
Oregon Agricultural College Extension Service

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The Long or High Renewal System of Pruning

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CORVALLIS, OREGON

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INTRODUCTION

Pruning cannot be intelligently applied without a thorough understanding of its relationship to the other orchard practices. Fruit is one of the most difficult crops to grow to perfection and at a profit. The method of growing is very complex, including several distinct and equally important parts. These in turn must be varied according to the needs of the trees in the orchard under consideration. No general treatment of the orchard as a whole is sufficient. The general system of soil management should be planned to fit the needs of the average tree of the orchard and should be supplemented by additional manuring or fertilizing of the weaker ones. Each tree should be pruned according to its own needs rather than those of the orchard as a whole. Pest control measures planned for the orchard as a whole and for average seasons must be varied as the seasons differ and as each tree or block of trees shows need of additional treatment. Thinning the fruit of the bearing trees according to the vigor of the tree and set and distribution of the crop, rather than to a prescribed distance apart, is more nearly correct. These treatments combined and not alone are for the purpose of bringing about a rapid growth in young trees and a proper combination of growth and production in trees of bearing size.

The energy of a tree may be used for maintenance and rapid growth, for maintenance and production, for maintenance alone, or for any other combination of these activities. These varying responses of the tree are due either to different *soil moisture supplies* or to different relationships between the *soil foods* (the efforts of the root system in its environment, the soil) and the *air foods* (the efforts of the leaf surface in its environment, the air and light). The control of this soil moisture and the proper adjustment of these relationships should be the main purpose for adopting any system of orchard management. No part of this system should be changed without first considering the effect it will have upon the moisture supply or the relationships.

An effort has been made to chart the many factors which affect the moisture supply and the environments of the roots and leaves of the tree; also to show the effect of these variations upon the appearance and activities of the tree and the necessary changes in the system of orchard management to bring about the desired appearance and activities. At this point the reader is referred to the chart on pages 12-13.

DEFINITION OF PRUNING

Pruning is the removal of superfluous parts of the tree to assist in the direction and control of the remaining parts.

OBJECTS OF PRUNING

A. TO DETERMINE TYPE AND FRAMEWORK OF TREE

1. **Height of head.** The height of the head of a tree is the distance between the ground and the lowest primary (scaffold) branch. It is determined when the first scaffolds are selected by the pruning at the end of the first year in the orchard. The "height of head" is an open question among growers. There is little doubt that for most sections the "low-headed" tree is desirable. Cultivation can be just as conveniently done if the trees are properly handled and the right equipment used. The other orchard practices of pruning, spraying, thinning, and harvesting are much more economically done in low-headed trees. They suffer far less from sun-scald and high winds.

Low headed is a relative term only. Trees with their first branch from 18 to 36 inches from the ground are within the range. The height of cutting-back at planting time should be from 6 to 10 inches higher than the height of head desired. The head of the peach should be from 18 to 24 inches high. This calls for a 24- to 34-inch cutting back at planting time, leaving a 6- to 10-inch space for scaffold limbs to be selected at the end of the first year. Apricots, filberts, and Japanese plums should be headed about the same. Apples, pears, cherries, European plums, prunes, and walnuts are headed from 30 to 46 inches high, giving them a 24- to 36-inch head.

2. **Types of tree.** One of the first problems that presents itself in pruning is the type to which the tree is to be built. The types to be considered are: (1) the leader or pyramidal tree, (2) the open center or vase-shaped tree, and (3) the modified leader or delayed open center tree.

The "leader type" is developed by allowing the trunk of the tree to extend up through it as a permanent center. The scaffold branches are well distributed around and up and down this trunk. This type of tree has the advantage of being very strong and growing to large size. On the other hand, it has the disadvantage of being inclined to be very dense and grows very high. It is particularly suited to the English walnut.

The open center tree is developed by selecting from three to five scaffold limbs radiating from the trunk at about the same angle and equally distributed about it. From the time of planting, no leader is allowed to develop in the tree. The scaffolds are kept in perfect balance and the center of the tree completely open. This type of tree is particularly suited to the prune, peach, apricot, and Japanese plums or to those varieties which bear their fruit largely upon one-year-old wood and new spurs. This tree can be cared for economically; but in the case of many kinds of trees the fact that the scaffolds come out from practically the same point is apt to cause splitting.

The modified leader type of tree is the most sensible type for most fruit trees. This is a modification of the other two types. It combines the openness of the open center tree and the strength of the leader tree. It is developed by selecting scaffold branches well apart up and down as well as around the trunk. The trunk extends from 2½ to 4 feet above the first scaffold. Apples, pears, cherries, European plums, and filberts

should be built after this type. It is ideally suited to the "long system" of pruning as developed here in the West.

3. Spacing of scaffold branches. In all types of tree it is best to have the scaffold limbs as equally distributed around the tree as possible. It is of equal value to have them distributed up and down the trunk whenever possible. Here is where the "modified leader" type of tree has the advantage over the "open center" type. These scaffolds can and should be distributed from 6 to 12 inches or more apart. No trees built on the "modified leader" plan should have their scaffolds closer than 6 inches up and down the trunk nor one quarter of the way around it. With apple and sweet cherry trees, 8 inches should be the minimum, and with the English walnut, 12 inches. This will mean that

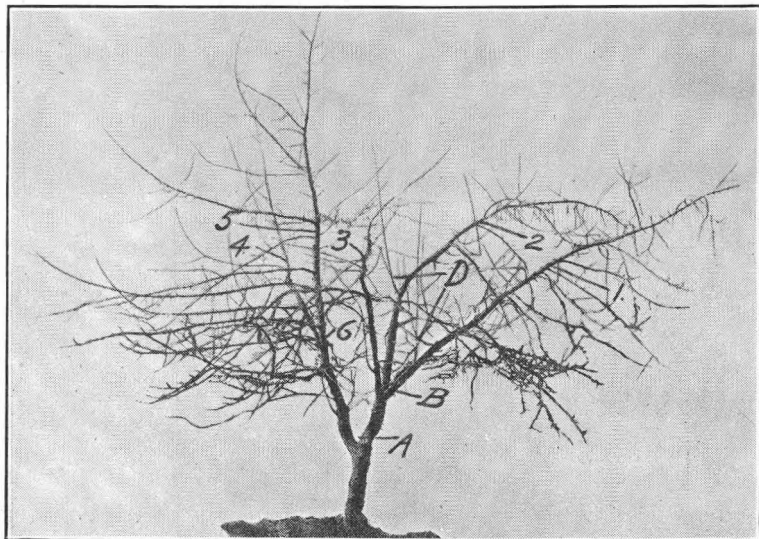


Fig. 1. Apple tree with five branches, each showing the proper leadership and showing also the spread resulting from the first two heavy crops of fruit.

A. Equal balanced crotch, due to the tree being started as a two-branched tree.

B. Bad crotch, due to breaking of one of the original branches into triplets at this point.

C. Bad crotch, due to breaking of one of original branches into twins at this point.

1, 2, and 3. Branches each showing the proper leadership, a good distribution of secondary branches, and the spread resulting from the 1921 and 1922 crops. The renewed growths at point D on branches 1 and 2 for replacing old branches as they become too low.

4 and 5. Branches showing proper leadership and development but not showing as great a spread resulting from the two crops due to their position against the prevailing wind. The 1923 crop has spread them both in fine shape.

Artificial bracing at A, B, and C is advisable.

the leader and two or three and sometimes only one scaffold branch can be selected at the end of the first year. Other scaffolds can be selected a year later from the new leader and others even a year later if necessary to get the desired number of scaffolds. From 3 to 6 scaffolds are sufficient in the "modified leader" tree.

4. Balance of scaffold branches. The scaffold branches should be kept in perfect balance. Their rapidity of growth differs one from

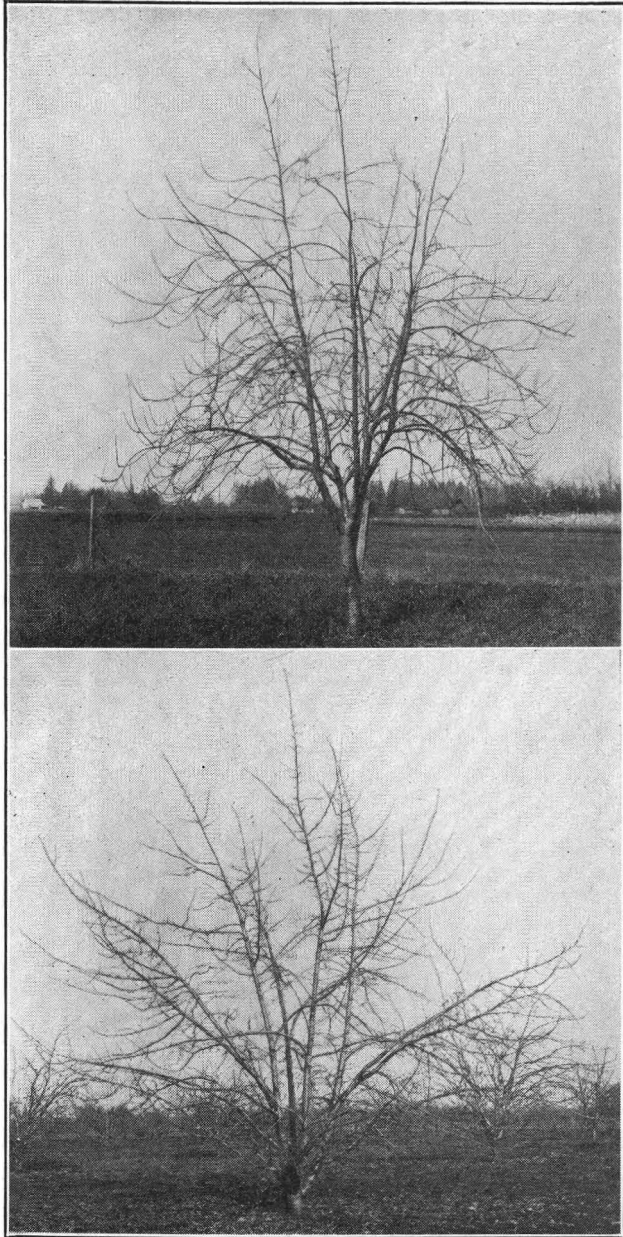
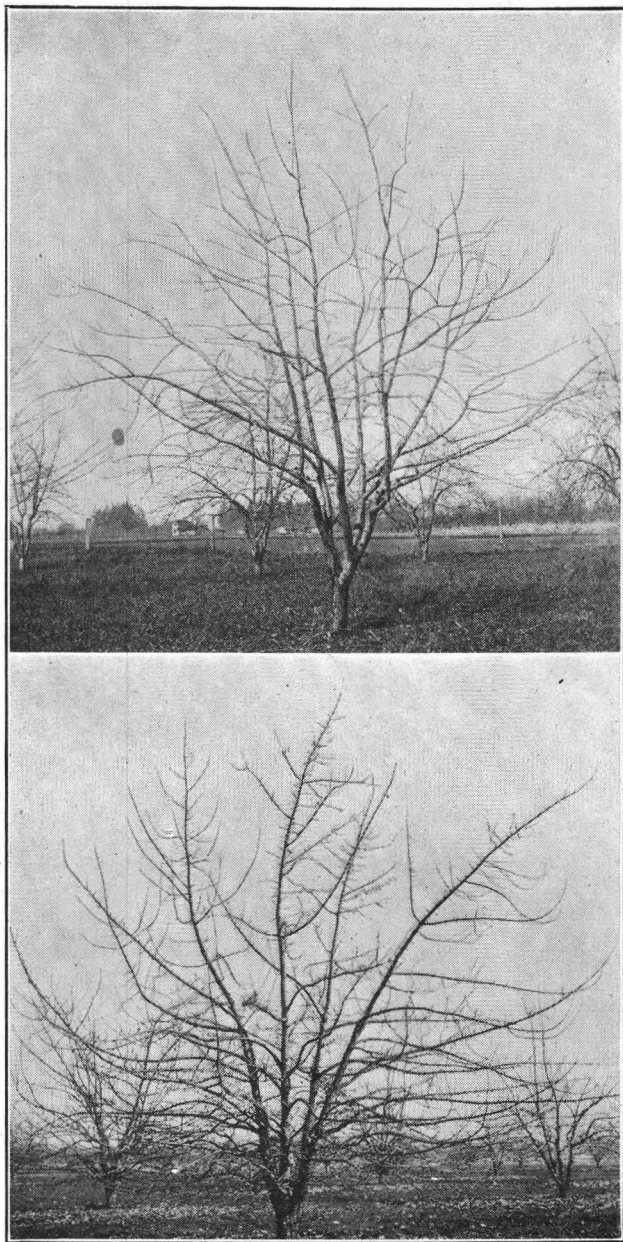


Fig. 2. Rome, Grimes, Newtown, and Gravenstein apple trees showing poor distribution of scaffold branches on trunk, but good development of leadership and distri-



bution of secondary branches, fruit hangers, and spurs. No heading pruning has been done on these trees since they were three or four years old.

another as their leaf surface, the uprightness of their position, and their light accommodations differ. The pruning and training of these scaffold branches should be for the purpose of equalizing these three growth requirements. An annual thinning-out and heading-back of the stronger growing scaffold branches severe enough to reduce their leaf-bearing surface to that of the weaker ones will tend to bring about a more equal growth. A separation of the more vigorous, upright scaffold branches by means of spreaders and a tying up of the less vigorous, more spreading ones to a more upright position will also tend in this same direction. At least the custom of cutting the strongest scaffold branch most and the weakest one least should be continued so long as this unbalanced condition exists.

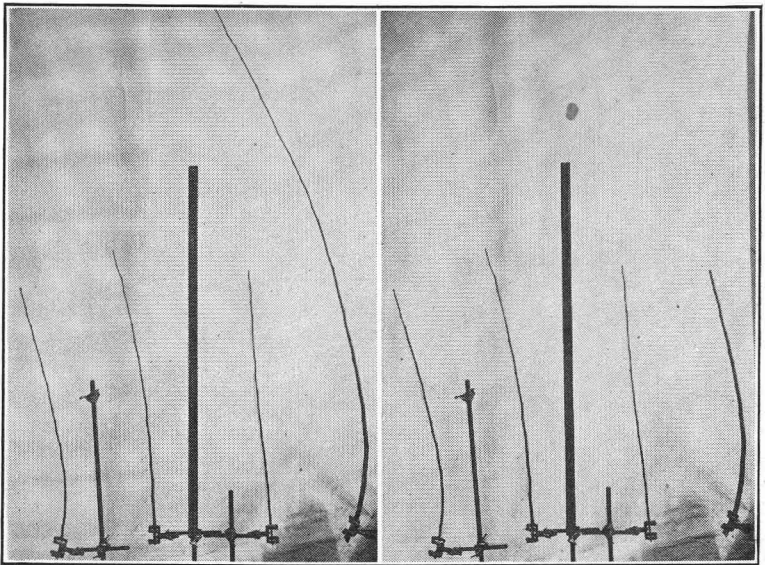


Fig. 3. Variation in length of shoot growth produced by an apple whip its first year in the orchard. This variation must be overcome by cutting back the stronger ones to fit the weaker ones if the proper balance between them is to be established.

Where prevailing winds exist, it is worth while to pay close attention to "bud pruning." Always prune to a bud on the upper and inside of the scaffold branch away from the wind. This will give it a more upright growth and will tend, to a certain extent, to overcome the effects of the wind. The scaffold branch against the wind should be pruned to the bud above the one on the outside of the branch, which is in the proper place to continue the lead of the branch. The top bud left will make the most upright growth and will soon be whipped over by the wind, while the next one will start a more spreading growth, due to its secondary position, and will have to be lifted to an upright position by the wind before it is finally whipped over. The growth made by the first bud is removed at pruning time, leaving the other one with its greater growth into and against the wind as the lead of the scaffold branch.

5. **Proper leadership.** Strong branches cannot be developed unless each of them has a definite lead. A scaffold limb should never be allowed to break into twins or triplets. There should be no competition for leadership within the scaffold branch. Where twin or parallel branches exist, no secondary branches can develop from the sides facing each other. The load of fruit will be so distributed on each branch that there will be a heavy strain upon the weak equal-balanced crotch where they unite. This is sure to result in a loss of one or both of them. By developing and maintaining a midrib or leader in each scaffold branch all weak crotches and parallel branches are avoided. A few scaffold branches with a normal distribution of side branches are worth considerable more than a large number of pole-like branches.

6. **Distribution of secondary branches and fruiting wood.** Secondary branches should always be what their name implies, secondary to the scaffold or main branches. They should never be allowed to develop too near to the trunk, or on the inside of the lead of the scaffold limb, but always on the outer half. If permitted to develop on the inside of the main branch they will be sure to ride or rest upon it when the tree is carrying a crop of fruit. At the beginning of the growing season, the secondary branch should always have considerable less leaf-bearing area than the main or parent branch carries beyond the juncture of this secondary one.

Fruiting wood will develop in abundance if the tree is built loosely enough. The first secondary branch on a scaffold limb should be at least 16 inches from the trunk. This means that the scaffold should not be cut shorter than 18 inches on one-year-old trees if secondary branches are to be developed. If at the end of the first year, the tree has not made enough growth to produce laterals long enough for this kind of heading, accept the fact that it has lost a year and take another year to grow it the right length.

The secondary branches should be selected from the moderately broad-angled, side shoots which develop just back of the place where the scaffold branch was headed. If any of these side shoots develop at extremely sharp angles and as real competitors of the natural lead or continuation of the scaffold, they should be removed if other side shoots are growing at a broader angle; if not, they should be retained but dwarfed by a heavy heading. All spurs and a limited number of extremely broad-angled, short shoots, should be retained for future fruiting wood. If any of these later develop into rapidly growing shoots they should be removed at the next dormant pruning.

A year later, the second selection of secondary branches should be made in the same way as the first. This second selection should be at least 18 inches above those selected the first year and never directly above nor parallel to them. Other secondary branches should be selected as the scaffold limb develops in length. They should be a little wider apart as they progress up the scaffold branch. They should be well distributed around the outer half of this branch. Fruit hangers and spurs should be well distributed on all sides of it.

Each secondary branch should be built and developed along the same plan as the scaffold branch, only on a smaller scale. The side

branching on them should be on the outer or under half and never between them and the parent branch. Scaffold branches as well as secondary branches should be more compactly built at their base, loosening up as they develop.

7. Proper spread of tree. A tree to be able to carry a proper load of fruit must have spread or width as well as height. The method of securing this spread is of great importance. It should not be secured by pruning, as persistent efforts along this line are largely responsible for the weak framework of many fruit trees of today. Cutting to a lateral for spread invariably leaves a weak place in the branch. The weight of the fruit borne by any lateral acts as a leverage upon its point of contact with the parent branch. When the parent branch is cut away, additional vigor and productiveness are forced into the lateral to which it was cut. The increased weight of foliage and fruit upon this lateral adds an additional strain upon the point of contact which has been weakened by the removal of the parent branch. This results in a high percentage of breakage and loss of bearing surface. It also dwarfs the tree almost in proportion to the amount of wood removed by the removal of these parent branches.

The natural and economical way to spread the branches of a tree is by the weight of fruit. *Build the branch in such a way that this pull of the crop will be all in one general direction and the spread is sure to come.* When the scaffold branches are allowed to develop with straight unbroken leads with the secondary branches all on the outer sides there will be very little overlapping of branches as they come down. This spreading will take place gradually, the branches strengthening as they come down. The amount of breakage will be very small. Keep the branches loosely built, with the bulk of the weight on the outer side, and a broad, well-spread tree will result.

8. Renewal and raising of drooping branches. Trees built after this fashion will be very low and spreading, too much so in fact, unless a system of renewing the upright scaffold branches and removing the tips of the drooping ones is practiced. As the scaffold branch gradually comes down under its weight of crops, pruning should be speeded up. The nearer the branch approaches a horizontal position the more pruning it should receive. Such pruning slows up the bending process and lengthens the productive life of the scaffold branch while it is being renewed.

The system of renewal is a very simple one. The bending scaffold branches coming down under their crops of fruit are always sure to send up plenty of vigorous growth from their upper sides. A few of these upright shoots should be selected for a continuation of the scaffold branch. They should be four to six feet apart, the one farthest back being four to six feet from the center of the tree. The one nearest the center is the permanent continuation of the scaffold branch and should be built exactly as the original scaffold branch was built. The others are only temporary and make convenient places to cut to when the tip of the old branch beyond them becomes too drooping to clear the ground under its crop. They are a succession of heading-back places as the branch settles more and more under its crops, until finally nothing is left but the new scaffold branch developed from the innermost upright growing shoot. It in turn will go through the same process of

spreading, renewal, and elimination, the tree gradually gaining a strong, heavy and spreading framework which cannot be secured in any other way. The only large cuts ever necessary are on the under side of the newly developing branches. The strain of the crop pulls toward these cuts rather than from them as is the case when the lead is cut to a lateral.

B. TO INFLUENCE FUNCTIONING OF TREE

9. Balancing root and top at planting time. The nursery tree goes into the dormant season with a balance existing between the root and the top. The root is just able to supply enough soil foods to balance the air foods for a good growth and a ripening of the wood and buds for the coming dormant season. When this tree is dug from the nursery a large part (50 to 75 percent) of the absorbing part of its root system is cut or broken off, destroying the balance between root and top. Unless the top receives a pruning at planting time, together with a removal of the buds six to ten inches from the top down, heavy enough to reduce this leaf-bearing surface to fit the depleted root system, it will evaporate more moisture than the roots can supply. This will result in the loss of more trees than necessary and a stunted, unsatisfactory growth in the others. If the soil moisture and fertility conditions are suitable for good growth, nothing will keep newly planted trees from making such a growth excepting this unbalanced condition between the root and top. Prune at planting time not only to determine the "height of head" of the tree, but to bring back that balance between root and top which was seriously upset when the tree was dug from the nursery.

10. Growth of tree. The tree enters the dormant season with a balance between root and top. It is also better supplied with stored food at this time of year than at any other. If the balance between root and top is not disturbed by pruning or otherwise, this stored food and the efforts of the root and leaves of the tree will be used during the following spring and early summer for making a uniform growth throughout the tree. The roots, trunk, and branches will all increase in size during this growing period. If this balance is disturbed by either root or top pruning, the first energy of the tree and the first stored food to be used in the early spring will be for replacing the cut-away top or root. The other part of the tree will practically stand still until this balance is regained, and then the tree as a whole will make a smaller growth than it would have made had its balance been undisturbed.

Devitalized trees, which have made no appreciable growth for a number of years, may be invigorated and forced into general growth by a top pruning, although the most permanent and surest way of invigorating devitalized trees is by improving the fertility of the soil rather than by pruning. All trees making good growth will be dwarfed in proportion to the amount of pruning received. Vigorous young trees heavily pruned will appear to make or may actually make larger individual shoot growths than similar trees lightly pruned. But the lightly pruned, vigorous tree usually makes more total shoot growth and always makes more root and trunk growth than the heavily pruned one. It also completes its growth earlier in the season and stores up a larger food supply than the heavily pruned tree. This high storage of food makes the tree more resistant to winter injury.

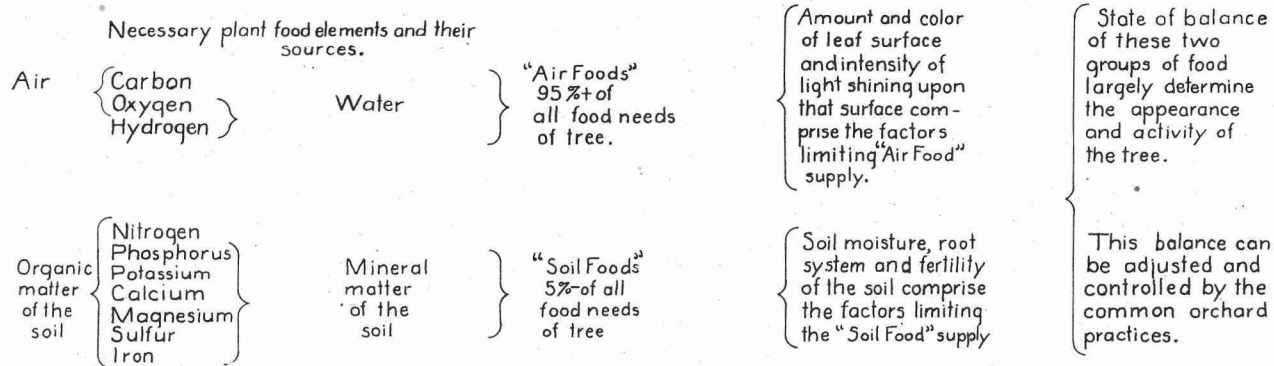
FACTORS AND PRACTICES AFFECTING GROWTH AND FRUIT PRODUCTION

FACTORS GIVEN IN ORDER OF THEIR IMPORTANCE

I SOIL MOISTURE.

Drain or irrigate if needed. Plow early. Cultivate thoroughly. Increase organic matter of soil by manures and cover crops.

II BALANCE BETWEEN "SOIL FOODS" AND "AIR FOODS."



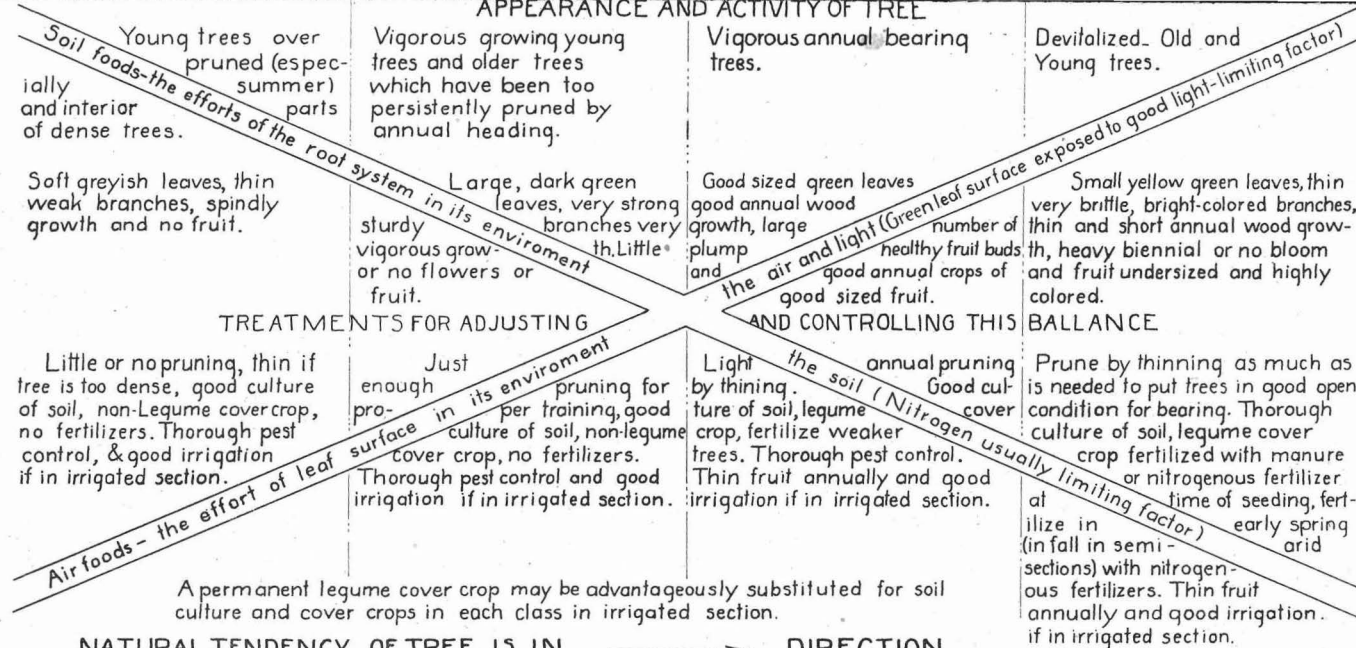
Soil moisture is used to dissolve soil fertility and to carry it to the leaves. Most of it is then transpired or evaporated into the air. A small part is retained by the leaves and combined with carbon of the air and oxygen of the air or water into "air foods."

RELATIONSHIPS OF AIR FOOD AND SOIL FOOD TO EACH OTHER

AND

THEIR EFFECT UPON APPEARANCE AND ACTIVITY OF FRUIT TREES AND

METHODS FOR CORRECTING THESE RELATIONSHIPS



NATURAL TENDENCY OF TREE IS IN \longrightarrow DIRECTION
 INTENSIVE SOIL MANAGEMENT FORCES TREE IN \longleftarrow DIRECTION
 PRUNING FORCES TREE IN \longleftarrow DIRECTION

Pest control and fruit thinning do not materially affect these relationships.

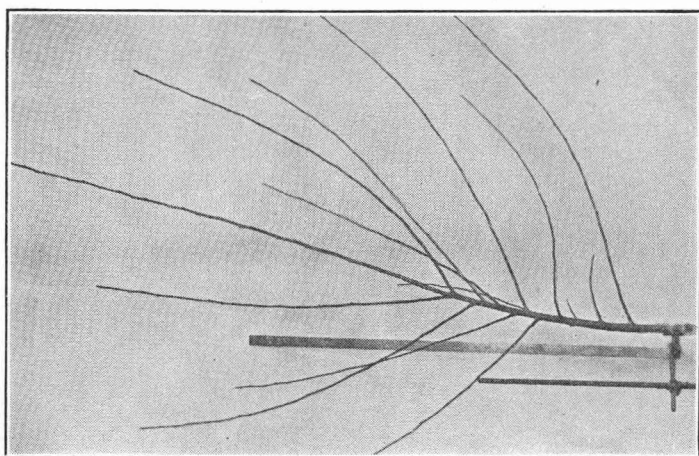
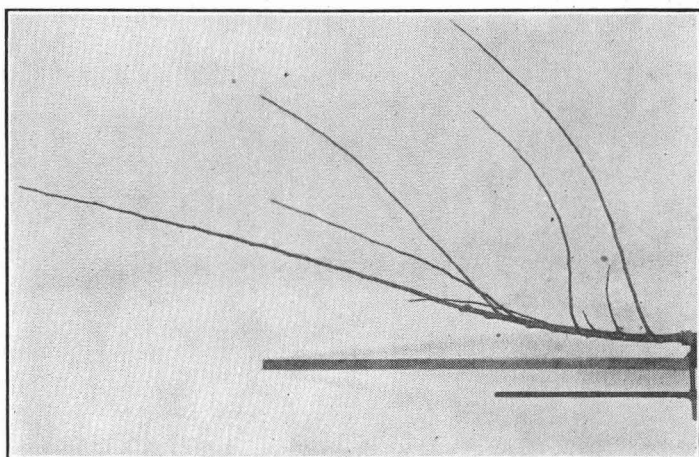
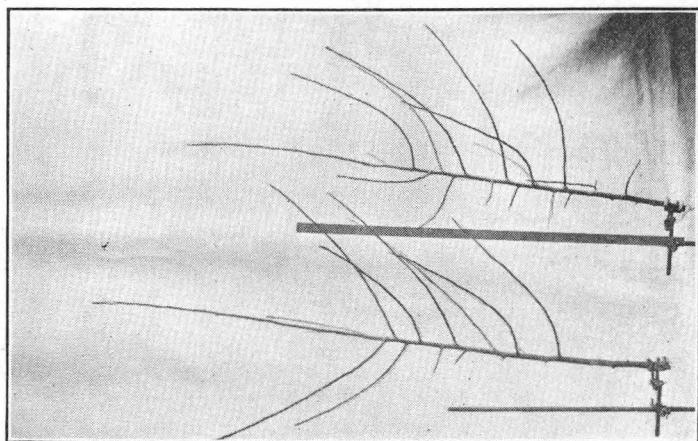
III PEST CONTROL.

Pest control prevents devitalization of tree and injury of fruit by insect, disease or rodents.

IV FRUIT THINNING.

Fruit thinning increases the size, color, and quality of the fruit, prevents breakage and extreme drooping of branches, and helps to maintain the vigor of the tree.

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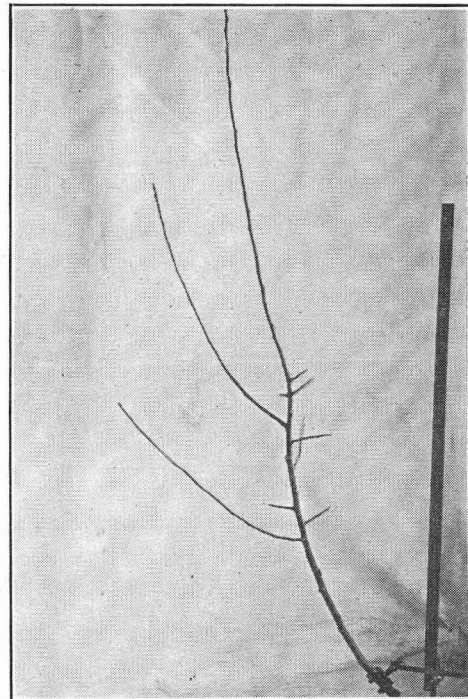
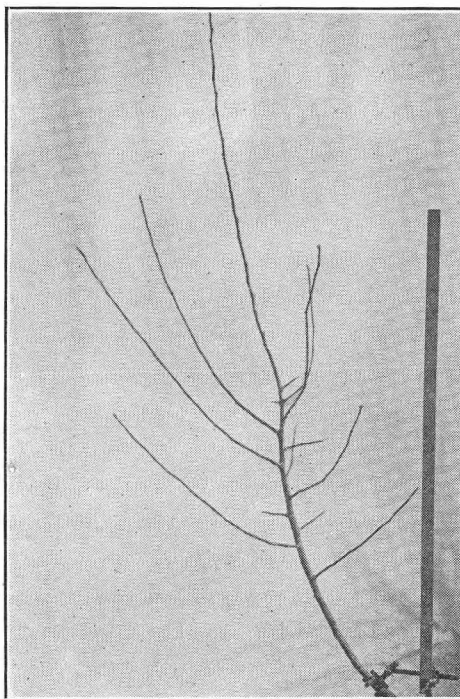
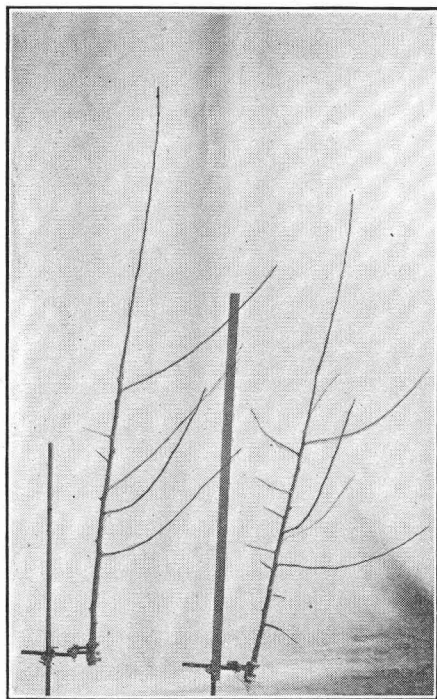


Fig. 5. *Upper:* The growth made by the same four shoots shown in Fig. 3 the second year in the orchard. Note the difference in the growth made by the one headed and the three not headed. *Lower:* Same after pruning. Leadership maintained and secondary branches selected on one side only. Broad-angled shoots and spurs kept on all sides.

11. Early bearing. Pruning not only has a dwarfing effect upon vigorous trees but retards bearing as well. The unpruned tree will reach bearing size, form fruit buds, and bear fruit before the pruned tree. The unpruned tree will have no balance between branches, will be very dense, and be inclined to bear its crops near the ends of the branches or outer part of the tree. Just enough pruning to direct and control the growth of the tree will not materially retard bearing and will give much better distribution of bearing wood and balance between branches. A loosely built tree will form many more productive fruit spurs than a tree having the same amount of top but more compactly built. Thinning-out pruning is the least discouraging to early bearing, while heading-back pruning discourages it the most.

12. Prolonging the productive life of fruiting wood. The first spurs often become devitalized and unproductive as trees become older. This is due not to the age of the spur so much as it is to its environment. A spur kept properly vigorous will continue to produce for a number of years. The two essentials for prolonging the productive life of fruit spurs and hangers are light and soil fertility.

The upper third of the tree should be by far the thinnest part of the tree. Light must percolate through it to the lower two-thirds of the tree. The next or central third of the tree should be somewhat denser but thin enough to allow entry of sufficient light to the lowest third of the tree. This last third, the lowest part of the tree, where fruit can be produced most economically, should be the densest part of the tree. The fruiting wood on this part of the tree is usually the least productive on account of heavy shade. The first step in prolonging the life of fruit spurs and hangers is to thin out the top of the tree and keep it thinned. Heavy shade is responsible for the short life of more spurs and hangers than any other one thing.

If the tree as a whole is devitalized, removing partly or entirely some of the spurs and hangers (spur pruning) may be necessary to reinvigorate the remaining ones. The natural spreading of a tree under its crops of fruit always results in an invigoration of the fruit spurs and hangers on the interior part of the tree. This is due to a better light supply and a restriction of sap flow through the bending branches. Keeping up the fertility of the soil is always necessary for prolonging the life of these spurs and hangers. Building a tree loosely and keeping it vigorous and properly thinned out is of first importance in keeping this fruiting wood active.

13. Size and color of fruit. Pruning properly done will not materially affect the size of fruit, unless soil moisture and fertility are the limiting factors. Of course the real remedy here will be a building up of the soil fertility and its water-holding capacity. While doing this or where this is out of the question, the upright branches should be thinned out and the fruiting wood and drooping branches thinned out and headed-back to fit this shortage.

The set of fruit and vigor of the trees are the two things determining the size of fruit. A very heavy set of fruit and a lack of vigor in the tree always means small fruit. Pruning should be used as a supplement to soil building and fruit thinning to correct this fault, but pruning, alone, should not be expected to correct it. Pruning for vigor, unless the

tree has been standing in a devitalized condition for a number of seasons, is usually a waste of bearing wood and does not permanently invigorate. Thinning the fruit by pruning removes the leaves as well as the fruit and does not give the results that thinning the fruit itself does. Pruning for a better diffusion of light to the fruit will materially increase the red color. The pruning may be severe enough to increase the growth and size of leaves sufficiently to shut out the light rather than let it in, which would materially cut down the red color. Trees of bearing age should be kept thin enough to allow diffusion of sufficient light for coloring the fruit.

14. Rejuvenation. Rejuvenating devitalized trees is a much more difficult task than keeping them from becoming devitalized. Such trees annually store their surplus of air foods which cannot be used until sufficient soil foods are available for balancing them. The longer the tree remains in a devitalized condition the more strenuous the treatment will have to be to invigorate it.

Pruning will be a big factor in this process of rejuvenation. All dead and badly diseased branches should be removed. Where more than four to six scaffold branches remain, remove them, giving sufficient space for a proper development of side branches and fruiting wood. If any of the remaining branches are divided into twins, break them by removing one or severely heading it to a side branch. Reestablish the lead in each scaffold branch by thinning to a single shoot, selecting one of the many resulting shoots if they have been recently headed. Remove all branches of any size on the inner side of the scaffold branch, minimizing the weight of the fruit on this side, permitting the weight on the outer side gradually to pull the branch in that direction.

If the former pruning of the tree has built the branches too high and in such a way that the crops cannot bring them down, the high parts should be cut away, always cutting to laterals or side branches. If there is a chance of the branches finally coming down under their crops, do not head them but put up with the high parts until they do come down. The tree then, with its greater spread and permanently low top, will in all ways be much more satisfactory to work with.

If the fruit spurs and hangers are over numerous, they should be thinned out by cutting away some of them altogether and parts of others. This latter type of pruning, with its many small cuts distributed evenly throughout the tree, will invigorate the remaining spurs and hangers more than any other kind of pruning. This is due to the fact that the influence of any pruning is near the cut. This fine pruning will invigorate without forcing water sprouts, while the cutting of large branches will be sure to force a number of water sprouts near the cut.

Water sprouts should be removed in June or while they can easily be pulled off by hand. They should never be allowed to unite with the wood of the tree enough to cause a sliver of wood to pull off with them, splitting the bark of the branch from which they are taken. If allowed to get old before they are removed, it is best to cut them off. Some of them may appear again after this early summer removal, and should be removed in the same way. Water sprouts taken out in this way in the early summer are not so likely to return the next season as those pruned off during the dormant season.

C. TO FACILITATE OTHER ORCHARD PRACTICES

15. Soil management. Cutting off the low branches of a tree will greatly facilitate plowing and cultivating in the orchard; but at the same time, if carried to the extreme, will also decrease the yield and increase the cost of production greatly out of proportion to the savings made in the plowing and cultivating. Branches which, when properly thinned, will clear the ground with their crop of fruit, are not too low to be retained. It is not necessary to plow close up to the tree trunk. By plowing in opposite directions every other year and disking in both directions every year, only a small square around each tree will go uncultivated. Extension disks and harrows make it possible to cultivate close up to the trees without driving the team or tractor near them. Low branches should not be wholly sacrificed for the sake of appearance and added convenience. The high yielding trees and orchards are those still carrying many low branches.

16. Pest control. A loosely built tree is the first step in pest control. If the framework is built to fit the mature tree instead of the young tree, no large branches need ever be removed. It is through such wounds as those made by removing large branches that wood rot gets its foothold in the tree. Pruning which keeps the top of the tree very sparse, with a gradual increase in density as the lower branches are approached, is the kind of pruning which makes for easy pest control. Giving access to sunlight and air makes conditions unfavorable for many of the most injurious pests and most favorable for the spray applications.

17. Thinning and picking. Trees built after the suggestions in this bulletin will carry the bulk of the bearing wood low. They will also be open enough to make all parts easily accessible to the thinner and picker. The three- to six-branch tree with its natural spread will have plenty of openings for placing the ladder. The systematic distribution of branches and fruiting wood will prevent the tangle and interference met with in the average tree.

TIME OF YEAR FOR PRUNING

18. Dormant pruning. The dormant season is the most economical as well as the most logical time of the year for pruning. The trees are inactive and have their season's food storage completed. A good rule to follow in planning the season's pruning is to start with the more devitalized older trees in the early winter, taking the others in the order of their state of vigor, and finishing the more vigorous, younger trees in the late winter or early spring.

The air foods greatly predominate in the stored food of the older, devitalized trees and predominate to a lesser extent in the younger, more vigorous trees. The leaf-bearing parts of the tree carry a greater percentage of this stored food at the beginning of the dormant season than they do at the end of it, since there is a slow and gradual distribution of this stored food to all parts of the tree. The earlier a tree is pruned in the dormant season the more of this stored food is cut away with the prunings. The more devitalized, older trees (class 4) having a surplus of air foods benefit to a certain extent from early dormant sea-

son pruning, while the more vigorous, younger trees (class 2) having a surplus of soil foods and a shortage of air foods are much better off if pruned in the later dormant season. Injury from pruning trees while the wood is frozen is negligible and should be given little if any consideration.

19. Summer pruning. Summer pruning is more devitalizing than dormant pruning and should not be given a place in the management of a bearing orchard. Extremely vigorous two- and three-year-old trees that have made growth of sufficient length by the first of July or earlier may be headed at this time at the proper length, thus forcing out an additional set of secondary branches. Two-year-old trees that have

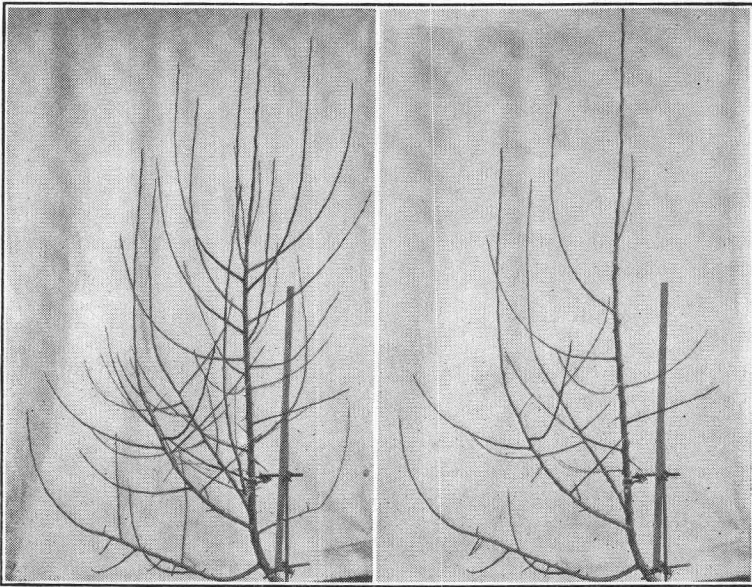


Fig. 6. The growth made by one of the same shoots the third year in the orchard. Before and after pruning.

made a growth less than twenty-four inches and three-year-old trees that have made a growth less than thirty inches before the first of July should never receive this summer heading-back.

Late summer pruning is too much of a gamble to give it a place in the commercial orchard. The removal of suckers or water sprouts during the summer is advisable. Pulling them off by hand early in the season before they become woody enough to cause a sliver of wood from the old branch to split off and adhere to the sucker is the ideal time for their removal. They are easily and quickly removed at this time without splitting or tearing the bark of the old branch from which they are taken. They are not so likely to return when removed in this way as they are when cut off with pruning tools later on. Trees that are suckering badly should be gone over twice during the growing season.

Summer pruning to force trees into early bearing usually has been unprofitable to the grower as well as injurious to the trees. *A tree that continues to make a rank growth, increasing in size rapidly, has not yet reached bearing size.* The balance between root and top has not yet been reached, and any practice that tends to throw the tree into bearing before that time is wrong. The better the soil moisture and fertility the larger the tree will grow before it reaches bearing size. The larger the tree grows before it reaches this size the more profitable it will be when it does come into bearing, due to its greater bearing surface. For these vigorously growing trees, as little pruning as necessary and that a light thinning-out during the dormant season is more nearly right than any summer pruning.

TREATING PRUNING WOUNDS

20. Wound dressing. Wound dressings are used to prevent a drying out and cracking of the exposed sap-wood or to prevent wood rot infection. Whether the dressing of pruning wounds for the first-mentioned purpose is profitable or not is an open question and cannot be answered here.

A good bordeaux paste of the consistency of thick paint applied soon after the wounds are made appears to be the best material in common use to prevent infection from wood rot fungi. This should be repeated annually unless the trees are receiving an annual spraying with bordeaux mixture. After the first application of paste, this annual bordeaux spraying will probably prevent any wood rot infection.

Wounds and tools should be disinfected with the "Reimer Disinfectant" when pruning in Pear Blight infected orchards. A like precaution may be advisable in orchards where European Canker, Anthracnose, and other contagious bark and wood diseases are prevalent. The "Reimer Disinfectant" is made by dissolving one part of cyanide of mercury and one part of bichloride of mercury in five-hundred parts of water. This disinfectant cannot be kept in metal containers.

PRUNING TOOLS

21. Pruning tools. A pair of nine- or ten-inch hand shears, a pair of loppers, a saw, a pole pruner, a light pole with a hook on one end and a good picking ladder are all the pruning tools needed for commercial pruning. The hand shears should be strong and well made. They are used in pruning nursery stock at planting time, for pruning very young trees, and for pointing up the tips of older trees. The picking ladder, a light, three-foot pole with a hook on one end for reaching and pulling these tips within reach; and the hand shears make easy and rapid work of this pointing-up pruning. The hand shears should always be held with the handle attached to the blade against the fingers and the other handle against the heavy part of the hand. In this way the blade rather than the guard moves, thus making a sliding cut. The blade should be held next to the branch from which the part is being cut. The cut should be made from the side or bottom rather than from the top of the part to be removed. The lopper is used for removing anything taken out of older trees up to one and one-half inches in size. It is a very rapid and effective tool for doing the bulk of this thinning out.

The blade should be always held next to the branch from which the part is being removed. The cut should be made from the side across or the bottom up and never from the top down. The saw is used for removing larger branches only. The pole pruner is convenient for thinning out the higher parts of trees from the ground, especially those parts which cannot be reached from the picking ladder with the hook and hand shears.

All cuts should be made just within the bulge (collar) formed by the union of the twig or branch with the parent branch or trunk. This leaves a smaller wound than if the cut were made flush with the parent branch or trunk and will heal over just as rapidly. Shears and loppers with double cutting surface, saws with teeth on both sides, and pole pruners that hook over a branch and cut it off by pulling down should all be avoided.

