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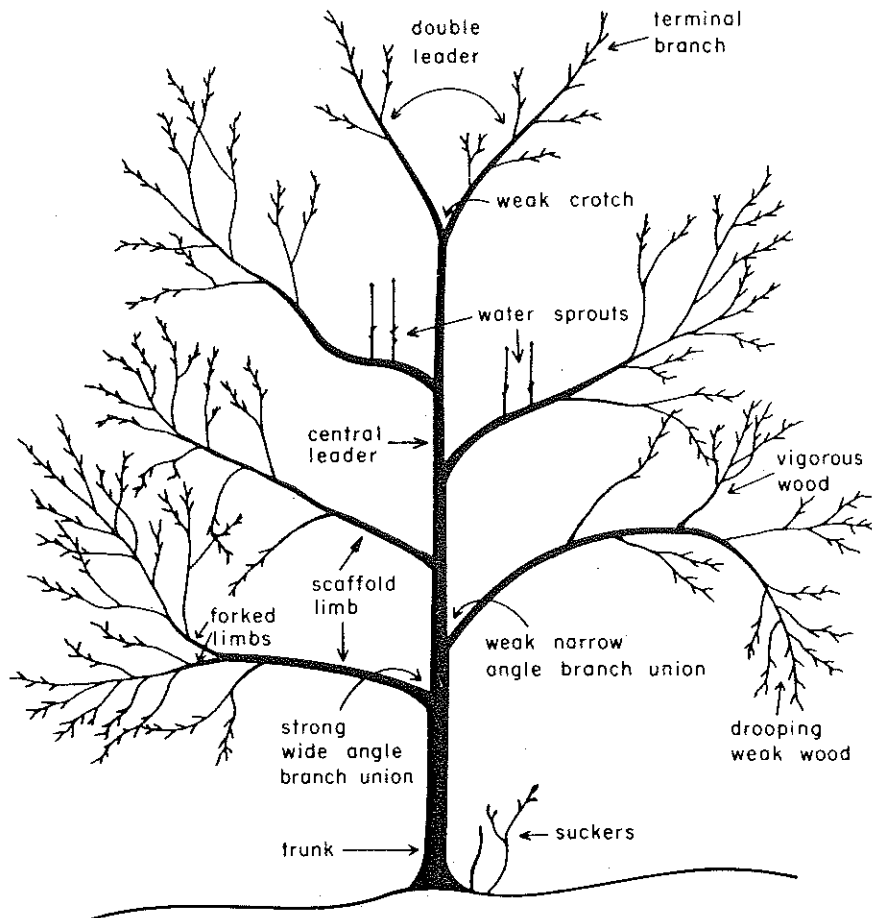
# Pruning Fruit Trees in the Home Orchard

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University of Massachusetts, United States Department of Agriculture and  
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*Fig. 1. The major gross structure of apple tree.*

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# Pruning Fruit Trees in the Home Orchard

Pruning improves both the fruit crop and tree appearance. It is a practice frequently neglected, and/or misunderstood, by the home orchardist and the inexperienced commercial fruit grower. Perhaps the greatest pruning challenge is renovating neglected, aging apple trees.

The best way to learn how to prune fruit trees is to have someone experienced in pruning personally show you how to do it. This leaflet is no substitute for personal instruction, but we hope it will increase the reader's understanding of some basic pruning techniques.

## PURPOSE OF PRUNING

Young trees are trained to establish a strong scaffold system of wide-angled, well-spaced branches capable of supporting large crops with a minimum of branch breakage. In pruning bearing trees, we are primarily concerned with (a) eliminating those parts of the tree which tend to bear fruit of poor quality; (b) maintaining suitable branch spacing to allow penetration of spray materials and light; and (c) maintaining the desired tree form and height.

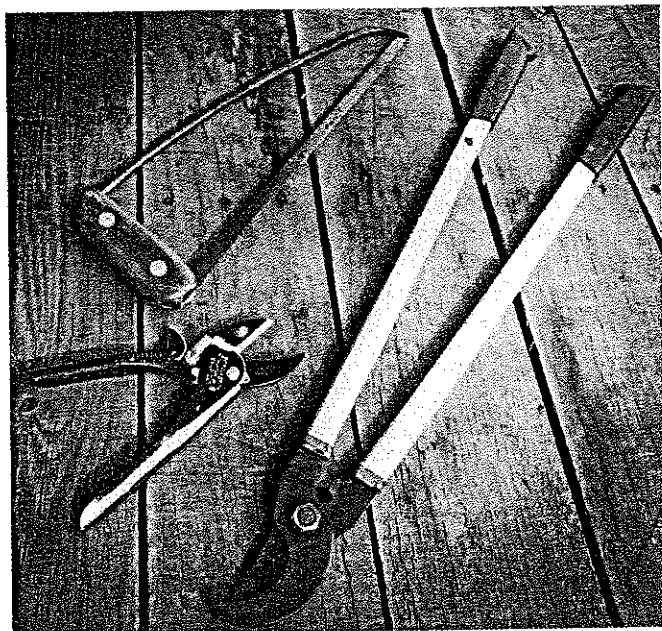


Fig. 2. Common pruning tools.

## PRUNING TOOLS

All essential training and pruning can be accomplished with hand shears, lopping shears and a saw (figure 2). Hand shears, which will cut branches up

to one-half-inch in diameter, are most useful on non-bearing fruit trees and on bearing peach trees which require the removal of many small branches.

Lopping shears with 24 to 30-inch handles, although not as essential as hand shears and a saw, are suitable for cuts up to one-inch in diameter.

Cuts larger than one-inch in diameter should be made with a pruning saw. A carpenter's saw is not recommended. Its wide blade is a hindrance when making pruning cuts and frequently causes excessive scarring of adjacent branches. The saw shown in figure 2 is frequently used by commercial orchardists. This saw can be purchased from local orchard supply companies in Massachusetts.

Another useful tool is the pole pruner. This tool will allow you to make many cuts from the ground, greatly reducing the need to climb in the tree. It is especially useful when pruning bearing peach trees and in restricting the height of other fruit trees.

## SEASON TO PRUNE

Growers with large orchards begin pruning some types of bearing fruit trees in late-January, but individuals with small orchards can wait until the arrival of milder weather. Pruning may be done through the blossoming period, but late-January through April is preferred for all bearing fruit trees with the exception of peach trees. *Delay pruning peach trees until growth begins in the spring.* The peach trees then should be sprayed before a rain occurs to help prevent Valsa canker infections which can weaken or destroy the trees. Contact your local county Cooperative Extension Service for spray recommendations to control Valsa canker. It is best to delay pruning young fruit trees of all types until March.

Water sprouts<sup>1</sup> on apple trees should be removed in midsummer. Dead or diseased branches can be removed whenever they are present.

## PRUNING APPLE TREES NOT SUPPORTED BY A TRELLIS

### Training young trees

The "ideal" tree at bearing age is one on which the lowest scaffold branch is about 20 to 22 inches from the ground. It has a main central stem or leader extending upward four to six feet above the lowest scaffold branch. It has five to seven main scaffold branches coming out at wide angles (45° to 90°) from the leader and spaced at least six inches apart. These scaffold branches are arranged symmetrically

<sup>1</sup> Rapidly growing shoots that originate on main branches of the tree. These compete with more desirable branches for space and sunlight. (See figure 1.)

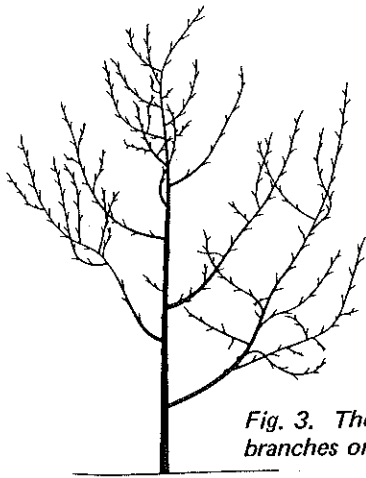


Fig. 3. The ultimate arrangement of branches on a central leader tree.

around the leader so that each is pointing in a different direction (figure 3). This is known as a central leader tree.

#### Type of pruning cuts

Before we proceed with our discussion of pruning, we should define the type of pruning cuts. Most of the pruning cuts can be classified as either heading, thinning or stubbing cuts.

- **Heading cuts:** removing only a portion of a current season shoot<sup>2</sup> or a one-year-old shoot. Heading removes the growing point on shoots, or the terminal bud on one-year-old wood, which are associated with apical dominance. Heading cuts are made to:
  - encourage development of lateral branches.
  - stiffen central leaders.
  - or are associated with summer pruning to restrict growth.
- **Thinning cuts:** removing an entire shoot or branch at its junction with another shoot, branch, or the trunk. These cuts are made to:
  - direct growth in a different direction.
  - eliminate competition among branches.
  - remove vigorous upright growth on branches and weak wood.
- **Stubbing:** cuts made into two-year-old or older wood. Such cuts:
  - force the development of side shoots.
  - reduce length of a limb.
  - stiffen branches.

Stubbing cuts differ from thinning cuts in that they are not necessarily made to a dominant side shoot.

#### Pruning at planting

Cut back one-year-old whips (unbranched trees) to three feet above the ground (figure 4). Trees less than three feet in height need no heading back. If you receive well-branched trees from the nursery, it is im-

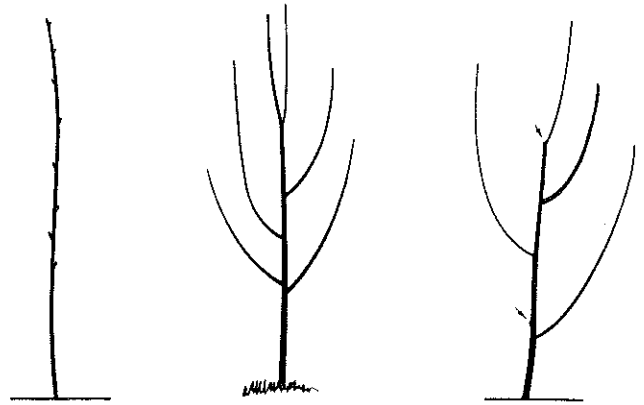


Fig. 4. A one-year whip when set has no branches.

Fig. 5. A well-branched tree received from the nursery before pruning.

Fig. 6. Same tree as in figure 5 after pruning.

portant to leave as many favorably positioned branches on the trees as possible to aid growth. Remove branches with narrow crotch angles, those competing with the leader, and those lower than 18 inches from the ground (figures 5 and 6).

#### Pruning during the first growing season

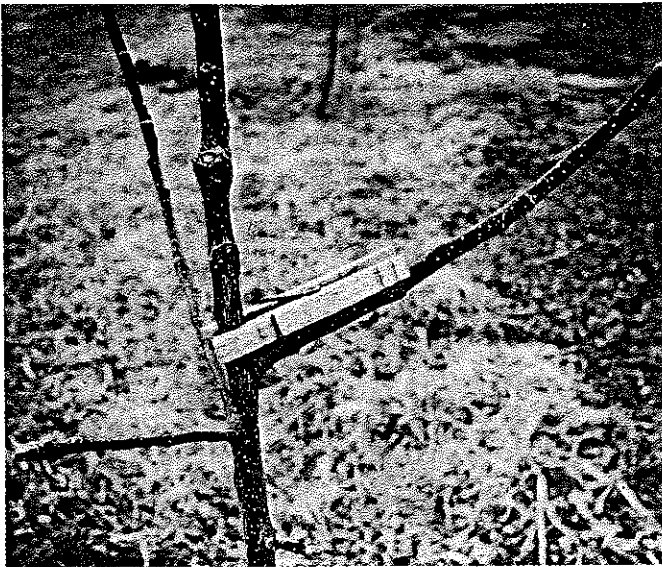
- During the first growing season most trees will produce a cluster of vigorous shoots directly below where the tree was headed at planting. The shoots are usually equal in size and have unacceptable narrow crotch angles. Early June is the time to select one of these shoots for the leader and to remove the competing shoots. At this stage of growth the job can be done by hand. Removing shoots by simply pulling the shoots off when they are four to six inches long leaves a scar which heals quickly (figure 7).



Fig. 7. Before and after pruning in June of the year of planting. The vigorous shoots that compete with the leader are removed to ensure dominance of the leader.

<sup>2</sup>A shoot is considered a current season shoot until it has lost its leaves in the fall. After this time, it is a 1-year-old shoot.

- As scaffold limbs develop, wide crotch angles should be established by using devices such as spring-type clothespins or toothpicks (figure 8).

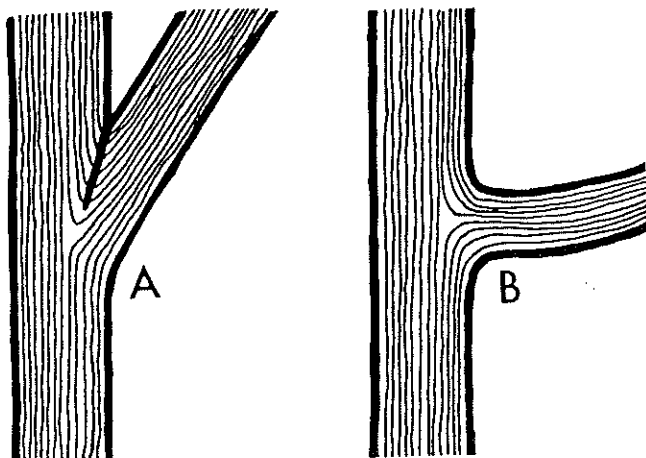


*Fig. 8. The use of clothespins on a young apple tree to improve the angle of the branch union. This will prevent the development of branches similar to that shown in Figure 22. Attach the clothespins when the shoots are 4 to 8 inches long. The limbs will become fixed in the spread position in about 2 weeks.*

- Try to prune so the two lowest limbs will be oriented in the tree row to avoid damage from mowers and other implements.
- Remove low limbs that will interfere with the placement of the mouse guard.

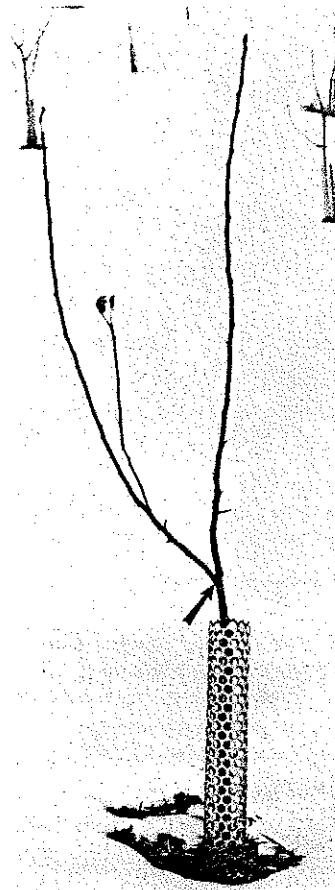
#### Pruning during the first dormant season

- Select central leader and remove branches competing with it if this was not done the previous June.
- Remove branches with narrow crotch angles (figure 9).



*Fig. 9. A narrow crotch angle (shown in A) usually contains a bark inclusion which makes the crotch much weaker. A wide crotch angle (shown in B) has annual rings of wood deposited all around the junction of the scaffold branch and trunk which increases crotch strength.*

- If only one branch developed on the tree, or the branches are too high or too low, remove them (figure 10).
- If branches have developed on only one side of the tree remove them.



*Fig. 10. A McIntosh tree after one growing season. This tree had one strong branch at planting that should have been removed. It now competes with the leader of the tree. The scaffold branch should be removed at the point indicated by the arrow.*

- Study the tree to determine which branch arrangement will more nearly approach the ideal (shown in figure 3), starting with the lowest scaffold branch in each case. Frequently, only two or three branches will be suitably located for permanent scaffold branches. The remainder of the framework will have to be selected in the next year or two. After you select the permanent scaffold branches, leave temporary branches which do not shade the permanent branches to provide additional leaf area. These temporary branches must be cut off though, as soon as they begin to interfere with the permanent branches. (Temporary branches interfere if they grow faster than, or shade permanent branches.) Any limb which originates at the same level on the leader as a permanent branch should be removed. This avoids stunting the growth of the leader above that point.

- Continue to spread branches. Spread to a 45° to 60° angle from the central leader (a 90° angle from the central leader would mean the limb is horizontal to the ground). See figure 11.

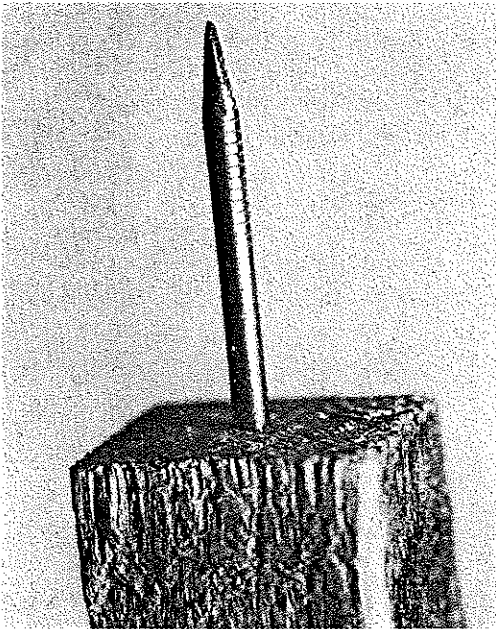


Fig. 11. Softwood sticks 3/4 x 3/4 inch or 1 X 1 inch and cut to various lengths are frequently used for limb spreaders. Regular box nails (8 or 10 penny) are driven into the ends of the sticks and then the nail heads are cut at a sharp angle. Sharpening the nails with an emery wheel will expedite positioning of water sprouts and reduce damage.

**Pruning during the second dormant season**

- Continue to select scaffold branches and maintain a dominant central leader (figure 12 and 13). Leave as many branches as possible without restricting the dominance of the central leader. See figure 14.

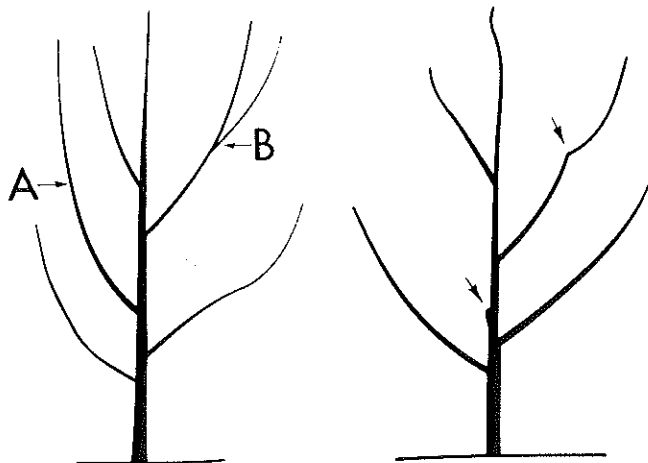


Fig. 12. Branches A and B are competing with the leader. Fig. 13. Situation in Fig. 12 is corrected. Branch A has been removed and Branch B headed back to a side branch.



Fig. 14. The central leader growth (see arrow) has been restricted on this young apple tree because too many branches were retained. Once the dominance of the central leader is lost it is very difficult to develop tree shaped like the one shown in Figure 26.

**Training during the third growing season**

- Particular attention should be given to spreading Delicious apple tree limbs because of their vigorous, upright growth habit and tendency to develop narrow crotch angles (figures 15 and 16).

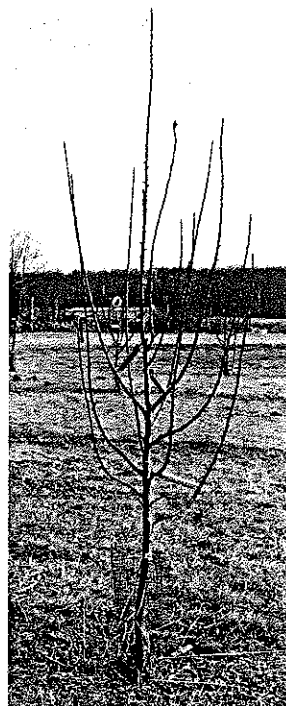
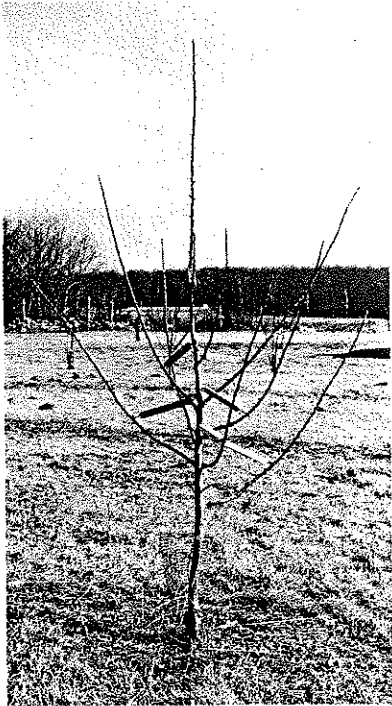


Fig. 15. Delicious trees tend to produce vigorous, upright growth which tends to compete with the central leader.



*Fig. 16. The same tree as shown in Fig. 15 after placement of limb spreaders. Spreading improves the crotch angles, reduces terminal growth, favors flower bud formation, reduces competition with the central leader, and eliminates interference of lower scaffold branches with the growth of scaffold branches originating higher on the trunk.*

- Vigorous trees of productive cultivars such as McIntosh and Empire may bloom and set fruit during the third growing season. Retain the fruit if the number is not excessive *but* remove those on the central leader otherwise their weight will cause the leader to bend.

#### **Pruning during the third dormant season**

- Continue the processes of training and pruning for the development of a strong central leader and scaffold branches.
- Develop a conic (Christmas tree) shape. The lower scaffold limbs should be larger and extend further from the trunk than the next scaffold limbs above.
- Golden Delicious, standard-type McIntosh and Idared apple trees can be trained to a conic shape with little effort whereas Delicious, particularly spur-types, will require special attention. Cortland and Empire have a tendency to lose their central leader and may require staking to maintain the upright growth of the leader. In addition, Empire frequently develops an insufficient number of lateral shoots on the central leader, making the selection of well-spaced scaffold limbs more difficult.
- Leave temporary scaffold branches to provide additional leaf area. These should be removed when they begin to interfere with the development of the central leader and/or the permanent scaffold branches.

- Branches on the windward side of the trees are apt to "hug" the leader until cropping holds them down. Leaving extra limbs on the windward side on windy sites will help keep the lower branches more horizontal because of competition. However, to keep from restricting the growth of the central leader and/or inhibiting the development of desirable scaffold limbs, these temporary branches should be stub pruned. Many of the stubbed branches will have to be removed, or again restricted, during the next pruning season.
- Remove limbs lower than 24 inches from the ground on Cortland trees. Limbs on this cultivar tend to be horizontally oriented and/or droop. On most other cultivars, the lowest scaffold branch can originate 19 inches above the ground level since their growth habit is more erect and will tend not to interfere with the necessary cultural operations.

#### **Pruning during the fourth growing season**

- The framework on well-grown trees should be established. Inspect the tree. Remove only water sprouts and those branches which are growing towards the center of the tree, or are competing with permanent branches.
- Trees on which development of a strong central leader has been difficult, or training has been neglected, may require staking to support the leader. This may be more practical than resorting to the excessive pruning frequently required to re-establish a leader.

#### **Pruning during the early fruiting years**

- In orchards where trees are planted at wide spacings, or on weaker rootstocks such as M26, early, heavy fruiting may not be desirable as it will tend to restrict growth. This early fruiting can be prevented by chemical, or hand thinning and/or by pruning. Heading the extension growth of the central leader and shoots of scaffold branches will also promote lateral growth and delay fruiting.
- With wide tree spacings, a framework will have to be developed so that the fruiting branches will exploit the space allotted for each tree.
- On the young, bearing tree it will be necessary to gradually remove the temporary scaffold branches because the trees will become too bushy for the fruit to color properly on the inner or lower branches.
- By the fifth or sixth dormant pruning season, the leader on vigorous rootstocks may be eight to nine feet tall. Some growers may now want to start containing tree height. To do this, cut the past season's extension growth on the central leader back to a weaker competitor. This will be the new leader. If the leader is too vigorous, cut the leader back to a vertical two-year-old branch. This procedure done annually will give a zig-zag growth pattern to the central leader and reduce its vigor.

Other growers may prefer to let the leader grow until it reaches 12 to 14 feet, then restrict tree height by cutting the leader back to the topmost, desirable, outward-growing lateral branch.

- As the branches on the trees grow longer, they bend downward because of cropping (figures 17 and 18).

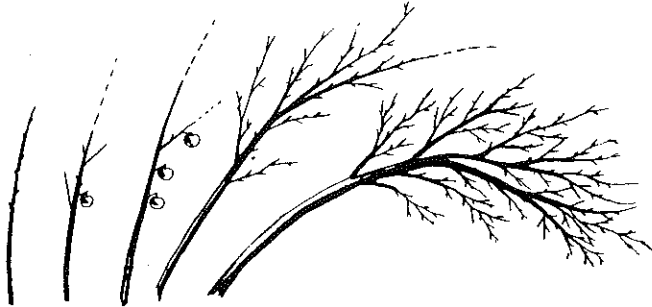


Fig. 17. Transition from non-bearing to bearing branch. Weight of fruit causes angle change.

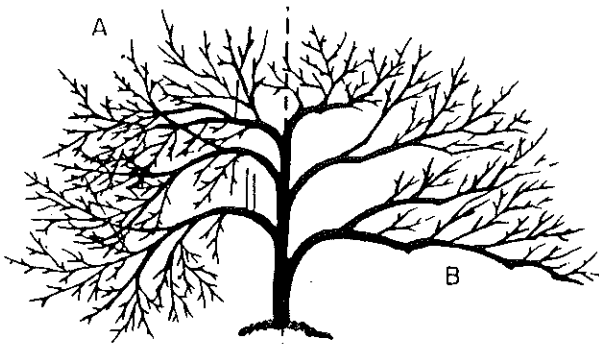


Fig. 18. (A) Unpruned. (B) Shaded, drooping, weak wood removed.

Terminal dominance is lost and numerous water sprouts and vigorous upright shoots are produced from buds on the upper side of these scaffold branches. This is particularly noticeable on Cortland and Delicious even when the trees are relatively young. The water sprouts and vigorous upright shoots require thinning out by: (a) completely removing some; (b) heading or stubbing others to a horizontal branch of moderate vigor; and (c) retaining those that can serve as a replacement for the drooping ends of branches.

- Remove broken and diseased branches (see figure 19).
- Eliminate branches tending to form narrow crotch angles.
- Eliminate crossing and parallel branches which tend to cause shading.
- Remove branches which are growing toward the center of the tree.
- The vigorous, strong scaffold branches growing 30 to 50 degrees from the vertical will have to be spread; or restricted by cutting to a horizontal lateral at a lower level on the branch; or removed. Unless spread, restricted or removed when young,

they will prevent the development of scaffold branches from the leader above them and the tree will become multi-leadered (see figures 20, 21 and 22 – on next page).

#### Pruning the older bearing apple tree

- Cortland produces much of its fruit terminally on one-year-old wood. The weight of the developing fruit causes the twig to droop and new upright shoots to develop nearer the base of the one-year-old wood. After several years the branches will have a profusion of thin, drooping wood. This thin, underhanging wood produces poorly-colored fruit, shades other branches and fruit, and should be removed. When removing this wood, it is advisable to begin at the end of the branch and work toward its base. Heading of shoots will eliminate many flower buds and should be avoided.

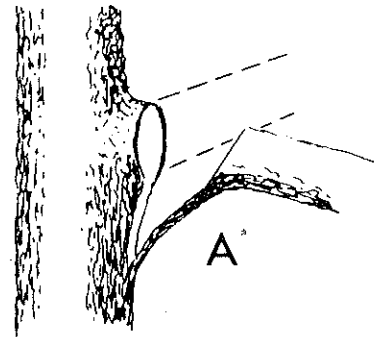
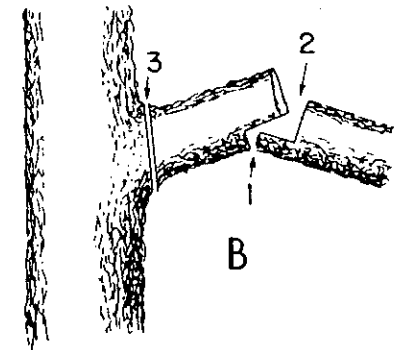
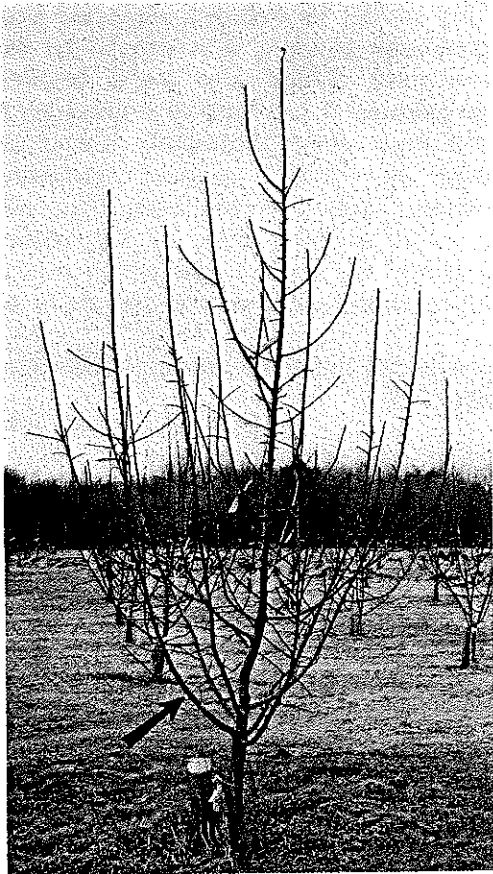


Fig. 19. Large limbs should be removed in stages. A. Wrong way resulting in tearing of bark. B. Correct way: (1) Under cut to prevent bark tearing, (2) Removal of bulk of limb, (3) Final close-cut.

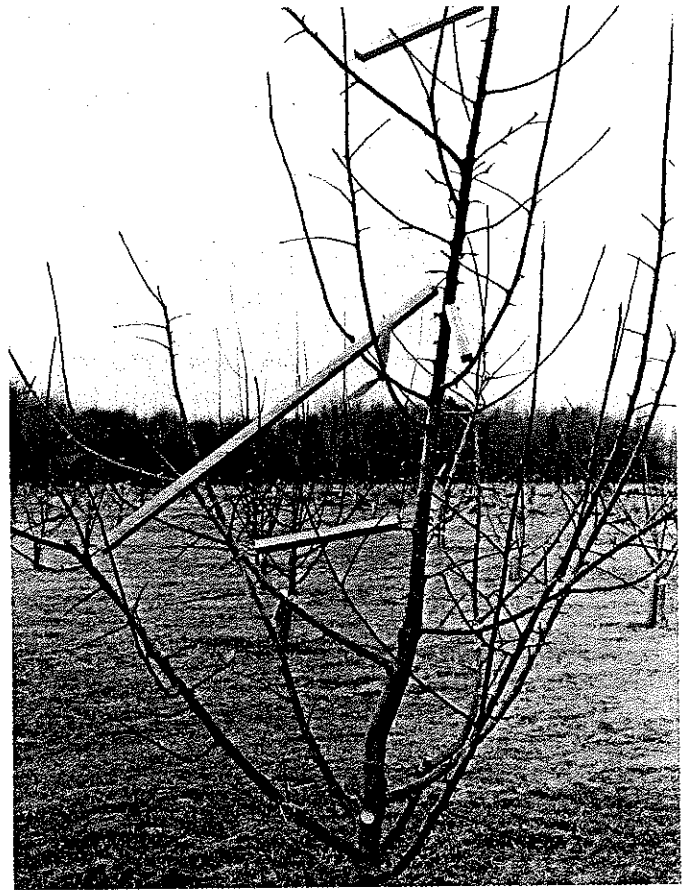


- Rome apple trees produce branches that have narrow-crotch angles, are upright in growth, and usually do not form good central leaders. To encourage the development of scaffold branches in the upper third or half of the tree, the vigor of the lower scaffold branches should be reduced by cutting them to horizontal growing laterals. The fruiting habit of Rome is similar to Cortland and will require the same detailed pruning.





*Fig. 20. The arrow points to the vigorous, upright growing limb that should be spread. Unless spread it will prevent the development of scaffold branches originating higher on the leader.*



*Fig. 21. Same tree as in figure 20 after spreading.*

- Delicious trees are subject to weak crotches, and branches are prone to develop in whorls and to droop. The ends of drooping branches should be removed to a lateral growing in a somewhat upright position. This will shorten and stiffen the branches. The tip of the lateral on a pruned, drooping branch should be higher from the ground than any other portion of the branch. This should reduce the problem of suckering.
- Remove broken and diseased branches.
- Remove any water sprouts not needed to protect branches from sunscald or to provide for branch renewal. Those retained for branch renewal generally require spreading.
- Eliminate branches tending to form narrow crotch angles.
- Eliminate crossing and parallel branches which tend to shade more desirable branches.
- Remove weak, drooping branches which are severely shaded and have few fruiting spurs.
- Remove branches which are growing toward the center of the tree.
- Remove suckers which grow out of the base of the tree.
- Reduce the height of excessively tall trees by stubbing back to a strong outward growing lateral branch originating at a lower level on the leader.



*Fig. 22. The upright-growing limb on the left should have been spread as shown in Figure 16 when the tree was young. Currently, this limb inhibits the development of limbs originating higher on the central leader.*

- Frequently a strong scaffold branch with a narrow crotch angle develops in the upper third of the tree. If this branch is not removed, or its growth restricted, the tree will become a multiple leader tree. Trees of this type are much more difficult to prune when practicing containment pruning or lowering tree height.
- Do containment pruning when necessary to restrict tree spread and height.
  - Branches that crowd those of adjacent trees will have to be removed or cut back to a weaker side branch. (Cuts made only to maintain the desired outer profile of the tree compound rather than alleviate tree containment problems. Such cuts will produce vigorous growth which, by the end of the next growing season, may extend as far as the original branch was before shortening and may cause more shading within the tree than did the original uncut branch.)
  - Maintain conical tree shape by removing large limbs in the top third of the tree or cutting back to a very much weaker side branch.
  - Initiate a limb renewal program in the top third of the tree. Remove the strong limbs and retain the weaker ones. The strong limbs should be cut back to the leader or to a weak lateral. Watersprouts can be spread and used as replacement branches.
- Detailed pruning should be avoided whenever possible. For commercial growers, it is simply too expensive. Homeowners should also avoid detailed pruning though because it can lead to physiological disorders in the fruit which ultimately lowers its quality. Instead, do "bulk" pruning (removing larger limbs which "open-up" the tree). This will also help you avoid pruning away all the smaller fruiting wood along the main limbs which results in having fruiting wood only at the periphery of the tree.
- Figures 23 through 26 illustrate pruning techniques on bearing trees.

### PRUNING DWARF APPLE TREES

Apple trees on M.9 rootstocks are true dwarf trees. Because of their brittle roots, such trees are often supported by tying them to a post or trellis. The type of support considerably influences the training techniques to be used.

#### Pruning the individually staked tree

Trees on M.9 are frequently trained as slender spindles. Tree shape is conical having a permanent frame of branches at the base of the leader, and, above this frame, short fruiting branches arranged around a vertical leader which is supported by a post.



*Fig. 23. The arrows are pointing towards two "problem" limbs. The limb on the left is upright growing and preventing limb development from the central leader of the tree. This limb should be shortened and after 2 or 3 years be completely eliminated. The "problem" limb on the right should be removed.*

The size of the permanent frame of branches depends on the planting distance. The greater the planting distance, the larger the frame should be.

Having large numbers of trees per acre is only possible with weak (small) frames. Therefore, pruning is minimized in the early life of the tree to encourage early cropping. On bearing trees, vigorous branches are completely removed to maintain low vigor on the trees. Thus, the combination of M.9 rootstock, minimum pruning, early bearing, and the removal of vigorous branches all contribute to weak growth and permits close tree spacings.

The following procedures are suggested for training trees as slender-spindles.

#### *Planting time.*

Head McIntosh trees and other vigorous varieties at 36 inches—a weak growing variety should be headed at 30 to 32 inches. Remove all branches lower than 16 inches from the ground. Other branches are best left unpruned except if they are badly placed, for instance all are on one side of the stem or where there is only a single vigorous branch. When all the branches are on one side of the stem they should be thinned out. If there is only a single, vigorous branch, it should be removed to avoid lopsided development of the tree.

#### *First growing season.*

When the extension shoots at the top of the tree are six to eight inches long, remove the upper-most extension shoots (generally two) and leave a weak up-

right growing lateral for the leader (figure 7). Spread branches with spring-type clothespins (figure 8).

#### *First dormant season.*

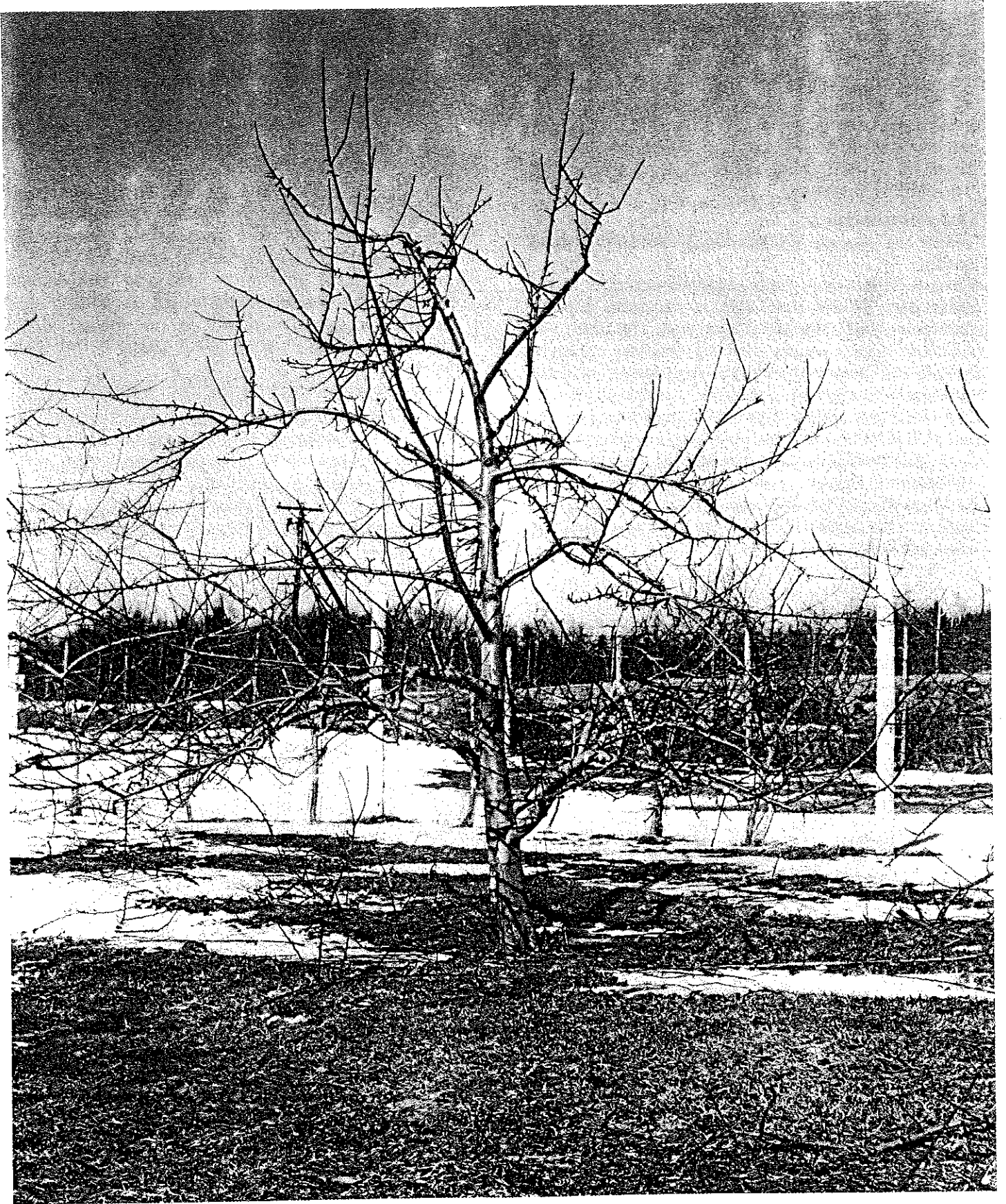
- In developing the slender-spindle, the goal should always be to weaken the growth in the top of the tree and encourage the production of fruiting branches. Thus, remove the strong vertical leader and use a weaker competitor lateral as the new leader if not done the first summer. The branch selected is not necessarily the first one below the leader, especially if the first lateral branch is growing very strongly. Similarly, if vigor in the lower part of the tree is weak, it is best to cut back to a lower upright-growing lateral to stimulate growth of the laterals for the lower frame. When there is no suitable lateral to serve as a replacement leader, it will be necessary to retain the central leader. It should be pruned back only if the overall tree is weak. Any competing lateral immediately beneath the central leader should be spread or removed.
- If desirable branches fail to develop 24 to 36 inches above the ground, reduce the height of the leader by 10 to 12 inches. Cut at a vertical one-year-old shoot suitable as a new leader. This is necessary to encourage formation of strong lower branches.
- Four or five strong wide-angled branches are needed in the lower third to half of the tree. However, it is better to have too many than too few. The extra ones can be removed later.
- Branches lower than 24 inches should be removed.



*Fig. 24. A watersprout can be retained to develop a new central leader as has been done on the Idared tree shown in this figure.*



*Fig. 25. A non-pruned mature Delicious tree.*



*Fig. 26. The same tree as shown in figure 25 after pruning.*

*Second dormant season.*

- Again remove the strong vertical leader and use a weaker competitor as the new leader. If the leader is too vigorous, cut back to a vertical two-year-old branch (figures 27 and 28). *The procedures of removing the strong leader will give a zig-zag growth pattern to the central leader and reduce its vigor.*
- When limb positioning is necessary, perform this procedure at this time.

*Third dormant season.*

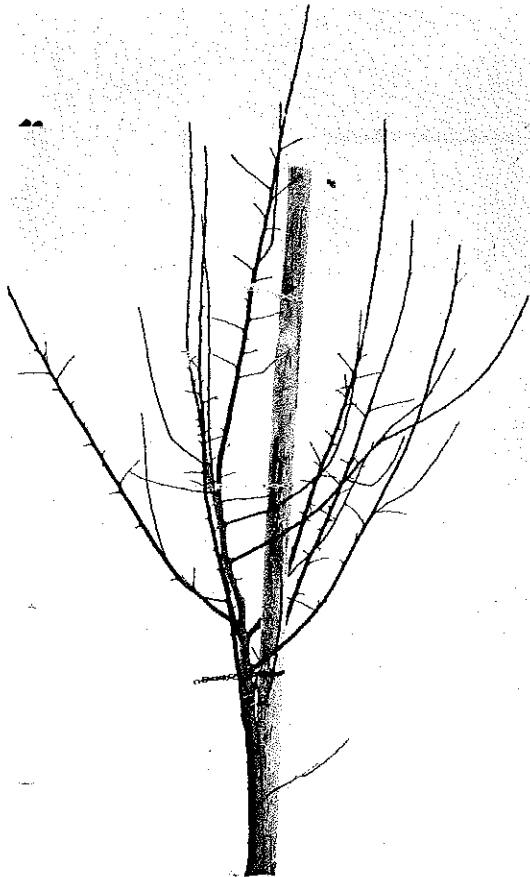
- Repeat the procedure following the second dormant season.
- Remove, don't head back, vigorous branches in the upper part of the tree. This is necessary for the maintenance of a conical-shaped tree. Therefore, the branches in the upper half of the tree must be shorter and weaker than the permanent branches at the base of the leader. Secondly, heading-back scaffold branches, rather than their complete removal, will stimulate undesirable lateral and vertical growth.
- Limb positioning is best avoided by retaining only the weakest shoots toward the top of the tree. All pruning should be directed toward reducing the vigor in the upper part of the tree and avoiding heavy growth.

*Fourth dormant season.*

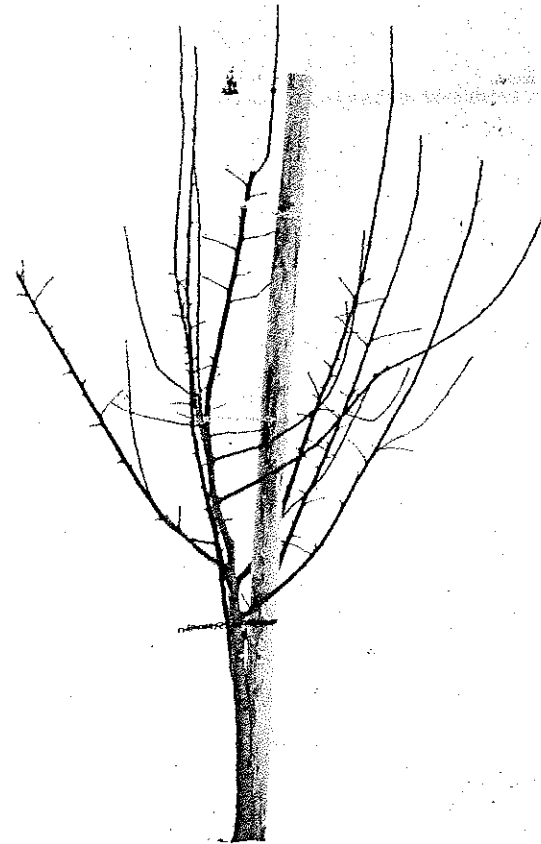
- The top of the tree should be cut back to a two or more year-old side branch and not, as in previous years, to a one-year-old shoot. Cutting back to a one-year-old shoot should be done only when the shoot is weak and wide angled, otherwise the growth of the top may become too vigorous.
- Strong growing branches one-year-old and older toward the top of the tree should be selectively pruned. This is necessary if vegetative growth and fruit quality in the lower parts of the tree are to be maintained.
- At this time, it may be necessary to remove some branches at the base of the leader, depending upon its vigor, because loss of the dominance of the central leader is possible if a balance is not maintained.
- Continue to maintain the conical tree form.

*Pruning fifth year and thereafter.*

- Pruning will be similar to the fourth year.
- Do branch renewal by completely removing excess branches. Leave a short stub when removing the branch since this encourages the growth of a replacement branch. However, branch replacement may be



*Fig. 27 McIntosh on M.9 after 3 growing seasons in the orchard. The central leader should be headed to a competitive lateral. Repeated replacement of the central leader by a weaker com-*



*petitive lateral should weaken the growth in the upper part of the tree. Fig. 28 shows the same tree after pruning.*

more successful on the upper portion of the leader than on its basal portion.

- Maintain a conical tree form.
- On weak growing varieties like Golden Delicious, thin wood pruning is necessary to attain fruit size. Cortland, which bears much fruit terminally, will require numerous small cuts to remove the excess of twiggy growth which develops toward the outside of the tree. On McIntosh and Delicious, it will be necessary to prune much vigorous wood growing above a horizontal position. However, whenever possible, remove just the drooping wood because undesirable upright growth will develop.

#### *Pruning trellis-supported dwarf apple trees*

Great variations exist in trellis construction and in training methods. Your county Cooperative Extension Service can supply you with names of local growers who have trellis-supported trees. You may want to visit these growers to get ideas on both trellis construction and methods of training and thus avoid some of the common errors beginning orchardists make. Perhaps the most costly error has been the failure to provide sufficient space between the rows. The cost of establishing a trellis-supported planting is expensive and merits much study and planning.

A trellis may be constructed to accommodate three to six wires and the top wire may be 6½ to 10 feet above the ground. The height of the top wire is determined by the harvesting method. In Massachusetts all picking from trellised-trees is done from the ground, thus the top wire is six to seven feet from the

ground. In other areas, the height of the tree wall or trellis may be 12 feet and the fruit are picked from platforms or short ladders.

The trellis can be constructed in stages over the first three years after establishment of the trees or totally at a convenient time. However, the posts and the bottom wire should be in place soon after planting to support the developing lateral branches and the central leader. A variety of systems can be used to train trees to a trellis (figure 29). Our experience is too limited to judge which system or systems are best. However, a simple system for a four-wire trellis involves training eight limbs per tree to the trellis—four on each side of the main leader—by twisting the limbs around the wire one or two turns. Spring-type clothespins, plastic ties, nylon ties, or baling twine can be used to hold the branches in place.

At planting, head the trees 17 to 18 inches above the ground to induce branching below the first wire. Two branches are selected during the growing season and these, plus the extension growth of the central leader, are tied to the bottom wire. To keep from restricting growth, do not bend the branch downward to a level that is lower than its point of attachment to the trunk. The branch is in the best position when it originates several inches below the wire to which it will be tied. All but the two selected branches are removed in order to maintain a dominant central leader.

Pruning in the succeeding years of training will be similar until the tree has eight limbs trained to the

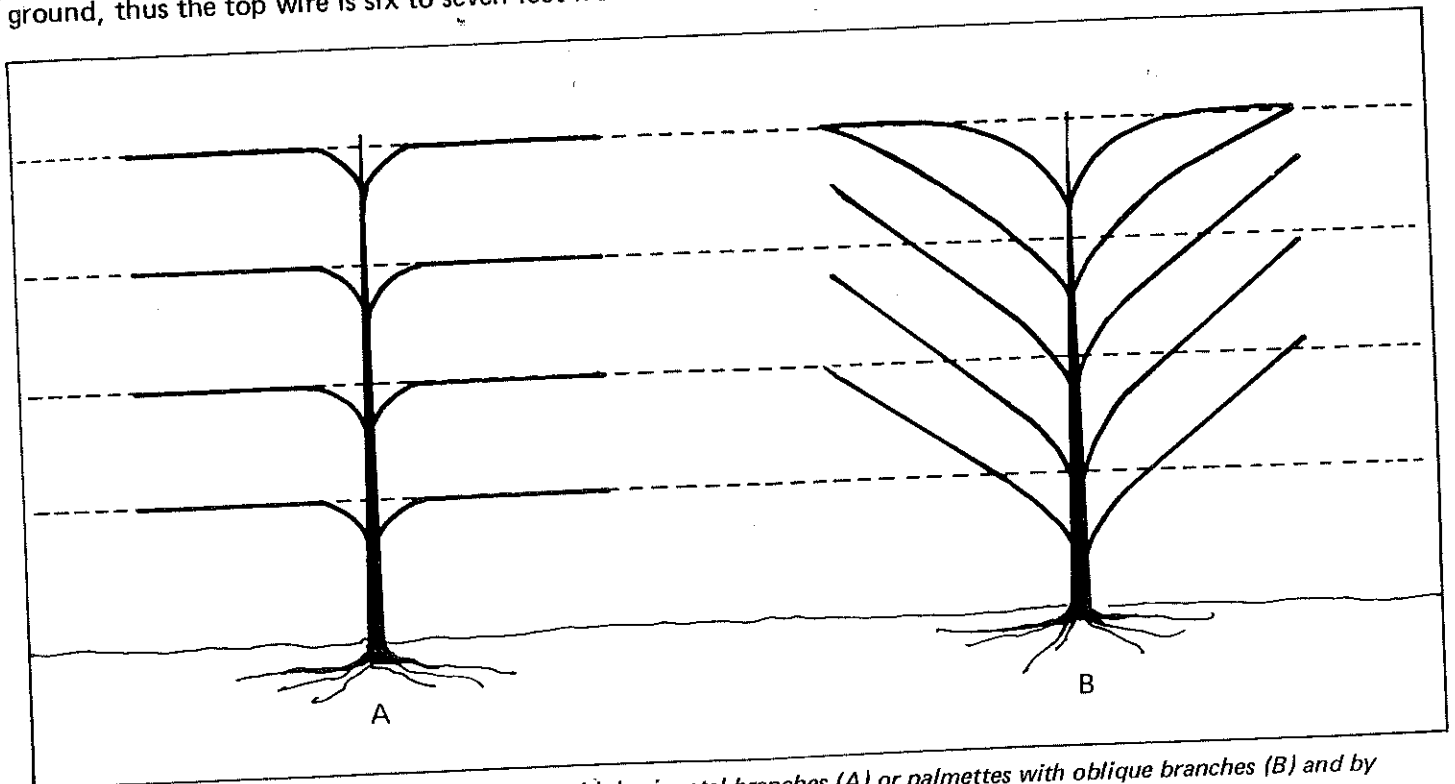


Fig. 29. Apple trees can be trained as palmettes with horizontal branches (A) or palmettes with oblique branches (B) and by other systems.

trellis—four on each side of the main leader. When the central leader extends higher than the top wire, it can be bent in one direction and tied to the top wire or be removed just below the top wire.

Each year, shoots will arise from the tied branches; some should be removed to allow better light penetration into the tree; others should be bent and tied to the wires; others should be headed back to maintain tree width in the row to three to four feet; and others should be used as replacements for older branches that have become low in vigor.

Snow and ice may cause limb breakage on trellised trees some winters.

### PRUNING NEGLECTED AGING APPLE TREES

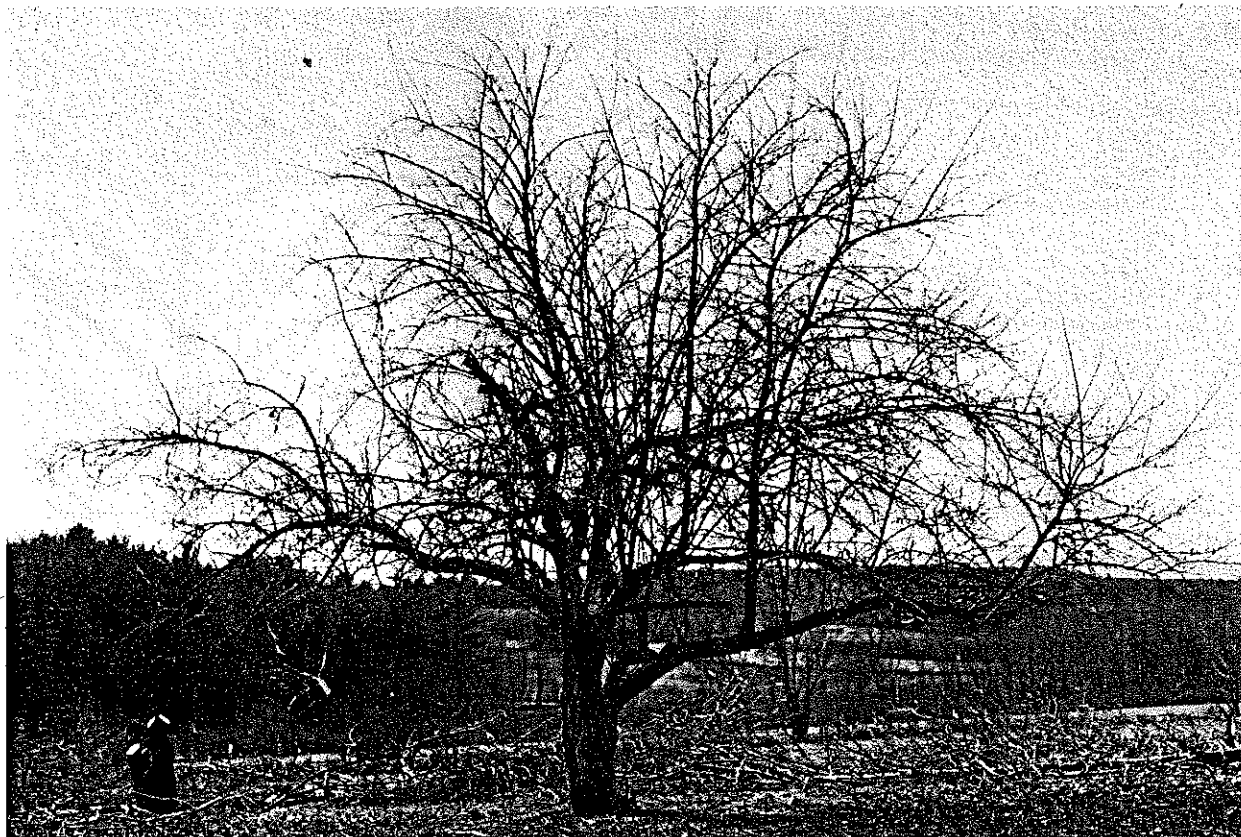
Frequently, the home orchardist wants to renovate neglected aging apple trees (figs. 30 and 31). Although the following description is the procedure for pruning trees of this type, for several reasons it is generally more logical to remove the trees or merely keep them for shade. First, the care of aged, high-topped apple trees is laborious and expensive. Fruit quality is generally poorer on older trees than on young, well-grown trees. The trees may not be the desired varieties. And, finally, many of the older varieties have a strong tendency to bear heavy crops only every other year.

Pruning the aging, high-topped apple tree is largely a job of renovating and renewing fruiting wood. The

pruning must be moderate and spread over a two-or three-year period to avoid excessive growth and injury to large limbs from sudden, over-exposure to sunlight. Such pruning consists of gradually lowering tree height to 18 feet or less, removing surplus scaffold limbs and eliminating weak wood.

The first step in renovation is to remove all dead and broken branches and branch stubs. Once this job is accomplished, pause and look at the tree. The interior and outer portions of the tree will be filled with many small branches that either droop towards the ground or crowd one another. The tree is probably so dense, it is difficult to walk into its center without pushing aside branches. Now note that there are an excessive number of large branches arising from the trunk and main leader (six to eight main scaffold branches are sufficient).

Remove, by pruning at point of origin on the trunk or central leader, several of the large branches causing crowding in the lower two-thirds of the tree. A chain saw may be used for this job. The tree now has been "opened up" considerably. This should allow improved light conditions during the growing season and make thorough spray applications possible. Probably the number of scaffold limbs is still excessive, but this condition can be gradually eliminated over a two-or three-year period.



*Fig. 30. A neglected tree in need of pruning.*



### Removal of weak wood

The next step is the elimination of drooping branches, and much of the bushiness caused by the excessive number of smaller, secondary branches arising from the remaining scaffold limbs. Remove all these secondary branches in the interior third of the tree. Then "thin out" the remaining secondary branches by removing a third of them. This procedure further enhances penetration of sunlight and spray materials.

### Lowering tree height

The next step in the renovation procedure is lowering tree height. To reduce height, remove tall, upright branches entirely, or cut them back to well placed strong lateral branches that extend horizontally below the height of 18 feet. A chain saw again is handy because these cuts generally involve removing limbs six inches or more in diameter. If a tree has several of these tall branches, all of them should not be removed in one year. Remove them over a two- or three-year period.

Cut back branches in the upper two-thirds of the tree to produce a pyramidal form.

### Follow-up pruning

The reduction of tree height requires follow-up pruning year after year in order to take advantage of newly developing fruiting wood and to avoid a return to the previous problem. The main problem will be the control of water sprouts which develop near

the larger pruning wounds and on the trunks. Those arising on the trunk or in the inner two-thirds of the lower limbs are likely to be of no value and should be removed. Water sprouts will arise in great abundance on the upper side of the limbs in the upper third of the tree the year following reduction of the height. These should be thinned out to a distance of about two feet, leaving those that bend towards the outside of the tree and heading back others to force lateral branching. The remaining water sprouts may develop fruiting wood the following season but new water sprouts will appear and must be removed. The lowering of tall trees introduces the annual nuisance of water sprouts.

## PRUNING PEAR TREES

### Training the young pear tree.

With slight modification young pear trees should be trained to the central leader system (figure 32) and many of the same procedures used in training apple trees can be followed as their growth and fruiting habit are similar. Because of their more upright habit of growth, young pear trees may appear too dense, however once they begin to fruit the branches will spread naturally. Pruning during this time should be limited to those cuts necessary to maintain the dominance of the central-leader. It may be possible to induce fruiting at an earlier age by manually spreading the scaffold branches. This can be done by

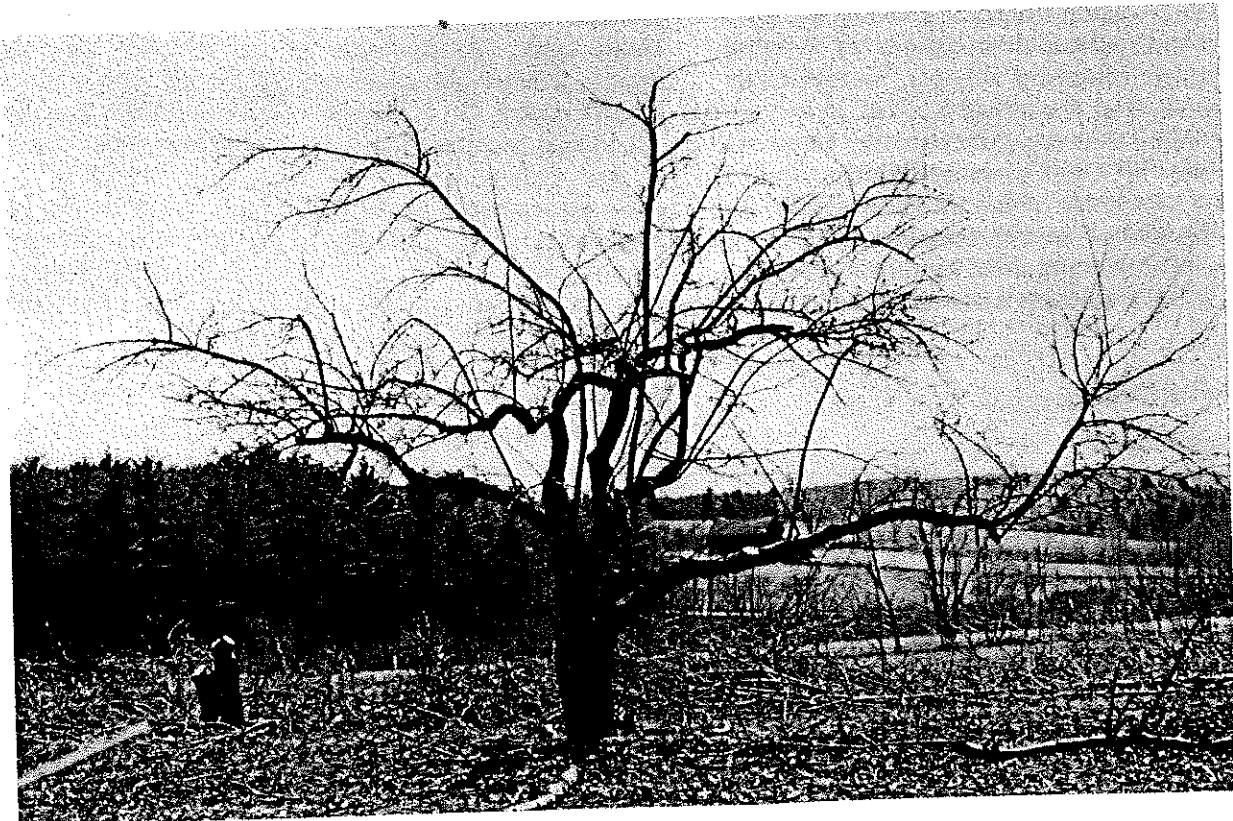


Fig. 31. The same tree as in figure 30 after pruning.

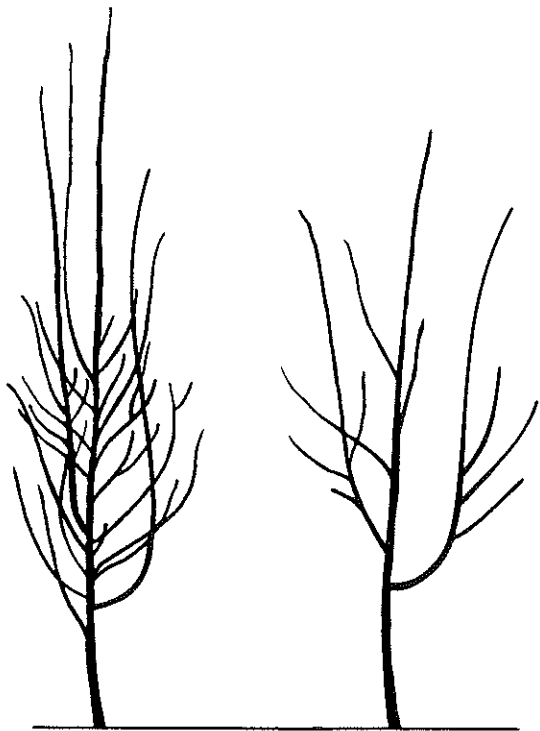


Fig. 32. Young pear tree before and after pruning.

bending the branch to proper position and securing it with heavy twine tied to a stake driven into the ground. Care should be taken so that the twine does not girdle the branch.

#### Pruning the mature pear tree

Because of their susceptibility to fireblight, pear trees are pruned less severely than apple trees. Pruning is often limited to removing suckers, watersprouts and those branches that are out-of-bounds. It may be necessary to do some thinning out of smaller branches to allow for better light and spray penetration and to improve the size and color of the fruit. The optimum height of a mature pear tree is between 15 and 18 feet, this height can be maintained by cutting the central leader back to a suitable two- or three-year-old branch.

### PRUNING PEACH TREES

#### Pruning at setting time

Even though the life of a peach tree is normally considerably shorter than that of an apple tree, the same care should be taken in building a strong framework to prevent subsequent breakage of main scaffold limbs.

A one-year-old peach tree as it comes from the nursery normally has several side branches. After the tree is set, all branches within 18 inches of the ground should be removed. Any narrow-angled side branches should be cut off. Then, three or four branches which come out at wide angles, vertically spaced about six inches apart, should be saved for main scaffold

branches. All other limbs should be cut off flush with the trunk. The leader should be cut back to the top-most side branch and the lateral branches should be cut back to short stubs, two to four inches long, with each containing one bud (figure 33).



Fig. 33. Young peach tree after pruning.

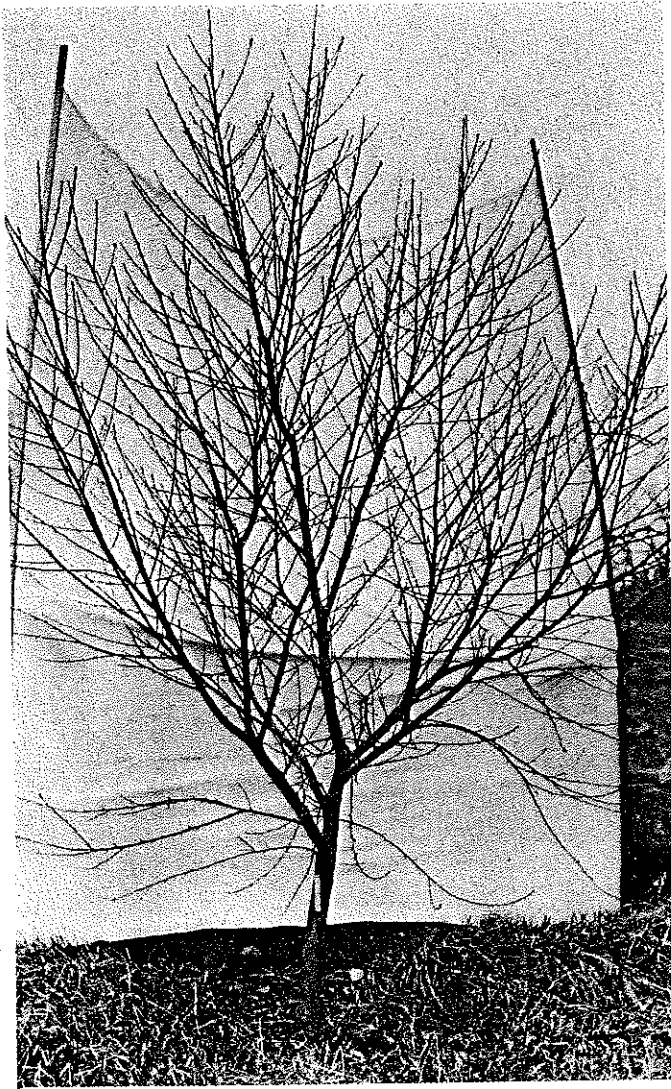
#### Pruning during the formative period

After the first season's growth, make a final selection of scaffold branches. Most of these will be the same as selected originally, with some slight readjustments. Subsequent pruning should develop a symmetrically open bowl-shaped tree by removing branches which tend to grow inward and those which are growing straight up through the center of the tree. Head back slightly only those selected scaffolds where growth has exceeded 30 inches with little or no branching. On scaffolds which have made less than 30 inches growth with several side branches, cut off all but two or three well-spaced side branches. Laterals on a scaffolding branch which will grow out and slightly up from left and right are most desirable. Those which tend to grow towards the ground should be removed. All branches which arise from the trunk, other than scaffolds, should be removed.

From the second to the fourth year, cut off annually those branches which interfere with the growth of the scaffold limbs, but avoid severe pruning as this will delay the time when the tree will start to produce a profitable crop.

#### Pruning bearing trees

When pruning bearing peach trees, keep in mind that peaches are borne laterally on shoots that grew the previous year. Therefore, the stimulation of one-year shoot growth by fertilization and pruning is essential for maximum yields of fruit. On a vigorous one-year shoot, usually three buds will be produced at each node. The two plump outside buds will be blossom buds and the smaller bud in the center will be a leaf bud. On less vigorous shoots there may be but one fruit bud and a leaf bud at a node.



*Fig. 34. Young bearing peach tree before pruning.*

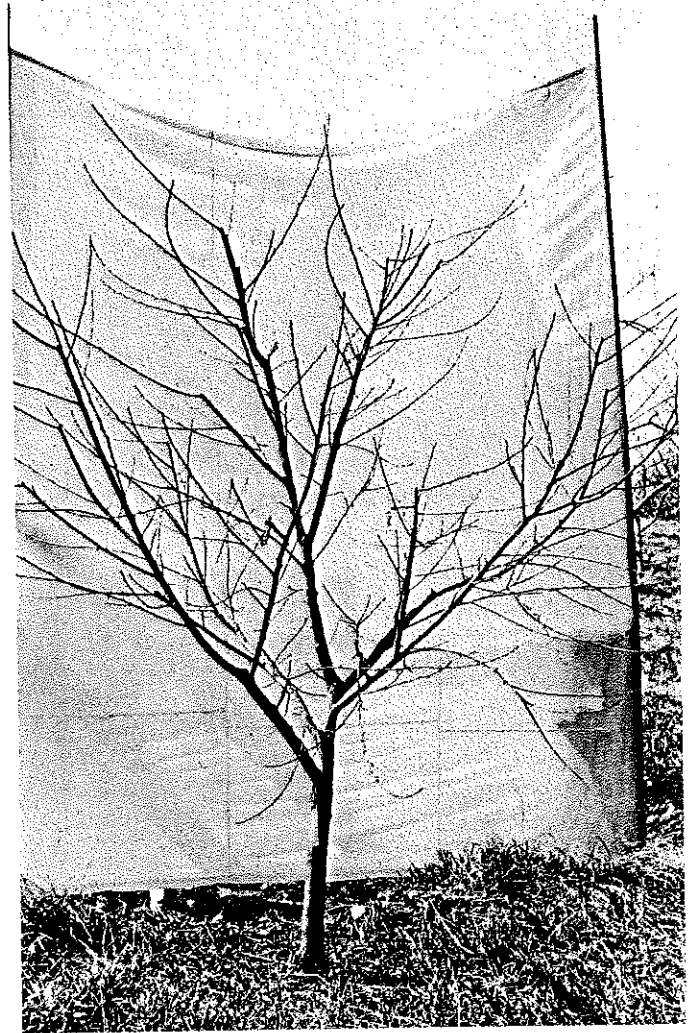
In pruning a bearing tree the following branches should be removed:

- Those which are broken or diseased.
- Those which are slender and weak—especially on the inside of the tree.
- Those which grow toward the center or straight up.
- Those which grow downward so as to interfere with mowing or cultivating equipment.

After these branches are removed, it may be necessary to thin out moderately, a few of the more vigorous branches where they are too numerous.

“Leggy” branches (those which grow out for a considerable distance without branching) need to be headed back in order to induce the development of side branches nearer the trunk.

To overcome the peach tree’s growth habit of producing bearing wood further and further from the trunk, retain a few young branches on the inner parts of the tree. These branches should be located so that they will subsequently replace older wood.



*Fig. 35. Same tree as in figure 34 after pruning.*

To keep the tree at a convenient height, head back upright branches to an outward growing lateral branch when they reach a distance of approximately eight feet from the ground.

## PRUNING PLUM TREES

### Pruning young trees

There is a marked difference in the growth habit of plum trees, depending on type and variety. Some are decidedly upright while others are distinctly spreading.

Regardless of growth habit, young trees should be trained essentially according to the leader system as described for apple trees. The minimum vertical distance between scaffold branches along the trunk should be six inches. Five or six main scaffold branches should be sufficient. On upright varieties, it may be necessary to head back exceptionally vigorous branches to outward-growing laterals in



*Fig. 36. Mature peach tree before pruning.*



*Fig. 37. Mature peach tree after pruning.*

## FURTHER INFORMATION

The following is only a partial listing of books on pruning. Leaflets on the subject are available from UMass Extension and from the United States Department of Agriculture.

**Childers, Norman**, *Modern Fruit Science*, Horticultural Publications. New Brunswick: Rutgers-The State University of New Jersey, 1981.

**Christopher, Everett**, *The Pruning Manual*, New York: MacMillan Co.

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order to spread the tree. On the other hand, with trees having a spreading habit of growth, any heading back should be to more upright growing laterals.

#### **Pruning bearing trees**

Plums are borne laterally on one-year shoots and spurs with the bulk of the crop borne on spurs.

Annual pruning helps to maintain a supply of young wood on which the spurs are borne. After a plum tree begins bearing, an annual thinning out of water sprouts and branches growing towards the center of the tree will constitute the major part of the pruning operation. Heading back of scaffold branches should be avoided except to suppress any which compete with the leader.

#### **Removal of black knots**

The plum is particularly susceptible to the fungus disease black knot, which may be identified by black swellings on the branches. The principal control for this disease is to prune off and burn these galls. Remove small branches entirely. On larger branches, cut to an outward growing lateral. In any case, the cut should be made at least six inches below any evidence of the disease. This may require more drastic pruning than would be recommended ordinarily.

### **PRUNING CHERRY TREES**

Sweet and sour cherry trees differ materially in habit of growth. Sweet cherry trees are typically tall and upright while sour cherry trees are smaller and more spreading. Both have one characteristic in common: the formation of whorls of branches at intervals along the main leader and scaffold branches. A whorl consists of two or more branches originating at approximately the same level. Whorls should be eliminated by removing one or more of these branches.

Both sweet and sour cherry trees may be trained to the central-leader system, described previously, with the lowest scaffold arising 18 to 24 inches from the ground. Four to six scaffold branches, not including the leader, spaced 8 to 12 inches apart for the sweet cherry and 6 to 8 inches apart for the sour cherry, on the central leader should be adequate. Only those branches forming a wide crotch angle to the central leader should be saved for scaffolds.

#### **Pruning cherry trees at time of planting**

*Sweet cherry.* For best results, a one-year, four-to six-foot whip, with a diameter of 3/4-inch or more should be planted. With a four foot tree, only the immature tip need be cut off. Taller trees should be cut back to a height of about four feet.

*Sour cherry.* In contrast to one-year sweet cherry trees, one-year sour cherry trees may have numerous branches. In the case of trees with vigorous growth, four well-spaced laterals coming out at wide angles

from the leader may be saved. Excessively vigorous branches should be headed back, all other laterals should be removed. If weak trees are set out, it may be desirable to prune all laterals back to short stubs and then to select the scaffold branches from the later, more vigorous, growth.

#### **Pruning mature cherry trees**

*Sweet cherry.* Sweet cherry flowers are borne laterally on long-lived spurs and on last season's shoot growth. A sweet cherry spur may remain economically productive for 10 to 12 years. Because of this, the sweet cherry tree requires less pruning than the other fruits discussed in this circular. Pruning is usually confined to removing those branches which interfere with the development of the scaffold branches and to those cuts necessary to maintain the desired shape and size of the mature tree. To prevent the tree from becoming too tall, the leader may be cut back to a strong-growing lateral at a height of 10 to 12 feet.

*Sour cherry.* Once the scaffold system has been developed, the sour cherry requires only light corrective pruning for the next four or five years. This corrective pruning involves removing water sprouts, inward-growing limbs, and branches that cross or compete with the main scaffold. As the sour cherry tree reaches maturity, it tends to become too dense and it is necessary to do an increasing amount of thinning-out in the periphery to keep the trees open. It is important to keep the trees open so as to prevent the inside and lower wood from dying because of too much shade, and to allow for better penetration of spray material. Annual terminal growth of 12 to 15 inches of plump wood appears to be necessary for good, annual fruit production. With annual shoot growth of less than 10 inches, most of the axillary buds develop into flower buds. This results in a branch free of all lateral growth the following season.