

# Pruning Fruit and Nut Trees

## PRUNING EQUIPMENT

In pruning, three tools are usually needed: pruning shears, pruning saw and, often, an orchard ladder.

Pruning shears commonly have two blades: a single-beveled cutting blade and a hooked or curved noncutting blade. The head usually contains a bumper to reduce pruner fatigue. Handles are of hardwood or metal and the overall shears (head and handles) come in lengths up to 36 inches. The long-handled pruning shears are used to make cuts up to 1 inch in diameter and are often called "lop-pers." Smaller hand shears can be used on young trees and limbs of ½-inch diameter or smaller. Pole pruners with a shear head mounted on an 8- to 12-foot pole also are available as an alternative to using a ladder for access to the upper portion of large trees. The cutting blade is operated by a lever-and-rope mechanism.

Pruning saws have a wooden handle with an 8- to 15-inch curved saw blade. The teeth are wide set (about 6 teeth per inch) so that green wood can be cut easily. Pole saws (a regular pruning saw on a

long pole) are sometimes used for making saw cuts in large trees rather than using a ladder.

Orchard ladders are wood or aluminum and commonly manufactured in even-foot lengths, such as 8, 10, and 12 feet. They are three-legged (tripod) with the third or positioning leg hinged at the top to the other two. *Do not use four-legged ladders for tree pruning* because they lack stability on uneven ground surfaces. *Do not use tripod orchard ladders on cement or other hard, smooth surfaces* because the single leg will slide and the ladder will collapse. Mechanical, man-positioners (commonly called pruning towers) are sometimes used in place of ladders.

Mechanized shears and saws are also used. These are operated by electrical, hydraulic or pneumatic means. Tree topping and side-hedging are sometimes done mechanically, using a series of large circular saws or a sickle bar arrangement, although this practice may be questionable for some species.

## PRUNING FRUIT AND NUT TREES

There are two pruning phases in the life of fruit trees. In the first young trees (age 1-4 to 6 years) are pruned or *trained* to provide a structurally strong framework for supporting a maximum fruiting area easily accessible for cultural and harvest operations. In the second phase older trees are *pruned* to maintain, renew, and evenly distribute fruit wood throughout the tree. At pruning time weak and

broken limbs, interfering branches and unneeded water sprouts also are removed. In California, deciduous fruit trees are normally pruned during the dormant season each year.

## TRAINING SYSTEMS

Three training systems are usually used for developing fruit and nut trees in California: open center, modified central leader, and central leader. The

system selected depends mainly on the growth habit of the species of tree being trained and also on tree spacing.

### The Open-Center or Vase-Shaped System

The open-center or vase-shaped system is most commonly used in California on almond, apricot, cherry, fig, nectarine, peach, pear, persimmon, plum, pomegranate and prune. Many apple and pistachio trees are also trained to this system.

Tree shaping to the open-center system is accomplished in a few basic steps. Variations are necessary because of differences in growth and bearing habits of the various species and varieties.

**Pruning at planting.** The tops of newly-planted trees should be pruned at planting time. Cut back (head) the tree at a point 24 to 32 inches above the ground. Hand-harvested trees are headed lower than mechanically-harvested trees which need higher heads for equipment access. Small trees (3/16- to 3/8-inch trunk diameter) usually have no lateral branches on their trunks. To prune properly head back (top) the trunk with one cut at the desired height above ground (Figure 1). The primary scaffold limbs that develop within 6 to 10 inches of this cut will form the tree head (crotch). Bigger trees (1/2-inch diameter or larger) usually have lateral branches along their trunks. Some of these branches can be removed completely, but others in desirable locations for permanent scaffolds should be headed back, leaving 2- to 4-inch stubs with one or two lateral buds (Figure 2). The trunk should be headed at the same height as smaller trees. Some larger trees (particularly yearlings) have potential scaffold limbs that can be headed back 6 to 8 inches from the trunk.

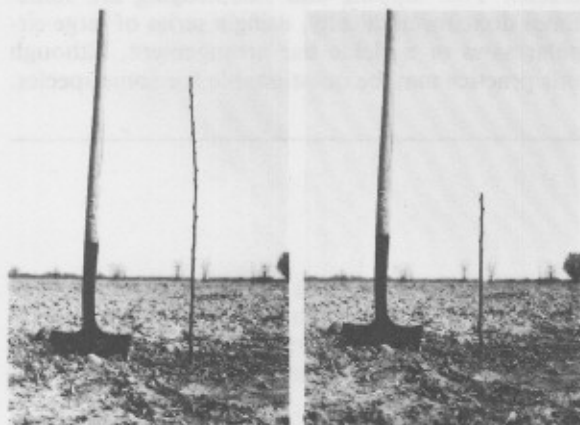


Figure 1. Many nursery trees have no lateral branches. To promote the development of primary scaffold branches, the unheaded tree (left) was cut back to 24 to 32 inches above the ground (right).

Many growers summer-prune during the tree's first growing season. This mainly involves removing undesirable branches (not wanted as permanent limbs), pinching back less desirable branches, and removing suckers. This allows good growth on branches desirably located for permanent scaffolds. The orchard is walked two or three times during the summer for pruning so that limbs are quite small when removed. All pruning is a dwarfing process, but summer pruning is especially devitalizing and can result in excessive growth reduction if too much leaf surface is removed. Thus, one should use caution in utilizing this practice and only experienced personnel should perform the task. Summer pruning can help spread the growth of some upright growing species.

**First-year dormant pruning.** Primary scaffold limbs are usually selected at the end of the first year's growth. These develop into the tree's main structural limbs, supporting top growth and crop load in later years. Most potential scaffold limbs grow just below the point where the tree was headed at planting time. Select three to four limbs that are distributed evenly around the trunk and, if possible, spaced approximately 6 inches apart vertically on the trunk, leaving small lateral branches along these scaffold branches for early fruiting, tree growth and sunburn protection (Figures 3 to 5).

Do not select scaffold limbs that are directly above one another. Avoid upright limbs with narrow, acute angles from the trunk because they tend to be poorly attached to the trunk. Flat-angled (horizontal) limbs should not be selected for scaffold limbs because they will not give an upward growth pattern. For most species, angles for limb attachments of about 45 degrees are desirable. In windy areas it is advisable (where possible) to have the lowest scaffold growing toward the prevailing wind. If the



Figure 2. Nursery tree with lateral branches (left) was headed at 24 to 32 inches above ground, and many of the lateral branches were removed (right). A few lateral branches were cut back to leave short stubs, with one or two buds on each to develop into potential primary scaffold branches.



Figure 3. The unpruned 1-year-old peach tree (left) had numerous potential scaffold limbs arising from its trunk. With pruning (right), three limbs were left, spaced about 120 degrees apart around the trunk and several inches apart vertically. These scaffold limbs were headed slightly to promote branching at the desired points during the next growing season.

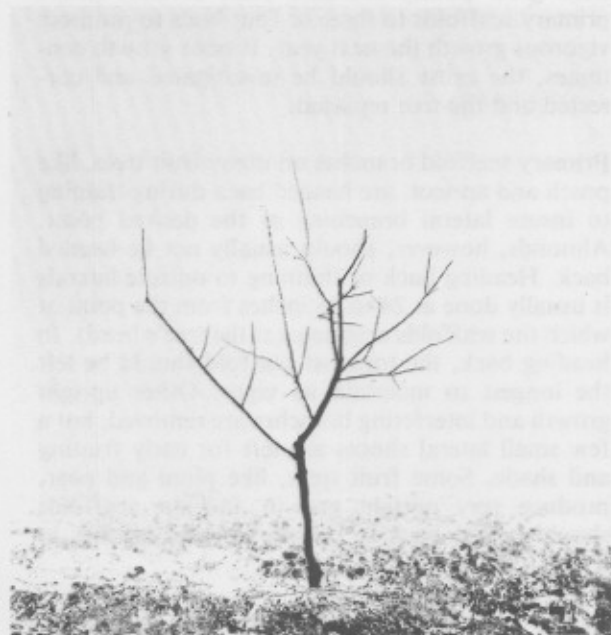
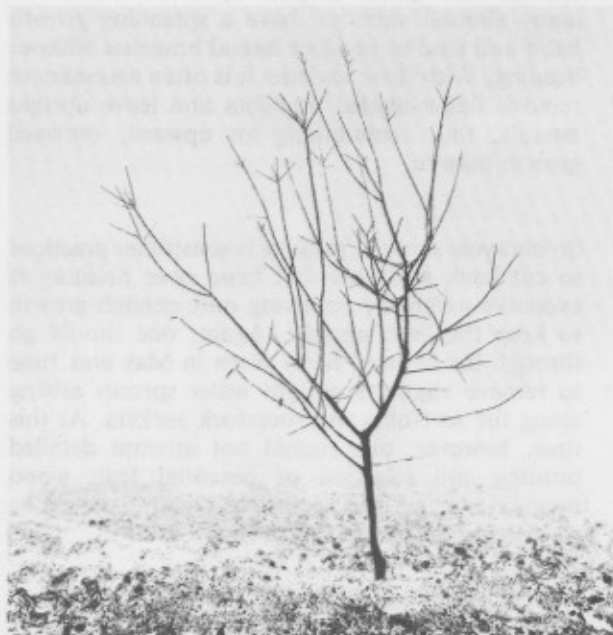


Figure 4. Trees with poor limb distribution on the trunk and uneven growth can be trained to develop satisfactorily. The unbalanced almond tree (left) was balanced by cutting the large scaffold limb more severely than the others (right).



Figure 5. Some trees (left) do not have three desirable scaffold limbs. In such cases, a branch arising from a primary scaffold can be selected to fill in the space and provide another scaffold limb. The third scaffold limb was selected by cutting off weak limbs in the center of the tree and leaving a strong outside branch (right).

trees grow poorly the first year, severely prune primary scaffolds to three or four buds to promote vigorous growth the next year. If poor growth continues, the cause should be investigated and corrected and the tree replaced.

Primary scaffold branches on many fruit trees, like peach and apricot, are headed back during training to insure lateral branching at the desired point. Almonds, however, should usually not be headed back. Heading back or thinning to outside laterals is usually done at 24 to 36 inches from the point at which the scaffolds originate (at the tree's head). In heading back, the topmost scaffold should be left the longest to maintain its vigor. Other upright growth and interfering branches are removed, but a few small lateral shoots are left for early fruiting and shade. Some fruit trees, like plum and pear, produce very upright growth and the scaffolds should be cut back to outside lateral branches to

provide tree spread (Figure 6). Other trees, like many almond varieties, have a spreading growth habit and tend to produce lateral branches without heading. With these varieties it is often necessary to remove flatter-angled branches and leave upright laterals, thus maintaining an upward, outward growth pattern.

Second-year summer pruning is sometimes practiced to cut back scaffolds that bend over because of excessive weight by removing only enough growth to keep the limb upright. Again, one should go through the orchard fairly often in May and June to remove vigorous upright water sprouts arising along the scaffolds and rootstock suckers. At this time, however, one should not attempt detailed pruning and selection of potential fruit wood because as much leaf surface as possible should be retained to maximize tree growth.



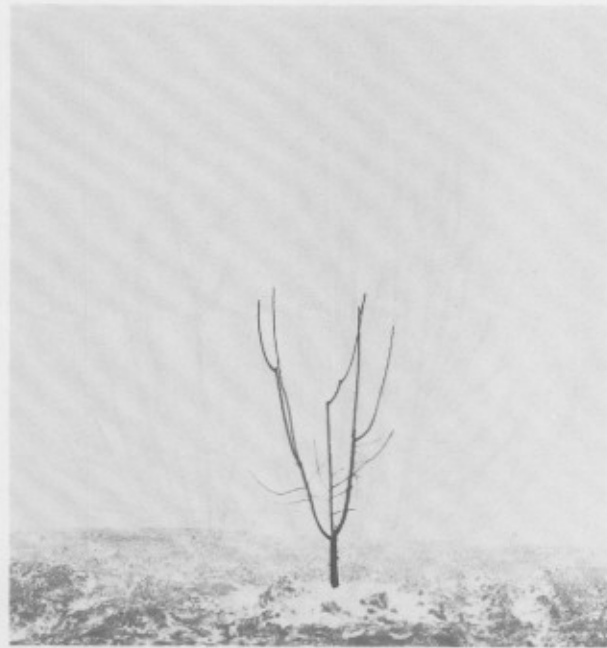


Figure 6. So that it would develop an open center, this 1-year-old Japanese plum tree was pruned to leave outside, spreading limbs, and was headed to promote branching at the desired locations.

**Second-year dormant pruning.** Select two vigorous lateral branches arising 24 to 36 inches from the head on each primary scaffold to serve as secondary scaffolds. These limbs should be well positioned around the tree to fill the tree's eventual circumference (Figures 7 to 12). While two secondaries are usually selected, some primaries may be left with only one secondary and, in a few cases, three may be warranted, because of vigor and placement. If more than two secondary scaffolds are left per primary scaffold, some of the resulting limbs may be weak, may develop less fruit wood and may be apt to break with heavy crops.

*Do not overprune while attempting to form a symmetrical tree. Each tree grows differently and few provide the opportunity to develop the perfectly shaped tree.* Thus, one must use judgment to train each tree into the best possible framework from the limbs available. The open center system is not a rigid system; rather, it is intended to adequately

provide the expanding fruiting area with structural limbs.

Secondary scaffolds can be headed as were the primaries the previous winter at 24 to 36 inches above their crotch with the primary scaffolds. Again, this depends on the lateral branching character of the species and almonds usually should not be headed. When two secondaries are headed on one scaffold, it is best to leave one somewhat longer than the other. Again, spreading trees should be trained to maintain an upward growth pattern, while non-spreading trees should be trained to an outward growth pattern.

Large, flat-angled (70 degrees and greater) limbs growing from main scaffolds should be completely removed along with upright vigorous shoots in the center of the tree. Allow most of the less vigorous, flatter-angled lateral branches to remain to develop as fruit wood.

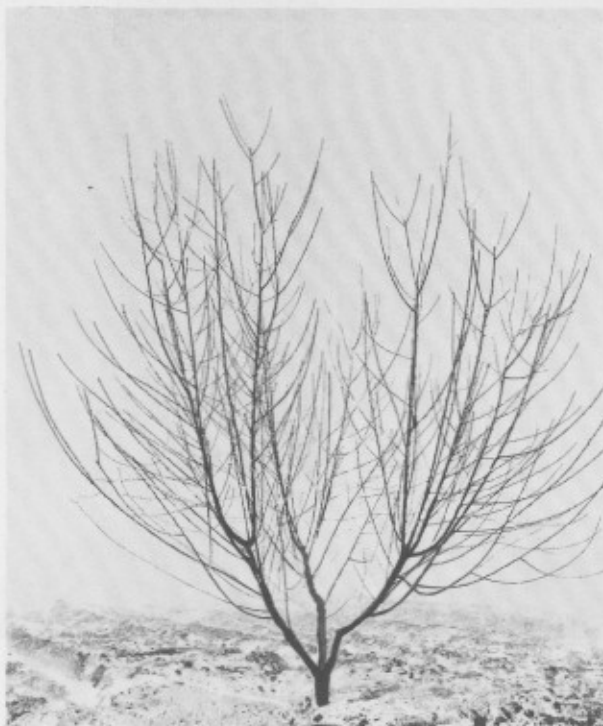


Figure 7. Many branches needed to be removed from the vigorous 2-year-old peach tree (left). Low and horizontal limbs were cut off, and vigorous moderately upright limbs were selected for permanent secondary scaffolds and headed at 24 to 36 inches above their crotch with the primaries (right).

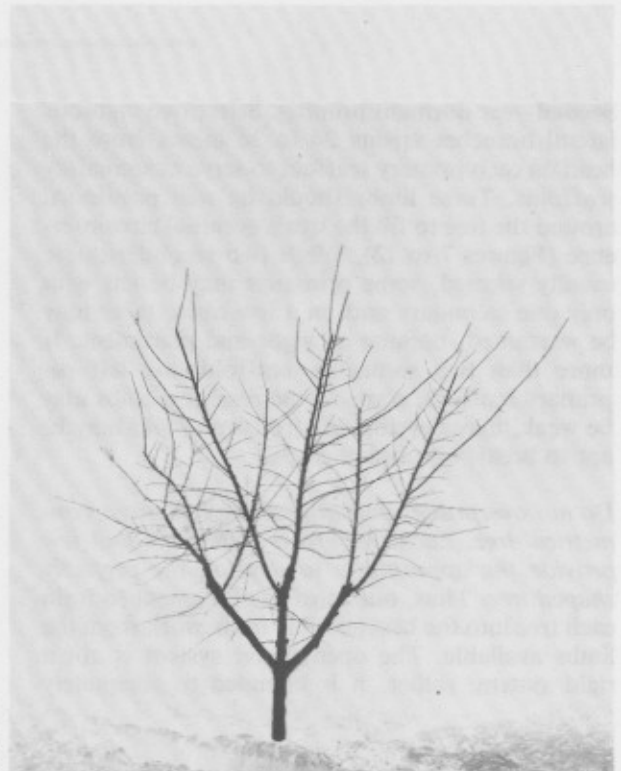
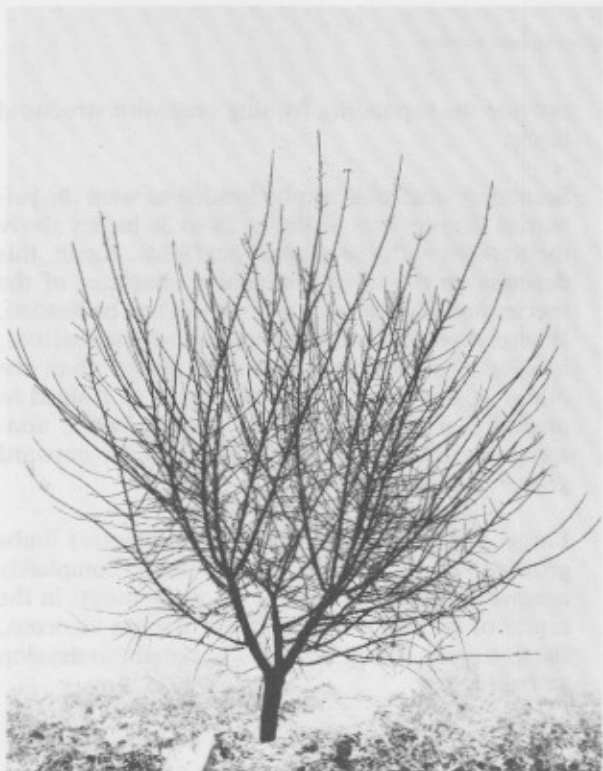


Figure 8. This 2-year-old vigorous almond tree (left) had too many limbs. These were removed during pruning to leave two secondary scaffolds on each primary limb (right). Many small lateral branches were left for fruit wood.



Figure 9. The lower and horizontal limbs of this young, moderately vigorous fig tree were removed. Secondary scaffolds were thinned to two or three per primary scaffold and were headed back at about 24 inches above their crotch with the primary scaffolds, where additional branching was desired.

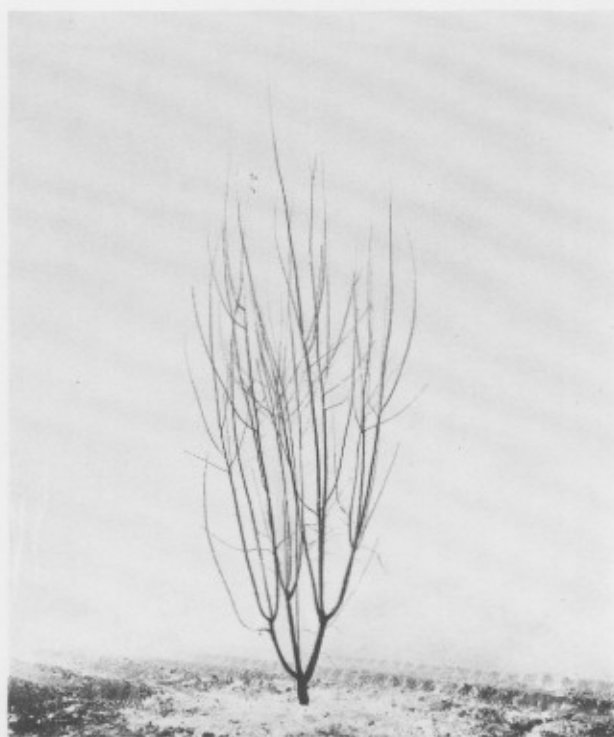


Figure 10. On this moderately vigorous, upright growing Japanese plum tree (left), it was important to remove the interior upright limbs and to leave outside spreading branches (right). The secondary scaffolds, with desirable lateral branches, were headed just above the side branch, while others without side branches were headed at a height where branching was desired (about 24 to 36 inches above their crotch with the primary scaffolds).

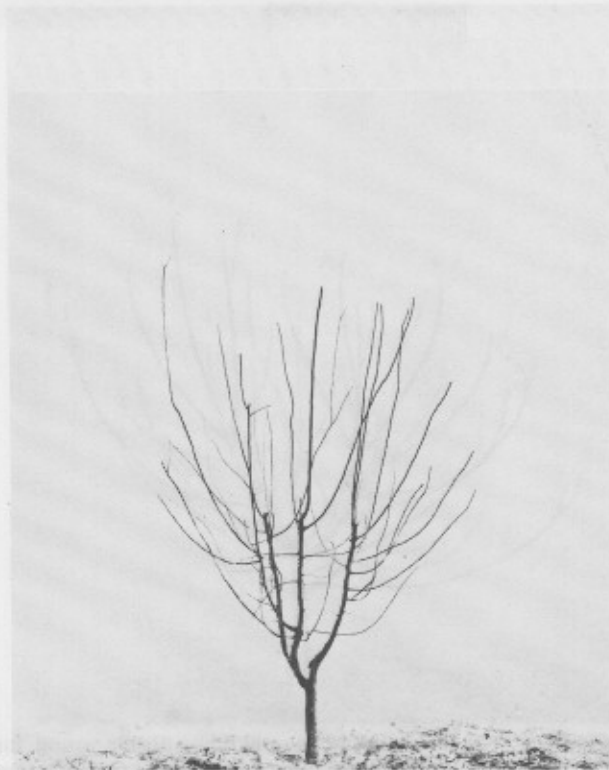
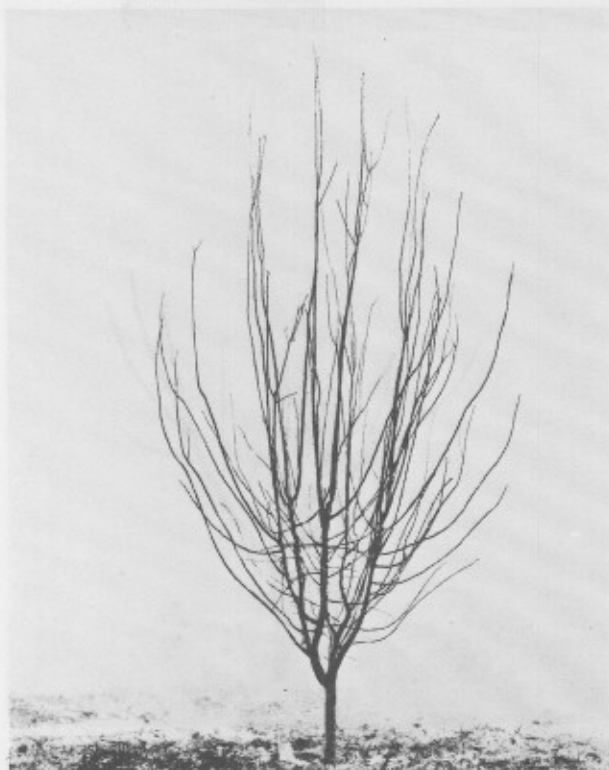


Figure 11. This prune tree was pruned to leave fairly long lateral branches for fruit wood. In later years, these branches may be shortened to reduce overcropping.

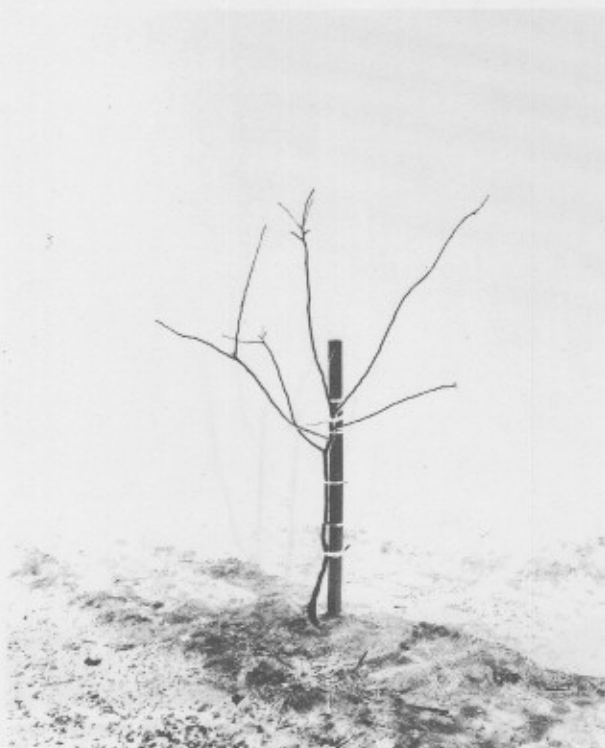


Figure 12. This young pistachio tree was summer pruned to eliminate unwanted branches, and the dormant pruning only consisted of heading back the existing limbs to encourage branching.



Tree training continues in the third and fourth dormant seasons as trees are pruned to grow upward and outward (Figures 13 to 20), while the open spaces are filled with scaffold limbs and fruiting branches. This kind of pruning, including heading as necessary to induce branching and maintain vigor, should be continued until the tree reaches its mature height.

At the end of 4 years of growth a tree should have three to four primary scaffolds at the head with five

to seven secondary scaffolds 4 to 6 feet above the ground. At 7 to 10 feet above the ground additional branches should fill the periphery of the tree top. Less vigorous, flatter fruiting wood was selected and thinned out during the first 4 years of structural training. This wood produces the first crops as the tree enters its bearing phase. The center of the tree should be somewhat open to permit light infiltration to maintain and stimulate further development of fruiting wood.



Figure 13. This 4-year-old peach tree should bear a substantial crop in its fifth year. Fruit wood was thinned out to adjust the crop load and reduce fruit thinning.



Figure 14. An apricot tree often tends to spread excessively. Train it to grow upward by removing horizontal limbs (below). Scaffold limbs must be headed to maintain desired tree height. Thinning of fruit wood also is necessary.



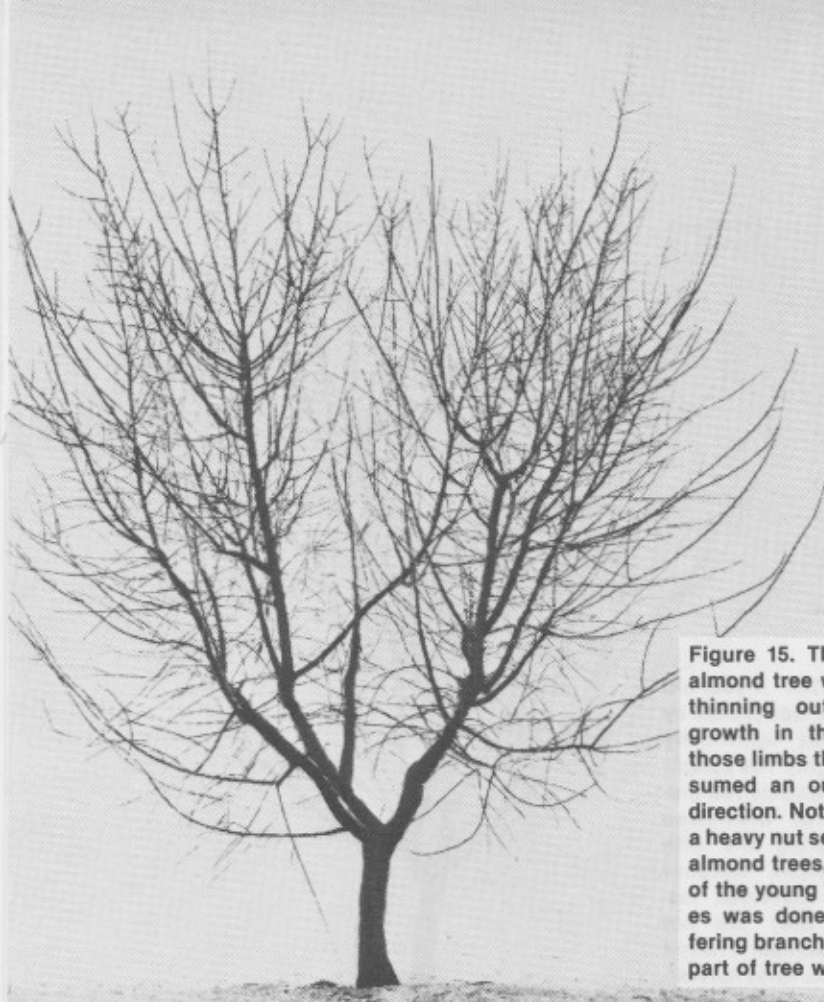


Figure 15. This 4-year-old almond tree was pruned by thinning out undesirable growth in the center and those limbs that had not assumed an outward-upward direction. Note that because a heavy nut set is desired on almond trees, little thinning of the young lateral branches was done. Larger interfering branches in the lower part of tree were removed.

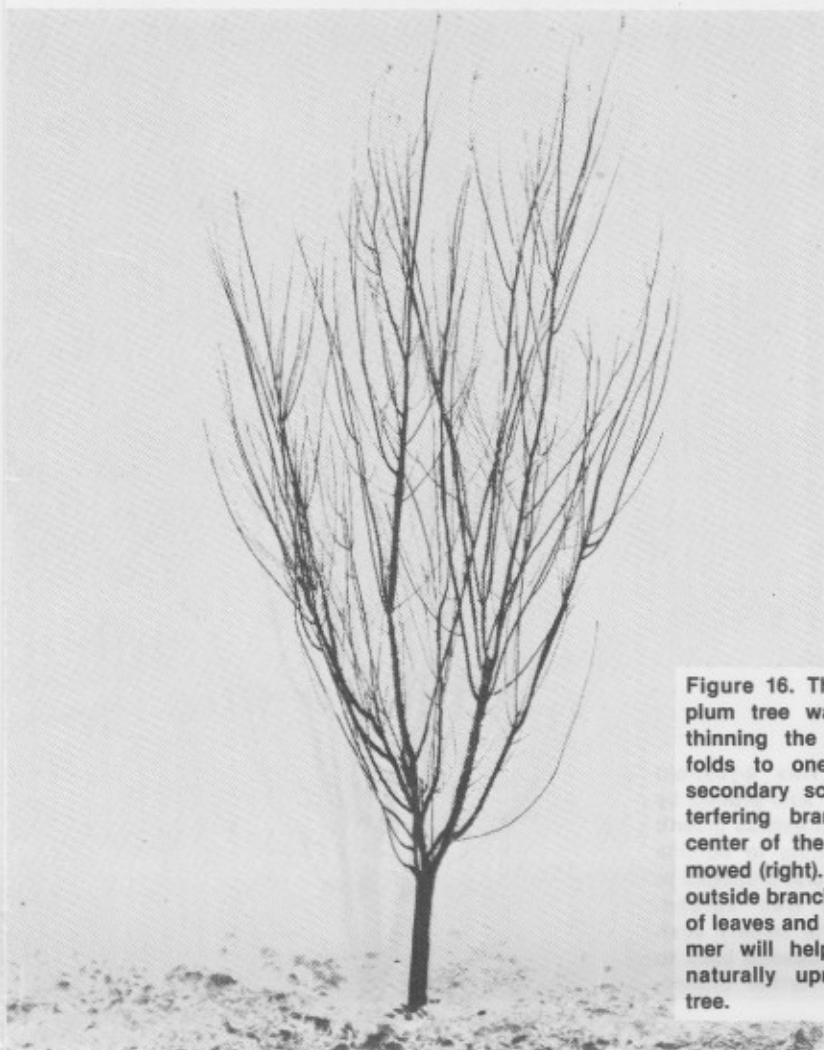
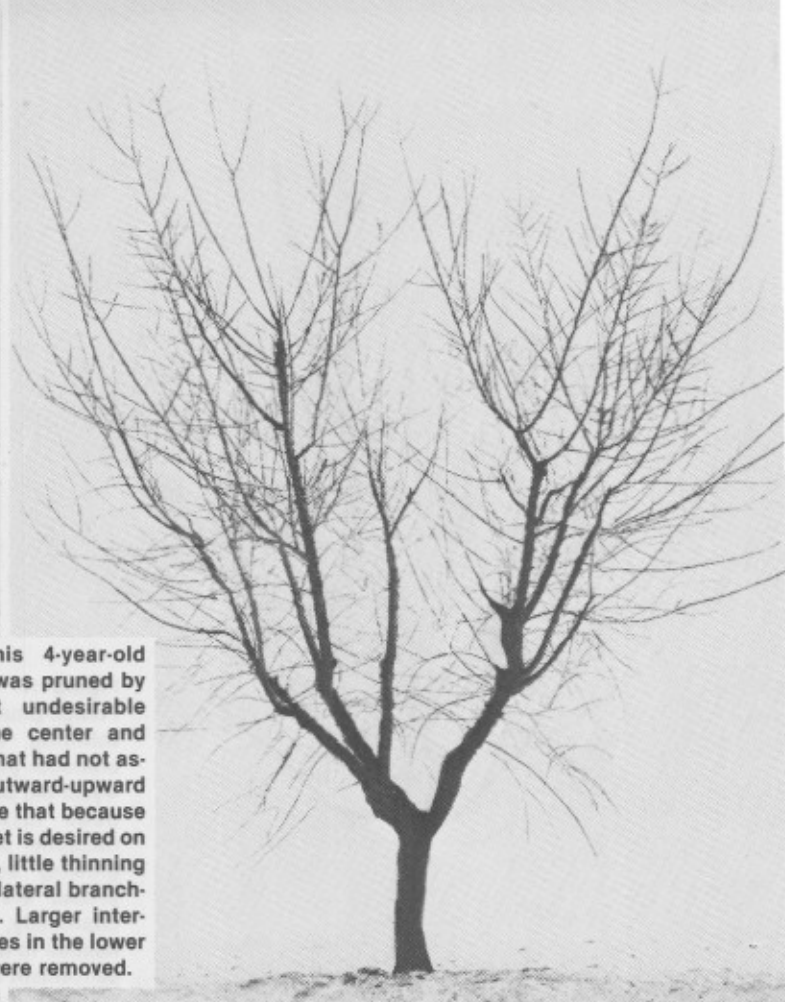
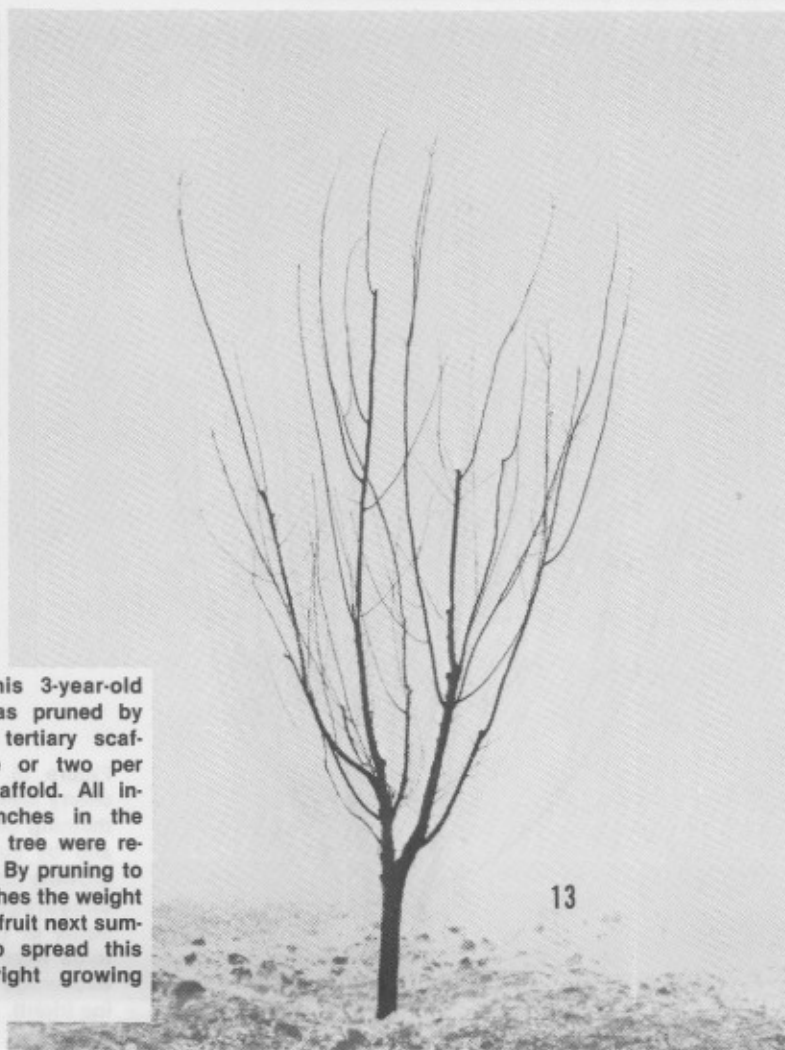


Figure 16. This 3-year-old plum tree was pruned by thinning the tertiary scaffolds to one or two per secondary scaffold. All interfering branches in the center of the tree were removed (right). By pruning to outside branches the weight of leaves and fruit next summer will help spread this naturally upright growing tree.





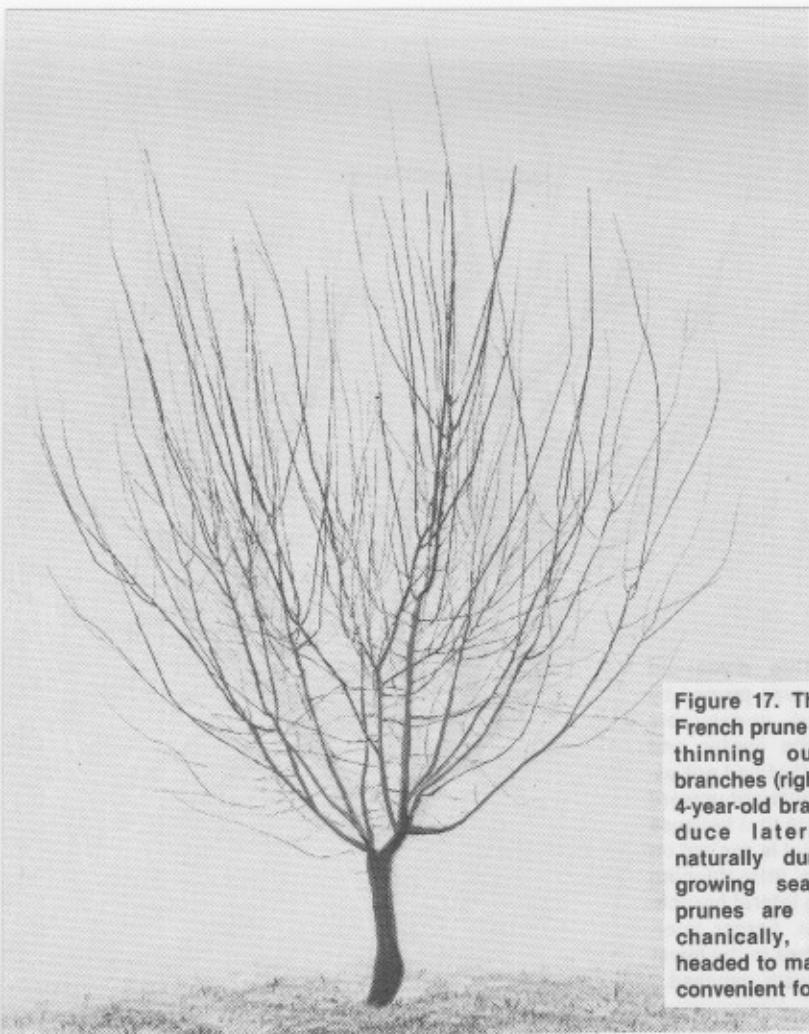
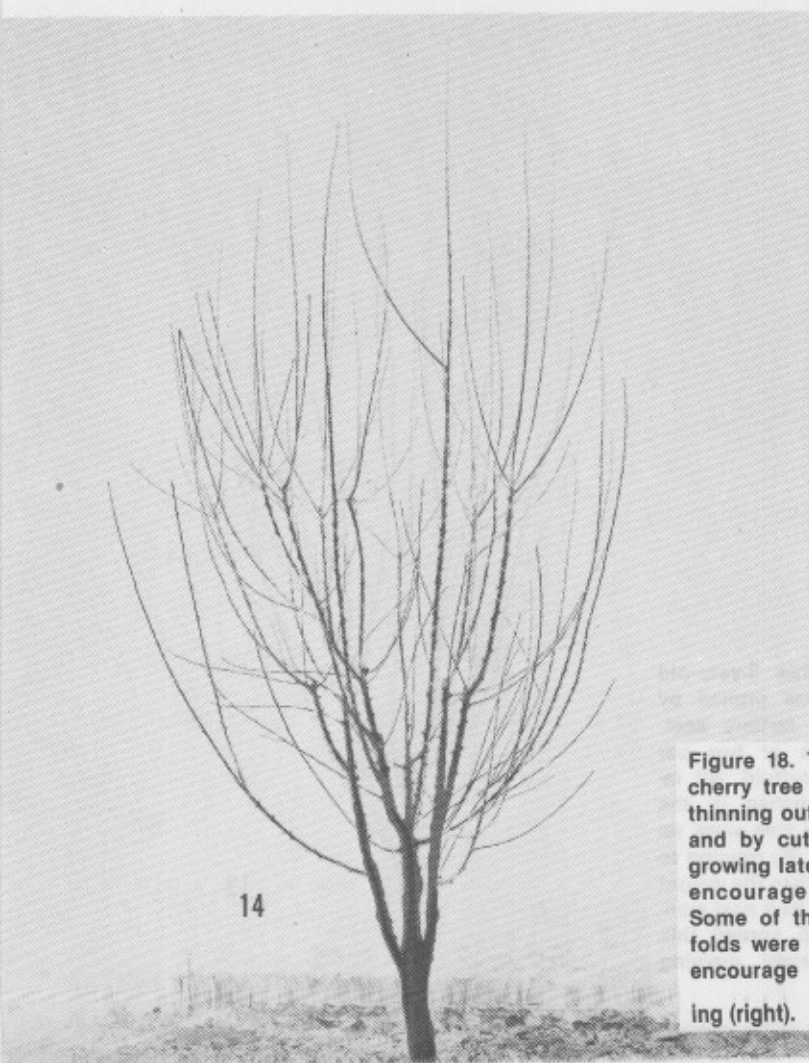
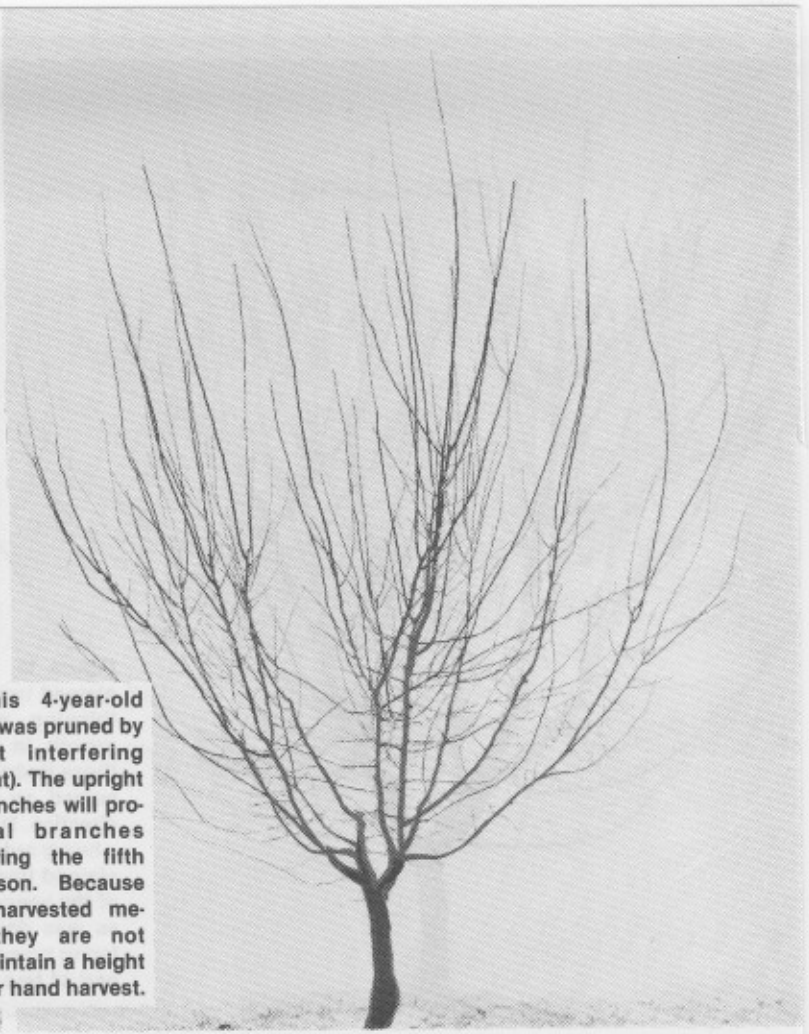
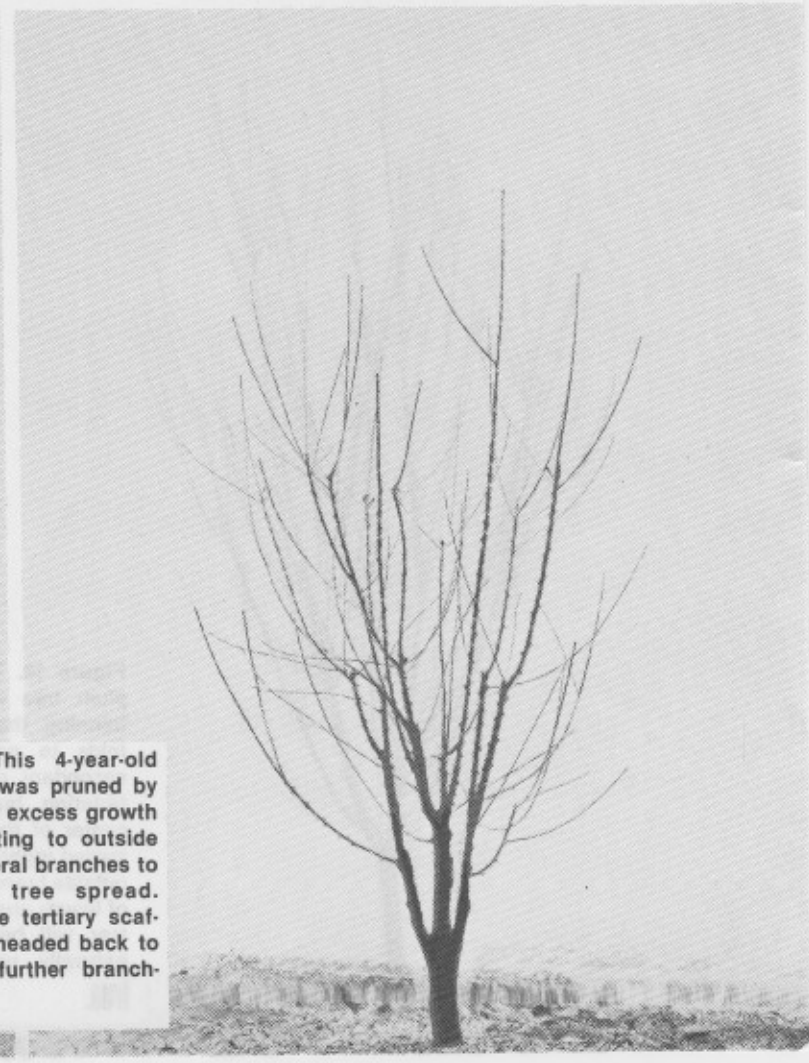


Figure 17. This 4-year-old French prune was pruned by thinning out interfering branches (right). The upright 4-year-old branches will produce lateral branches naturally during the fifth growing season. Because prunes are harvested mechanically, they are not headed to maintain a height convenient for hand harvest.



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Figure 18. This 4-year-old cherry tree was pruned by thinning out excess growth and by cutting to outside growing lateral branches to encourage tree spread. Some of the tertiary scaffolds were headed back to encourage further branching (right).





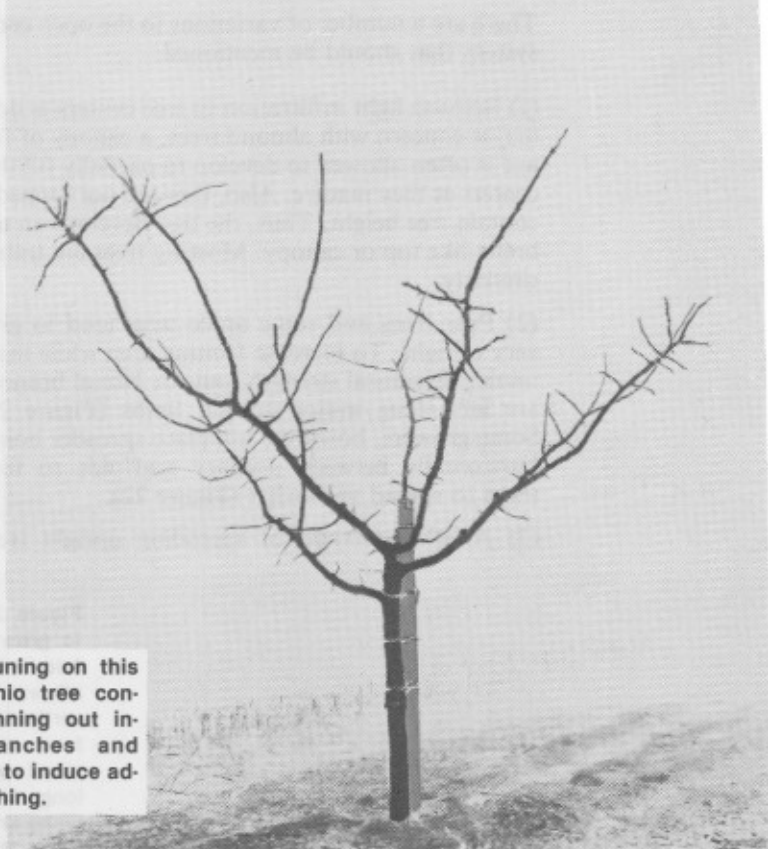
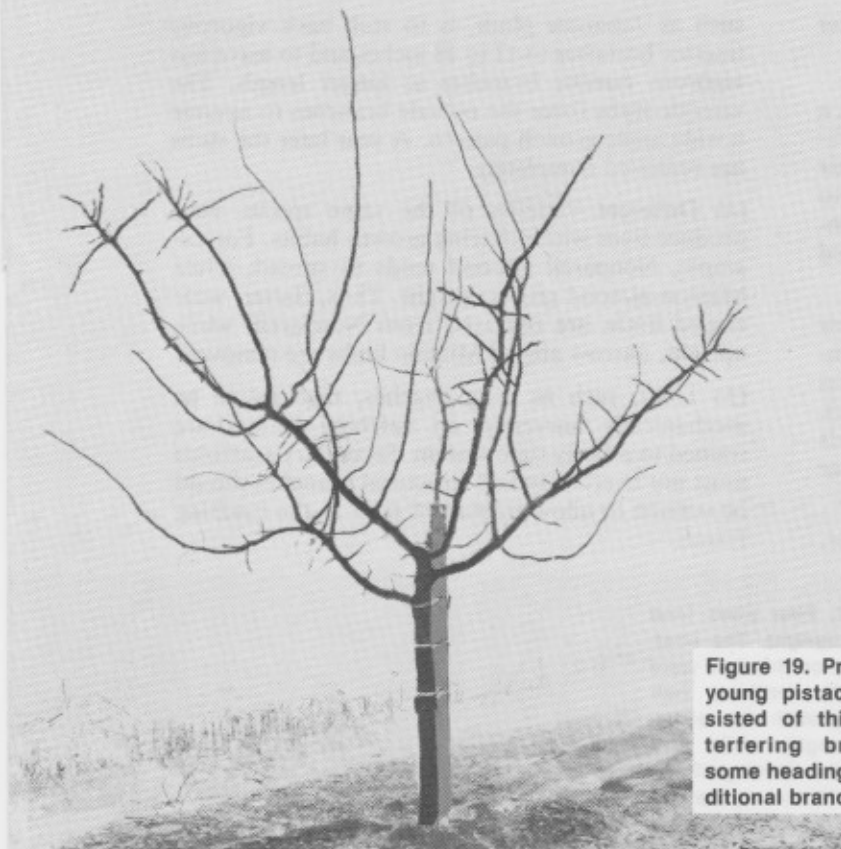


Figure 19. Pruning on this young pistachio tree consisted of thinning out interfering branches and some heading to induce additional branching.

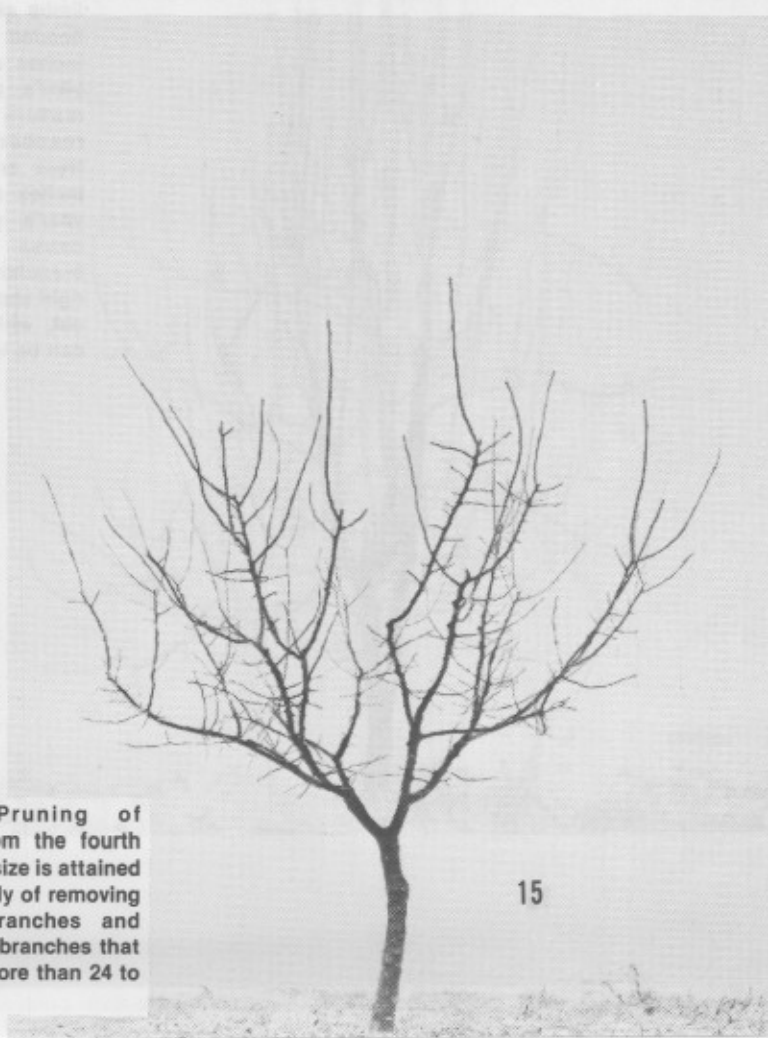
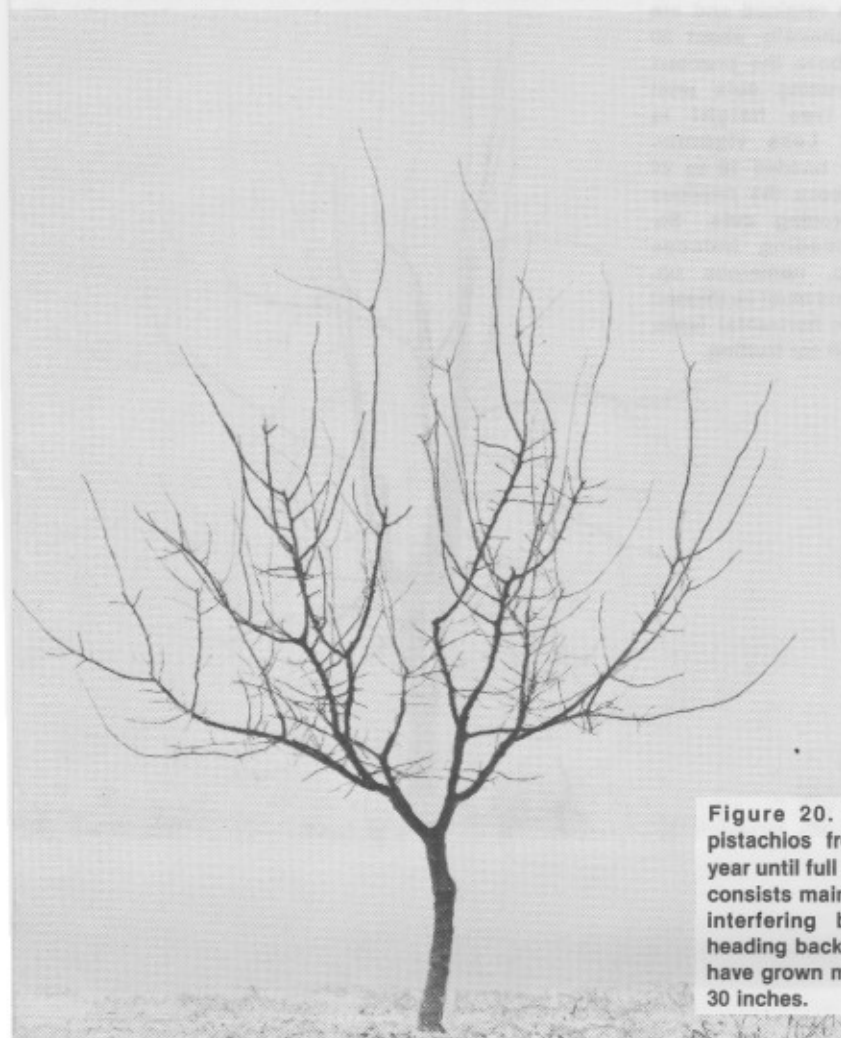


Figure 20. Pruning of pistachios from the fourth year until full size is attained consists mainly of removing interfering branches and heading back branches that have grown more than 24 to 30 inches.

There are a number of variations to the open center system that should be mentioned:

(1) Because light infiltration to tree centers is not a major concern with almond trees, a canopy of foliage is often allowed to develop to partially fill their centers as they mature. Also, they are not topped to contain tree height. Thus, the tree develops an umbrella-like top or canopy. Most fig trees are trained similarly.

(2) Pear trees and some apple trees tend to grow very upright. To increase fruiting area while maintaining structural strength, outside lateral branches are left along major upright limbs (Figure 21). Some growers, however, still place spreader boards horizontally between primary scaffolds to force them to spread somewhat (Figure 22).

(3) Another method of spreading upright trees,

such as Japanese plum, is to stub back vigorous interior branches to 12 to 18 inches and to leave less vigorous outside branches at longer length. The interior stubs force the outside branches to assume a wide angle growth pattern. A year later the stubs are removed completely.

(4) Different varieties of the same species may produce trees with differing growth habits. For example, Nonpareil almond tends to spread, while Mission almond grows upright. Thus, flatter, wide angled limbs are removed from Nonpareil, while upright, narrow angled Mission limbs are removed.

(5) Trees, such as cling peaches, that are to be mechanically harvested on catching frames are trained to a fairly rigid system. Secondary scaffolds must not overlap and all structural branches should be trained to allow freefall of fruit to the catching frame.

Figure 21. Pear trees tend to grow upright. The scaffold limbs on this tree were allowed to continue their vertical growth for structural strength, while fruit wood was developed on long, horizontal spreading limbs arising from the scaffolds. Three to four scaffold limbs are retained and are headed annually about 30 inches above the previous year's pruning cuts until mature tree height is reached. Less vigorous trees are headed 16 to 24 inches above the previous year's pruning cuts. Because heading induces branching, numerous upright shoots must be thinned out, while horizontal limbs can be left for fruiting.

