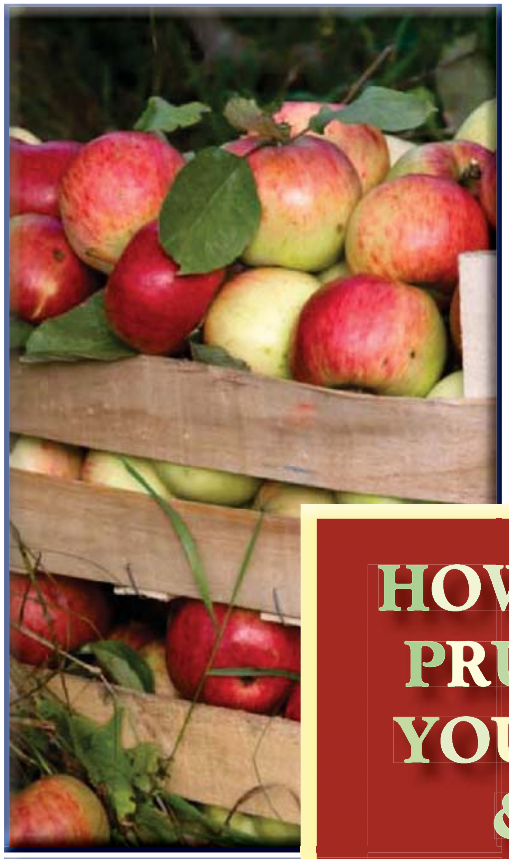
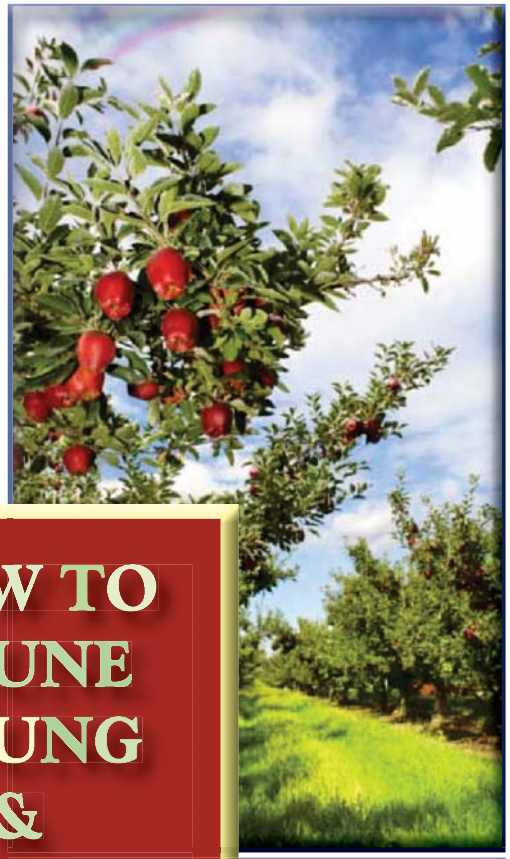
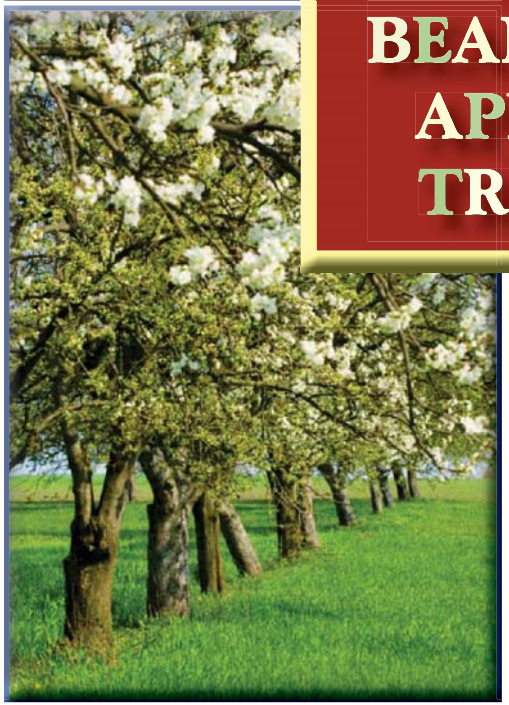
Kent A. Leonhardt, Commissioner
1900 Kanawha Blvd., East
Charleston, WV 25305





HOW TO PRUNE YOUNG & BEARING APPLE TREES



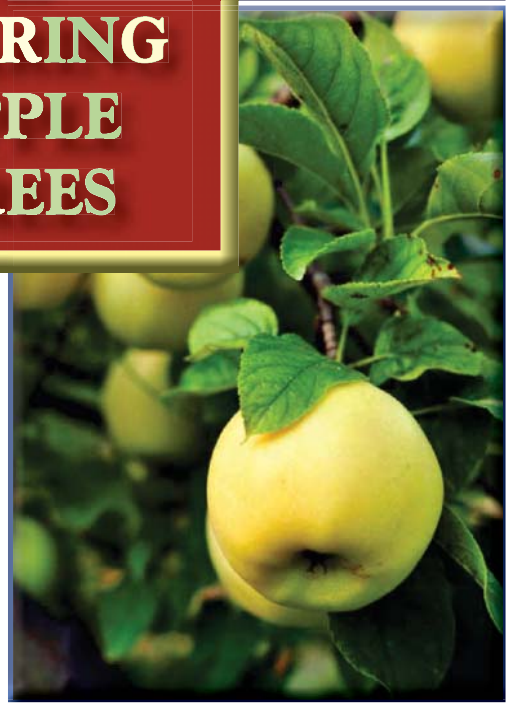


Table of Contents

How to Prune Young and Bearing Apple Trees

E. G. Christ
Specialist in Pomology
Rutgers University

Pruning is necessary to produce attractive, high-quality, marketable fruit. It invigorates the trees, prevents overbearing, increases fruit size and aids in the control of insects and diseases. Proper pruning produces a tree of desirable size, shape and form. It also exposes the maximum leaf area to sunlight.

The basic framework of each tree is established during the early years. As an apple tree attains full production, the amount of pruning must be increased to maintain an ample supply of young, vigorous, productive wood. Also, more pruning is required to keep the tree from getting too large.

Prune Young Trees

During the first two or three years in the orchard, each young apple tree should be pruned carefully to develop a satisfactory framework of branches. A few of the branches selected during the early years will be retained for the life of the tree.

One-year-old apple trees from the nursery are usually unbranched, straight 4- to 5-foot whips. Prune these trees to a height of about 3 feet. This promotes development of side branches.

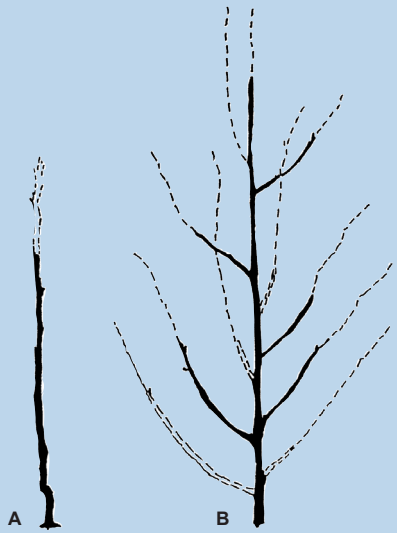


Figure 1. (A) Prune the 1-year-old nursery whip to a height of about 3 feet at planting time. (B) Prune the 2-year-old nursery tree to a central leader. Cut back the side branches that have wide angles with the trunk to about half their length. Remove broken branches and those that form a narrow angle with the trunk.

Two-year-old nursery trees often have many side branches. Prune these trees at planting time to a central leader, and cut back side branches to about half their original length. Remove broken branches and those that form an angle of less than 45° with the main trunk. Remove all side branches less than 24 inches from the ground if they are thin. If branches below the 24-inch level are large, prune them to 6-inch stubs; let the stubs remain for one year before removing them. Retain all satisfactory growth.

Keep pruning to a minimum during the early years. Production is greater on young trees that are pruned lightly. Often at the top of an

Contact Information

Plant Industries Division
Phone: 558-2212
Fax: 558-2435

Regulatory & Environmental Affairs Division
Phone: 558-2208
Fax: 558-3594
Pesticide Regulatory Programs Unit
Phone: 558-2209
Fax: 558-2228

Communications Division
Market Bulletin
Phone: 558-3708
Fax: 558-3131
marketbulletin@wvda.us

Executive Division
Phone: 558-3200
Fax: 558-2203
agriculture.wv.gov

Kent A. Leonhardt,
Commissioner of Agriculture

make many large cuts. Avoid large cuts as much as possible. If a large limb must be removed, make a 2-inch deep cut in the bottom of the limb 8 inches from its base. Next cut down through the limb about 6 inches from its base until the limb falls. Then remove the stub flush with the trunk.

Machine Topping

Several machines are available for pruning the tops and sides of apple trees. Old large trees can be reduced in height 6 or more feet if desired. The tops of the trees can be tapered to eliminate overhanging branches. This is drastic pruning and involves cutting into large limbs that are 10 or more years old. Very little additional pruning is required or recommended until the following year. Cut back each large stub to a side shoot and paint the exposed surface with tree-wound paint. Cutting off such stubs reduces sucker growth.

Fruit production is reduced following machine topping, and excessive sucker growth may occur. Reducing or eliminating nitrogen fertilizer prior to and during the year of topping will curtail sucker growth.

Less drastic machine pruning may be done the following year, but usually a thorough hand pruning will be sufficient. There is an opportunity to select new vigorous wood and in general renew the trees.

Machine topping and hedging must be supplemented by hand pruning. The retention of horizontal and upright fruiting wood and the removal of weak down growing wood must be done by hand. The removal of clusters of suckers and generally "opening up" the trees to allow maximum light exposure are necessary. It is more difficult to apply the machine pruning to the Rome variety that produces most of its crop on the terminals than to varieties such as Stayman, Delicious, and Golden Delicious.

General Suggestions

Apples are born mostly on spurs. The large and best colored fruits are born on large thick spurs that are well supplied with good leaves. On older trees, overall annual or biennial pruning is needed to keep these spurs in vigorous condition. The bearing history of a spur can be determined by its character of growth. Fruit spurs show a zigzag growth if they have been bearing normally every other year. If the spur has been unproductive over a number of years, it will show straight growth.

Remember, each spur needs plenty of room and light because spur leaves are largely responsible for the growth and coloring of the fruit. Thickly matted limbs prevent apples from growing and coloring well. Also, they interfere with spraying.

Since more and better mechanical equipment for use in orchards is now available, it seems wise to keep mature apple trees uniform in size and shape and relatively low. Trees on size-controlled rootstocks can be maintained at about 15 feet in height. On medium to low trees, it is easy to use pneumatic pruning equipment with a scaffold.

The author is indebted to Dr. Norman F. Childers, professor and research specialist in horticulture, Cook College, Rutgers University, who reviewed and criticized the manuscript. Also, credit is due to Dr. F. Hilkmbaumer, director of the Institute of Pomology, University of Bonn, Bonn, Germany, for illustrative ideas obtained from his book entitled Practical Work in Pomology.

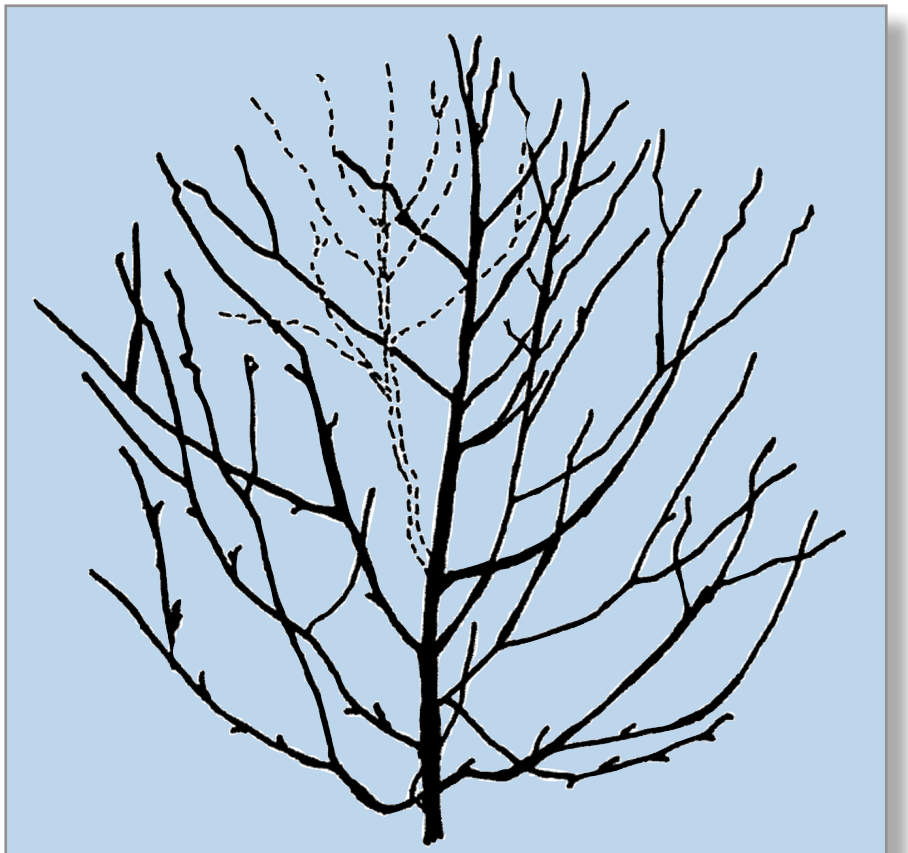


Figure 2. Watch for the formation of a “V” in the top of young apple trees. Remove one side of the “V” to retain a strong central leader. The pruning illustrated above should have been done a year sooner.

apple tree a “V” is formed after the second or third season, and sometimes a nursery tree will have a “V”. Retain the side of the “V” that is growing into the prevailing winds, if possible. This is an important pruning cut that is often overlooked.

Pruning during the third, fourth and fifth years should be mainly corrective pruning that will help produce a strong framework of branches. Any tree that is neglected during the first few years in the orchard often needs severe corrective pruning to eliminate a very weak framework.

Production often begins with a few fruits the third year and may be 4 or 5 bushels per tree the fifth season. From the fifth year through the twelfth year, the main scaffold limb selection is completed. Three, four or five limbs spaced around the central leader will eventually become main scaffold branches. Excess limbs are removed from the main trunk one at a time each year after the trees become five years old. *Limb breakage may alter the selection of main scaffold branches.*

Stub Pruning

Trees of the Delicious variety, especially the Spur Red Delicious, often produce many narrow angles at the trunk. This condition becomes worse if young trees are pruned excessively. Stub pruning improves the frame work development of this variety, and it can be used to some extent on other varieties. Undesirable limbs are pruned to 6-inch stubs. Limbs below the "brush" that grows on the stubs usually have wide angles. These limbs are selected as the permanent framework, and the brush on the stubs reduces the tendency for the permanent limbs to grow back into the tree.

Two-year-old nursery trees often have a large limb or two growing low on the trunk. Removal of a large limb leaves a wound that may result in a 25 or 30 percent girdling of the tree. It is more desirable to leave a stub for a year or two before removing it at the trunk. Remove all brush from these low stubs in May and June to retard growth at that point.

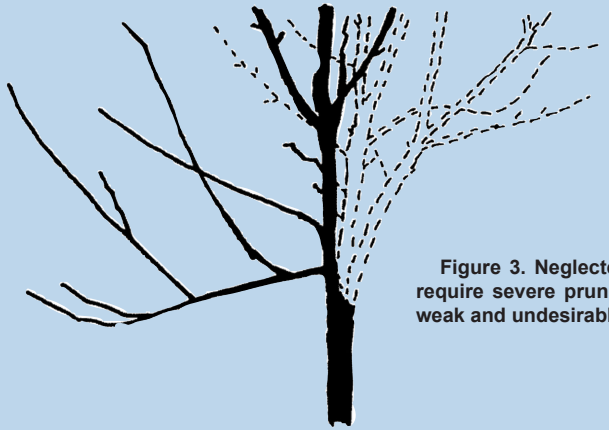


Figure 3. Neglected young trees often require severe pruning to correct a very weak and undesirable framework.

Spur-Type Trees

The most prevalent variety of spur-type tree is the Red Delicious, but there are spur types of Golden Delicious and several other varieties and more will be forthcoming.

Spur-type trees are smaller than standard trees even when grown on seedling roots. They will be smaller still when grown on dwarf and semidwarf roots. Spur-type trees grow in an upright manner much like pear trees. They do spread out somewhat as they approach 5 and 6 years of age, but they may be generally upright throughout their life.

The discussion on pruning applies to spur-type trees, but the upright habit of growth makes it more difficult to obtain a desirable framework. On Red Delicious, many of the crotch angles are narrow. Also, the low scaffold limbs often grow rapidly and dominate the central leader. Cut back such limbs to an outward growing side limb to avoid dominance over the leader.

Some trees will develop several leaders with no predominant central leader. They will become acceptable open-center trees. Use stub pruning on spur-type trees where needed and train limbs to grow in a more horizontal direction when possible.

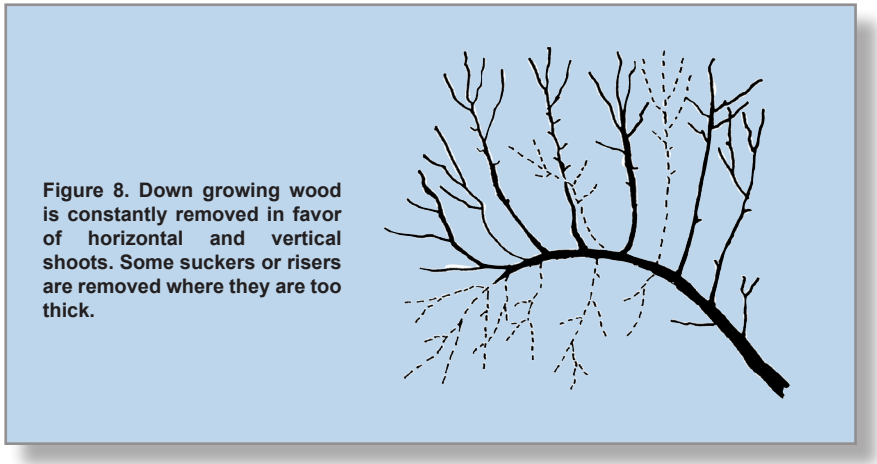


Figure 8. Down growing wood is constantly removed in favor of horizontal and vertical shoots. Some suckers or risers are removed where they are too thick.

Pruning Equipment

Use sharp pruning tools that are in first-class condition. The tools should be relatively light and easy to handle. Two-foot toppers and a handsaw are usually adequate for young trees, and pneumatic or electrical pruners are often used on bearing trees. Use rubber footwear to prevent scarring of crotches and limbs while climbing – especially after the bark begins to slip. To reduce the labor and time required for the overall pruning job, portable platforms with or without pneumatic pruning equipment are being used in many large orchards. The platform should be 8 or 9 feet above the ground and adjustable according to the height of the trees. Movable planks or kick boards may be extended from the platform for working closer to the centers of the trees. When needed, one or two men work on the ground to make the lower cuts and to move the tractor. Also, these men use pole hooks to remove prunings that catch in the trees.

Making the Cut

Smooth cuts can be made only with sharp tools, and they heal more quickly than ragged ones. Make cuts flush. Decay often starts in ragged cuts, and it will enter the main trunk and weaken the entire tree structure. Cuts properly made will heal rapidly.

Place the cutting blade of the shears below or at the side of the crotch – not in the crotch. Do not wiggle the shears through a cut; you may spring the shears and make a ragged wound.

If you prune your orchard regularly, you will not have to

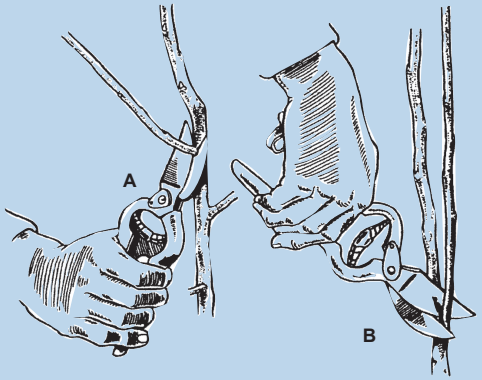


Figure 9. (A) Place the cutting blade below or at the side of the limb to be removed – (B) not In the crotch.

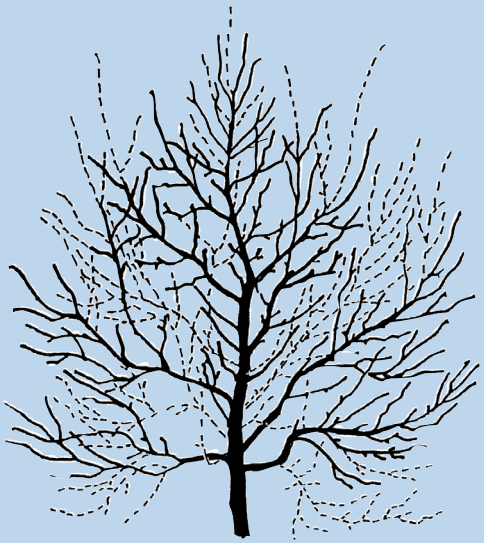


Figure 7. A young bearing apple tree with a central leader and strong framework branches. Removal of some large limbs at the trunk continues through the 10th year as permanent scaffold limbs are retained. Scaffolds are well spaced around the tree and form wide angles with the trunk. Down growing wood is removed in favor of horizontal or upright shoots. As the tree grows, every effort Is made to keep it in the form of a pyramid.

There are several methods used in training trees to a trellis. One system that is very popular is called the palmette or a modification of it. A central leader tree is trained to the wires with main framework branches at each wire. Branches are tied to the wires at an angle slightly above the horizontal. Usually eight main arms are sufficient. It is important that the lower limbs be developed first and the top limbs be suppressed during the early years. Do not permit the upper limbs to overgrow the lower limbs during the early years. Detailed pruning is necessary during the dormant season. Summer pruning during late June to mid-July is necessary to reduce the vigor and also allow good light penetration for fruit bud development and for the development and ripening of fruits.

Tree vigor is perhaps the key to success with trellised trees. Avoid excessive fertilization because it becomes extremely difficult to restrict the tree form if excessive sticker growth occurs.

When to Prune

Pruning can be done anytime during the dormant season when the weather is mild. It is best not to prune when temperatures are below freezing. Pruning may continue into the blossoming period. When growth starts, however, the bark slips easily and pulls loose at pruning cuts. Such damage can be serious.

Summer pruning is a practice followed in Europe, especially on trellised dwarf trees. Also, considerable summer pruning is done on freestanding trees growing on EM IV and VII and on the Malling Merton stocks. Summer pruning is a thinning and heading back process. It is more dwarfing than dormant pruning if done during late June and July. Little or no sucker growth is made following summer pruning when compared with dormant pruning. Prune terminal growth to about half its length, remove strong sticker growth entirely, and cut back the top of the tree if necessary. Most summer pruning involves new shoots and little cutting of 2- and 3-year wood. Do not prune the terminals of main framework branches because this reduces regrowth of pruned lateral shoots.

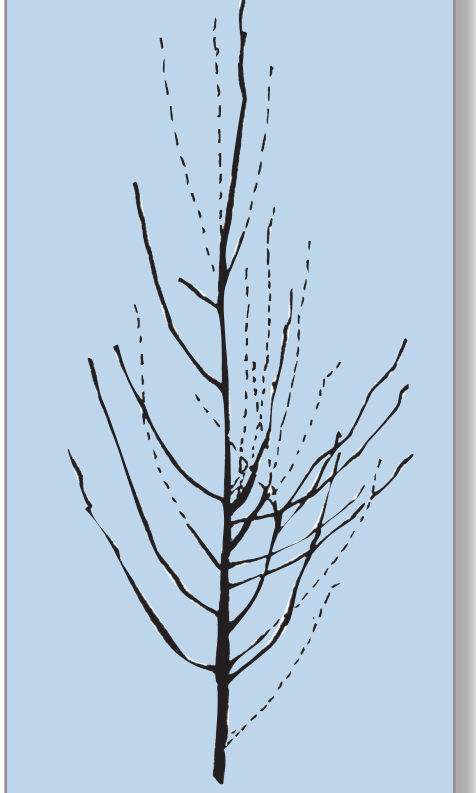


Figure 4. Some undesirable limbs are removed at the trunk; others are cut to stubs. After one year of growth, the "brush" is removed and the stub may be left for another year before it is removed at the trunk. The "brush" that grows on the stub aids in the development of a wide-angled limb below the stub and reduces the tendency of the retained limbs to grow back into the center of the tree.

Semidwarf Trees

The free-standing apple trees on semidwarf rootstocks (EM 26, EM II, EM VII, EM IV, MM 106 and MM III) are best trained to a central leader as described. The term free-standing trees includes those that require a stake for support as in the case of EM 28, EM VII, and EM IV.

Trees on Hibernal roots are slightly smaller than standard and are also excellent when pruned to a central leader.

Train Young Trees

Training young trees includes spreading the limbs by various means and tying limbs down to a horizontal position to widen angles and encourage early fruit bud formation. But it is important that more detailed training be done, especially if smaller trees and spur-type trees are grown.

Spreading of limbs should begin during the first dormant pruning and continue each year until the tree produces its first good crop.

There is a need for more careful pruning and training of young trees during the early stages of growth.

Prune Bearing Trees

The development of the central-leader apple tree has been described and illustrated. As the name implies, the central leader is in the center of the tree and dominates all other limbs. As the tree produces heavy crops of fruit, the limbs bend down and never quite retain their upright or horizontal position after the fruit is removed. The central leader often bends over and becomes one of the more horizontal main scaffold branches. It is desirable for the leader to bend so that the height of the tree will be somewhat reduced. If the leader does not bend, prune it to a strong side branch that will eventually balance the tree.

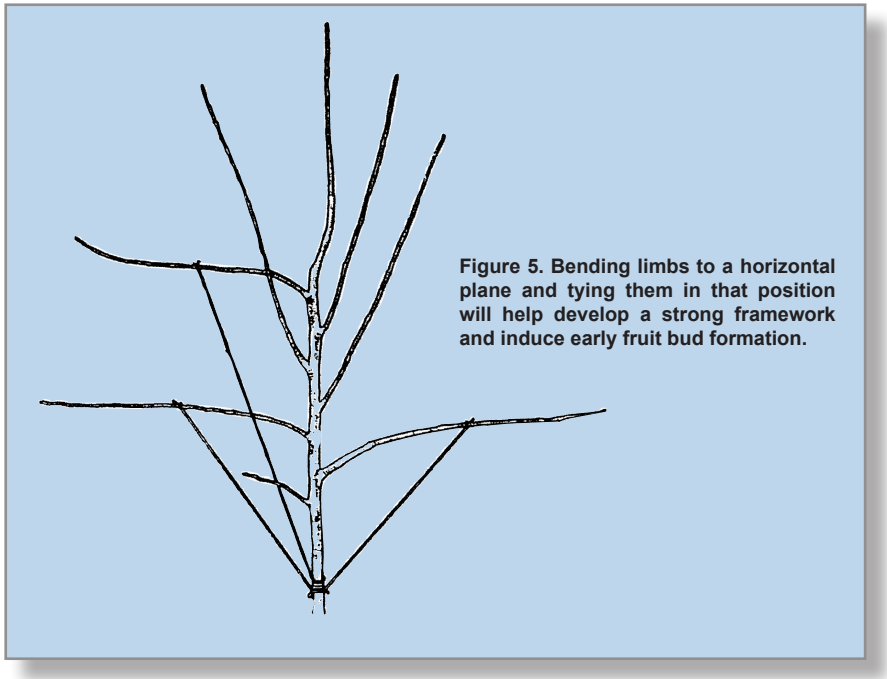


Figure 5. Bending limbs to a horizontal plane and tying them in that position will help develop a strong framework and induce early fruit bud formation.

Important Considerations

Keep in mind while pruning that the top of the tree must be kept more or less pointed so that the tree resembles a pyramid. A tree with a wide base and a pointed top is the most productive and most desirable. Trees of this shape receive maximum sunlight on leaves and fruit, and they have lower limbs that remain vigorous and productive.

Do not permit an apple tree to grow into an umbrella. Such a tree will eventually lose its lower limbs because of shading, and the tree will never produce the amount of fruit it should.

As the limbs of an apple tree bear fruit they bend down, and after successive years of cropping, the ends bend below the horizontal and eventually hang straight down.

Proper pruning will help young wood grow in a horizontal or upright position throughout the tree. Wood growing in a "down" position on bearing trees is neither strong nor productive. On bearing trees, remove down growing wood at a point where a limb is growing in a horizontal or upright position. This is a constant procedure as the tree bears fruit and the limbs bend down.

Figure 6. Spreading limbs help develop a strong framework and promote earlier fruit production.

Young non-bearing trees are brought into earlier production by this bending down of young wood. Consequently, it should not be removed. On bearing trees, however, branches growing in a position below the horizontal must be replaced by upright growing wood or the tree will eventually have too much down growth. Make every effort to keep a good supply of young vigorous wood.

Thinning

Numerous suckers or risers grow throughout the tree – especially in the upper part. They most frequently grow at a point where the limb bends down, at the point of a large pruning cut, or where breakage of a large limb occurs. Not all suckers or risers should be removed. Select some of them to replace broken or pruned limbs. Also, at the bend of a down growing limb, the riser is an ideal replacement. As the upright limb begins to bear fruit, it will gradually become horizontal and be productive for several years.

Remove weak and diseased wood. Where growth is excessive and thick, some thinning is necessary to permit light to enter the tree.

Varieties Differ

Apple varieties differ in their habit of growth. Some trees will develop a good central leader, but Golden Delicious will often produce two or three large structural branches. This makes it difficult to select a central leader. Rome, Starr and Twenty Ounce produce whorls of branches often with no dominant leader. Usually more main limbs make up the final tree than in the case of Stayman or Delicious. Rome and Twenty Ounce also produce much of the crop on terminals, and this results in a droopy tree. Also, these two varieties have a considerable amount of thin wood. They are very twiggy and pruning of thin wood Is a major job. With the important Rome variety, pruning should include the removal of some of the under hanging small branches. As the tree becomes old, it is necessary to make larger cuts to thin it. Weak thin wood that becomes matted on the ends of limbs can be a real problem. In other words, it is time consuming and difficult to prune Rome trees.

Why Develop a Central Leader?

1. Production is higher because the maximum leaf area is exposed to sunlight.
2. Trees develop faster and fill the orchard area quicker.
3. Apples hang free, color better, and are less subject to limb rubbing.
4. A high percentage of the crop is in the lower and inside areas of the tree.
5. The tree is strong and there is little limb breakage.
6. Shape and size are easily controlled.
7. Pruning is simple.

Trellis System

The trellis system of growing apples is popular in Europe and used in a few commercial orchards. Rootstocks of the dwarf EM IX or EM 26 are best suited to this system, but the semi-dwarf EM VII and MM 106 may also be used. The trellis usually consists of three or four wires with the lowest at about 2 feet above ground and the highest at about 8 feet. Spacing between wires varies from 2 to 3 feet. Tree spacing in the row varies from 6 feet with EM IX, 8 feet with EM 26, and 10 feet with MM 106 and EM VII. The rows should be no closer than 14 feet.