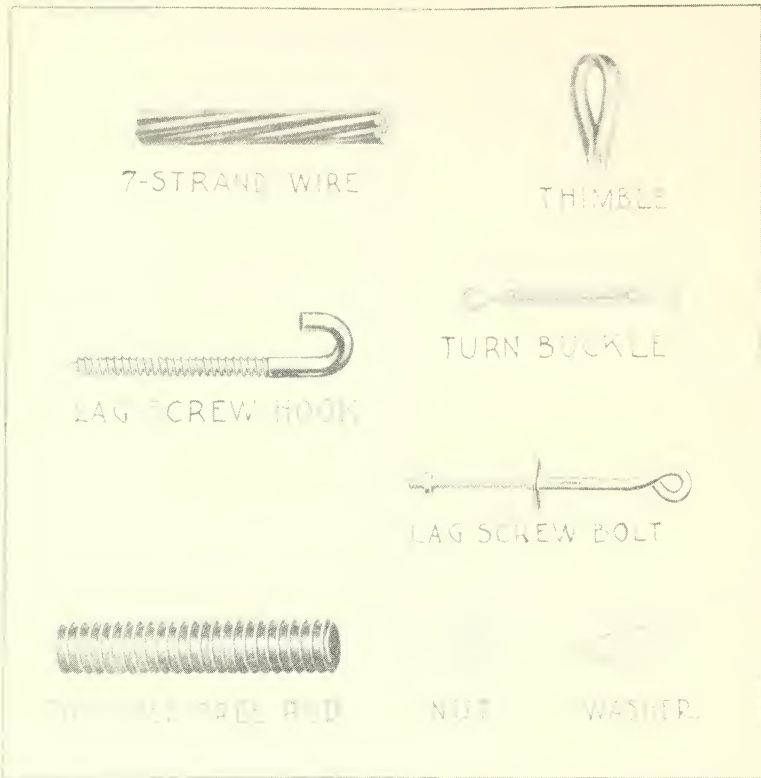


Figure 51

### MATERIALS

Some of the standard materials used for bracing are shown above. Flexible cables made of 7 wire galvanized strands  $\frac{3}{8}$  to  $\frac{1}{2}$  inch in diameter commonly used. Lag screw hooks  $\frac{1}{4}$  to  $\frac{5}{8}$  inch in diameter used to screw in branches for cable attachment.

Threaded screw rod used in crotch bracing

Thimble used to make an eye-splice

Turnbuckles are not necessary in cable bracing, but cables can be made taut easier by using them

Lag screw bolt is used instead of lag screw hook when installation of cable is made in a tree which has very soft wood

Nut and washer used on lag bolt. Diamond shape washer is better than round washer. See page 50 for installation.

### CABLING

Flexible cables used to strengthen weak crotch or branches are usually placed as high in the tree as practicable to achieve a maximum efficiency with a small cable. Usually the cable is placed two-thirds of the distance from the

crotch to the end of the branch, and as nearly as practicable the lags should be installed equidistance from the crotch. Cables should not be placed so that they rub against limbs nor placed less than six inches above a crotch inter-section. Although we have no formula for determining the size cable to use for bracing branches of different sizes, experienced men have concluded that a  $\frac{1}{4}$  inch cable is a safe size for limbs up to six inches in diameter at the point of attachment,  $\frac{1}{8}$  inch cable is satisfactory for limbs up to ten inches in diameter at the point of attachment.

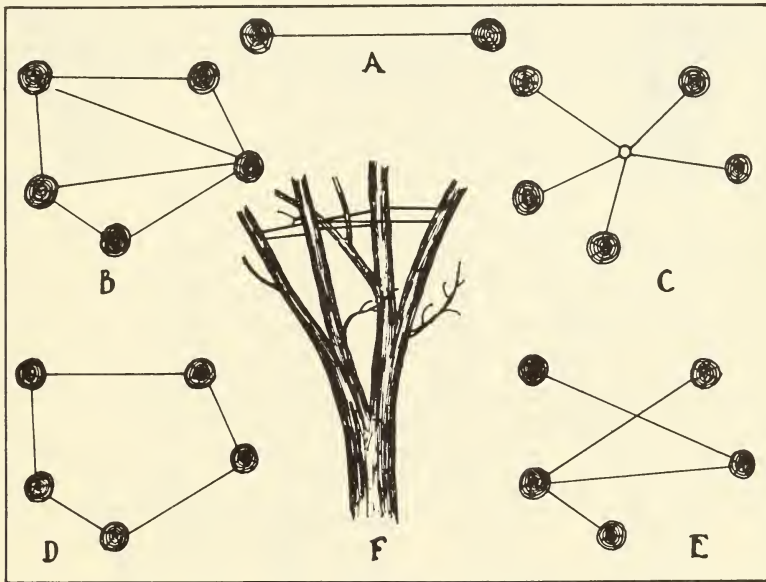


Figure 52

### CABLING SYSTEMS

The above cross-section diagrams show various systems that may be used in bracing branches with cables.

**A Simple Direct**—A single cable directly supporting two limbs arising from a single crotch

**B Triangular**—Probably the best system providing direct support for weak crotches and provides lateral supports which minimize twisting

**C Box or Rotary**—Each connecting limb given lateral support but no direct support of weak crotches

**D Hub and Spoke**—Cables radiate from a ring in center. This system is of minor value since no lateral support and little direct support are provided

**E Multiple Direct**—Direct support provided but no lateral support

**F Perspective of triangular system**



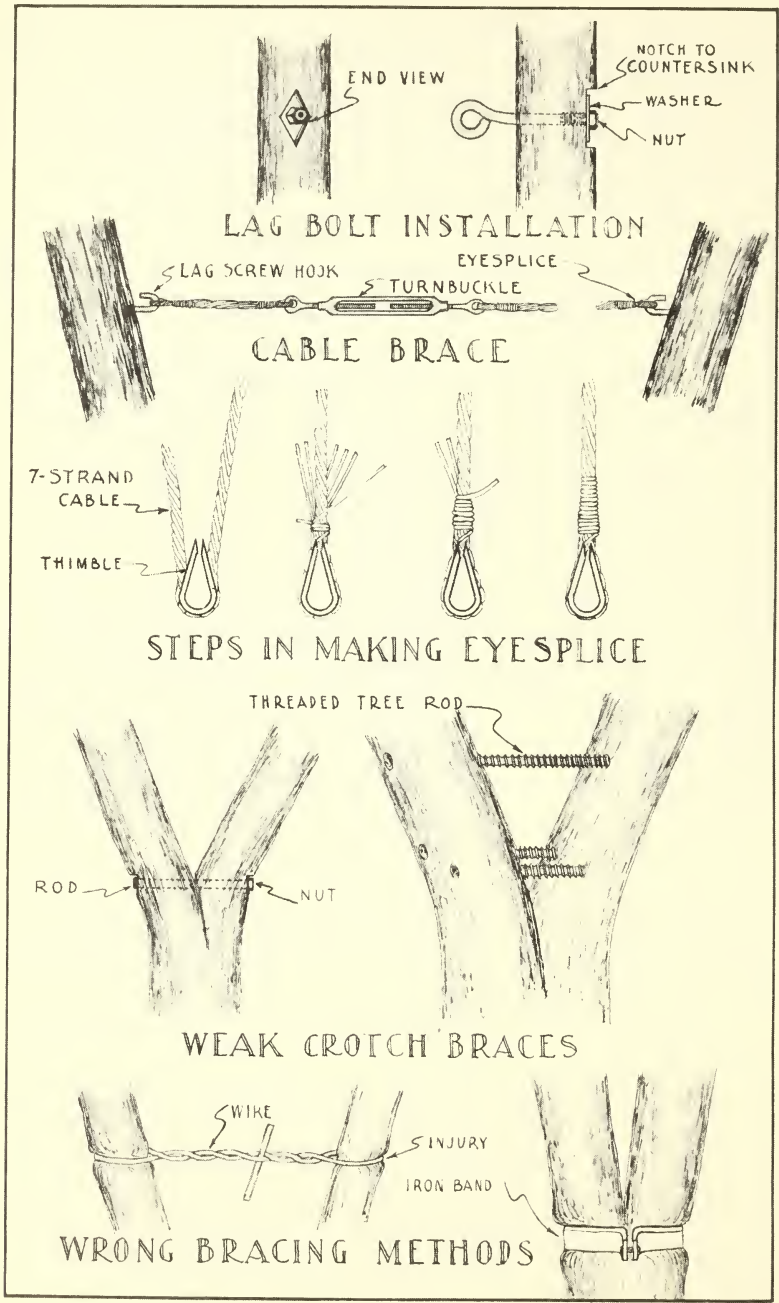


Figure 53

## BRACE INSTALLATION

Methods of brace installation are illustrated on the opposite page and will be described from top to bottom.

**Lag-bolt Installation.** Lag bolts used to anchor the cable are installed by first drilling a hole the same diameter as the lag bolt to be inserted. The hole should be bored so that the bolt and cable will form a straight line. With a chisel notch one end the exact shape of the washer to a depth of about one-eighth inch below the bark. Before inserting bolt, cover bolt with tree dressing so that water and air are excluded. Paint the splices, nuts, washers and wound with tree dressing.

A **Cable Brace** is installed by first locating the position of lag screws on the limb. Lag screws rather than lag bolts are used when bracing trees with hard wood. Lag screws are usually inserted in holes which are drilled one-sixteenth inch smaller in diameter than the lag. Drill hole slightly deeper than the length of the lag thread to prevent splitting, and it should be so drilled that the cable and lag form a straight line at the point of attachment. Lags should be screwed up to a point which will just allow the cable to slip over the hooks. The turnbuckle provides means of the cable being drawn taut. Eye-splices should be made as shown by drawing.

Weak crotches may be braced by using a cable as already shown, by using rods or a combination of these methods. The rigid bracing that a rod provides is not often necessary except in cases of crotches that have already split. In the case of large trees several parallel rods may be necessary for adequate crotch bracing. Such installation is usually better done by men well trained in work of this nature.

Do not make the mistake of placing wires or bands which do not allow the plant to grow normally. Such methods are expensive and injurious to trees.

## INSECT CONTROL

In the control of insect pests some knowledge of how they feed and breathe is essential for best results in using insecticides. So far as feeding habits are concerned insects in general may be divided into two groups, those with biting mouth parts and those with sucking mouth parts. Examples of insects with biting mouth parts are beetles and caterpillars. Such insects have jaws that are similar to a pair of hedge shears, in which small pieces are cut from the leaf, bud, or flower and then chewed and swallowed. Biting insects are usually controlled through the use of stomach poisons. If a plant is sprayed with such a chemical as arsenate of lead, the insect will be poisoned when it eats a part of the plant that is covered with the insecticide.

The sucking insect has a short beak which extends from the lower part of its head. Within this beak are slender needle-like filaments which fit together and form a small tube. The insect pushes this little tube down

through the leaf or other part of the plant and through it pumps up the sap. A stomach poison such as arsenate of lead sprayed on the foliage has no effect on the sucking insects, since they never eat the plant tissue. To control these pests it is necessary to use a material which hits the body of the insect. Such a preparation is generally called a contact insecticide, and nicotine is one of the best known insecticides of its kind. Of the sucking insects, some of the most common are plant lice, mealy bug, and scale insects.

To understand how a contact insecticide kills one must know how an insect breathes. Most insects breathe by means of a system of air tubes which extend to all parts of the body. The air enters these tubes through a series of openings down each side of the insect. Most contact insecticides such as oil emulsion kill by clogging the openings through which the air passes into the body, and the insect dies of suffocation. Other insecticides such as nicotine in the control of aphids enter the openings and penetrate the walls of the tubes, causing damage to the tissues. In still other cases such as lime sulphur in the control of scale insects, the insect's body is corroded by the insecticide. It is evident that a contact insecticide can be effective only when it actually comes in direct contact with the body of the insect. The thoroughness with which the insecticide covers the body of the insect and the force with which the spray material hits the body of the insect will influence the effectiveness of the insecticide. For this reason it is advisable, when possible, to use a high pressure sprayer in the control of sucking insects such as shown, figure 54, page 53.

## DISEASE CONTROL

Satisfactory control measures for diseases of ornamental plants are usually preventives rather than cures. Most diseases can be prevented if control measures are used before the appearance of disease. When once a plant becomes affected with a disease, often the only remedy is to destroy it and start over. In the great majority of instances a disease can be kept from spreading by using certain control measures. The use of fungicides, proper growing condition, healthy propagating stock and strict sanitary measures are the most important practices which the grower can put into effect to prevent disease.

Fungicides commonly used on plants contain either sulphur or copper as the toxic agent. Several mixtures containing one or the other of these elements are available commercially. No one fungicide has yet been found which is effective in the control of all diseases. To obtain effective control the correct fungicide must be used and must be properly applied. Thoroughness is extremely important in applying either sprays or dusts; the entire surface of leaves and stems must be covered. Fungicides are generally more effective when applied before rains rather than afterwards. It is during wet periods that many diseases spread, and the plant becomes diseased unless it is protected by the presence of a fungicide.

Since thoroughness of application is essential it is important that suitable sprayers and dusters be used. Small, cheap equipment often covers the plants only partially, consequently unsatisfactory results occur. Low pressure sprayers do not break the spray into a fine mist and in general are not as effective as high pressure machines.

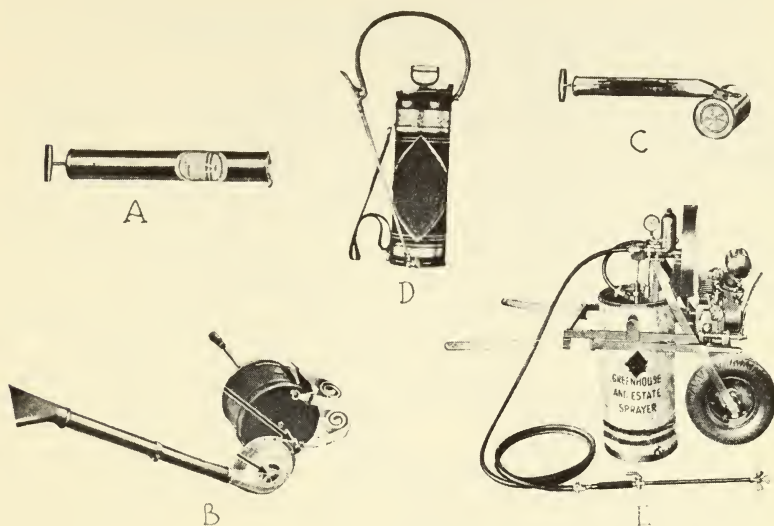


Figure 54

Dusting and spraying equipment: A. Small dusting gun too small for dusting shrubs or trees. B. A desirable type duster that has an agitator and develops a blast of air that prevents clogging and breaks the powder into a fine floating dust. C. Small hand sprayer that is usually undesirable particularly in applying contact sprays. D. A popular type sprayer that is usually satisfactory for ordinary home use. E. Wheelbarrow type power sprayer is efficient and economical for use on estates, parks, and large public areas.



## CONTROL FOR COMMON INSECTS AND DISEASES OF ORNAMENTAL TREES AND SHRUBS

Control during Spring and Summer Season, March to October

Name of Pest	Plants Attacked	Description of Pest	Treatment
Aphids (Plant lice)	Rose, spirea, euonymus, viburnum, many others	Small sucking insects that are green, red, black in color	Spray with 2 teaspoonfuls nicotine*, 1 cubic inch soap, 1 gal. water, or use derris dust
Azalea lacebug	Azaleas, pyracanthas	$\frac{1}{8}$ inch long $\frac{1}{16}$ inch wide. Lace-like wings with brown and black markings	White oil emulsion 3 teaspoons, powdered derris 2 tablespoons, and one gal. water
Bag worm	Arborvitae, red cedar, junipers, other evergreens	Spindle shaped, bag-like shelters. First appear in May	Picking bags in spring and fall. 12 teaspoonfuls lead arsenate to 1 gal. water, or 4 lbs. lead arsenate to 50 gallons water
Black spot (disease)	Rose	Black spots on leaves and stems	Regular application of dry dusting sulphur every 2 weeks. Burn diseased leaves
Camellia scales	Camellias	Cottony mass, small brown specks	White oil emulsion 1/50
Canker (disease)	Lombardy poplar, pussy willow, rose	Cankered areas on bark	Cutting out infested parts in February
Fall web-worm	Elm, walnut, pecan, persimmon, variety of trees	Webbing inclosing tips of branches	3 teaspoonfuls lead arsenate to 1 gal. water or 1½ lbs. lead arsenate to 50 gal. water. Cut out nests.
Flat-headed apple tree borer	Pecan, elm, apple, oak	Boring trees under bark, especially in young transplanted trees and weakened trees	Keep trees vigorous. Wrap trunk. Carbon bisulphide placed in tunnels with eyedropper
Leaf spots	Euonymus, crepe myrtle, camellia, many others	Various color spots on leaves	Bordeaux mixture 4-4-50
Mildew (disease)	Rose, crepe myrtle, variety of plants	Whitish covering of leaves	Regular applications of dry dusting sulphur, every week during rainy weather

\*Nicotine sulphate or Blackleaf 40.

Name of Pest	Plants Attacked	Description of Pest	Treatment
Mealy-bug	Gardenia, azalea	Large cottony masses in forks of limbs	Miscible oil 1-50 with cleaning away of litter
Oleander scale	English Ivy oleander	Yellowish Scale	Nicotine soap* $\frac{3}{4}$ -100-4, when blackberries are in bloom
Red spider	Arborvitae, junipers boxwood, rose many others	Fading of leaves to pale gray color. Leaves covered with fine web. Thousands of tiny mites crawling over plant	Miscible oil 1-50 in early spring, sulphur dust in growing season. Syringe with cold water on small infestations
Rose chafer or other rose beetles	Rose, apple, variety of plants	Yellowish-brown beetle	5 lbs. lead arsenate* and 5 lbs. hydrated lime in 50 gal. water
Slugs or rose worms	Rose, variety of plants	Slugs on leaves are $\frac{3}{4}$ in. long, greenish in color. Skeletonize the leaves	Lead arsenate, 3 teaspoonfuls to 1 gal. water
Thrip	Rose, azaleas camellias many others	Very small; young ones yellow, adults black. Flowers fail to open	1½ teaspoonfuls nicotine, 1 oz. soap, 1 gal. water
Twig blight and Nursery blight	Red cedar, arborvitae, cypress, chamaecyparis	Dead tips of twigs	Prune tips. Bordeaux 4-4-50, or sulphur dust
Whitefly	Dogwood, cape jasmine, laurel, ligustrums, chinaberry, citrus	Small white flies on leaves. Smutty appearance on leaves	Nicotine $\frac{1}{2}$ pt., 2 lbs.* soap, 50 gals. water; or 1 gal. oil emulsion to 50 gals. water
Woolly aphid	Apple elm	Curled leaves	No treatment effective

\*See directions on last page for small quantity measurements.

## Control during dormant season, November to March

Name of Pest	Plants Attacked	Description of Pest	Treatment
Cedar apple rust	Red cedar in winter. Apple, haw, pyracantha in summer	Hard, brown galls in winter. Red gelatinous growth on branches of cedar in spring. Red leafspots on apples	Pick growths off cedar in winter
Cottony maple scale	Soft maples	Cottony matter projecting from brown scales	Oil emulsion 1/40
Euonymus scale	Euonymus bittersweet	Brown scales mixed with small white ones	Oil emulsion 1/40 Continue through season
Magnolia scale	Magnolia	Large waxy white scales $\frac{1}{2}$ in. diameter	Oil emulsion 1/20
San Jose scale	Apple, pyracantha, quince, crataegus, flowering peach, crabs, cherries	Circular grayish scales $\frac{1}{8}$ in. diameter when full grown	Oil emulsion 1/20

\*Oil emulsion is a mixture of oil that will mix with water. The formula 1/40 means to use one part of oil emulsion to 40 parts water. Oil emulsion is sold under several trade names such as Garden Volck, Nursery Volck and Scalecide.

## INSECT AND DISEASE CONTROL MATERIALS AND HOW TO USE THEM

**LEAD ARSENATE:** Use for all leaf feeders such as caterpillars, worms, chewing beetles, etc. The usual rate of application for **SMALL QUANTITIES** is 3 teaspoonfuls of lead arsenate plus 3 teaspoonfuls of hydrated lime in 1 gallon of water. The proportion for **LARGER QUANTITIES** is 1 pound lead arsenate and 5 pounds hydrated lime in 50 gallons of water.

**DERRIS:** A plant extract containing rotenone. It is not poisonous to man but is both a stomach and contact poison to insects. It is used either as a dust containing  $\frac{3}{4}$  % rotenone or as a spray using 6 teaspoonfuls of 4% derris dust to 1 gallon of water.

**NICOTINE:** Used for plant lice, thrips, red spider, white flies and other soft-bodied insects. The usual formula for **SMALL QUANTITIES** is 1 to 2 teaspoonfuls of nicotine sulphate (Blackleaf 40) in 1 gallon of water in which a cubic inch of soap is dissolved. For **LARGE QUANTITIES** use  $\frac{3}{4}$  pint nicotine plus 4 lbs. soap to 100 gallons of water. If a **NICOTINE DUST** is preferred (dust is easier to apply if you have an inexpensive dust gun) it may be made in small quantities as follows: Place 19 ounces of hydrated lime in a gallon molasses can. Add 1 ounce of nicotine sulphate and a handful of small rocks. The cover is then tightly closed and the can shaken vigorously for 2 minutes. The dust is ready for use. It should be used immediately.

**PYRETHRUM:** Used for same purpose as nicotine. It is sold under such trade name as Red Arrow, which is applied as a spray. Directions given on container.

**OIL EMULSION AND MISCIBLE OIL:** These are both used especially for scale insects. The oil emulsion is thick and creamy, while the miscible oil is a clear color like lubricating oil. Both mix readily with water—turning a milky white. For winter applications they are usually mixed at the rate of 1 part oil emulsion or miscible oil to 20 parts of water. The summer sprays are mixed 1 part emulsion to 40 or 50 parts of water.

**DUSTING SULPHUR:** This is very useful in controlling red spider, black spot and mildew. It is a finely divided sulphur dust, and more effective than ordinary flowers of sulphur. Wettable sulphur is available for liquid sulphur sprays.

**CARBON BISULPHIDE:** A liquid gas to treat borers and to eradicate ant nests.

Information about the control of insect pests and plant diseases may be secured at any time from the State Plant Board at State College. Specimens of any insects or diseases causing injury should also be sent to the State Plant Board for identification.