



Care of Woody Plants

Kentucky Master Gardener Manual Chapter 12

Adapted from *The Virginia Master Gardener Handbook*. Edited by Ray McNeilan, extension agent emeritus, Multnomah County, Oregon State University. Adapted for the *Kentucky Master Gardener Manual* by Rick Durham, consumer horticulture extension specialist and master gardener state coordinator.

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To prune or not to prune? This is a question that gardeners often faces gardeners. Most feel they ought to prune but are not sure why or how. Pruning is an accepted practice in orchards and frequently is done in rose gardens, but it is used haphazardly elsewhere. Ornamentals are most often pruned only when a shrub or tree begins to encroach on its neighbors, a walkway, or a building.

Pruning often is thought of as a way to make a barren tree fruitful. If carried out correctly, it eventually will do so. However, years of neglect cannot be corrected in one season. Gardeners who don't know how to prune but do so because they think they should often end up with no flowers at all because they either prune excessively or prune at the wrong time of the year. Keep in mind that pruning will not compensate for lack of fertilization, poor weed control, or drought conditions.

What, then, is pruning? Why, when, and how should it be done? Pruning can be described as the removal of part of a woody plant for a specific purpose. This chapter explains the reasons for pruning, the proper techniques and tools to use, and how to prune various types of plants.

Reasons for Pruning

Reasons for pruning can be grouped into four general categories:

- Training a plant
- Maintaining plant health
- Improving the quality of flowers, fruit, foliage, and stems
- Restricting growth

Training a Plant

Prune trees and shrubs after transplanting only to remove dead, broken, crossed, or pest-infested branches. Contrary to common belief, it is not necessary to prune away one-third of a tree's top growth to compensate for root loss as long as you use properly pruned, nursery-grown plants. According to research, excessive pruning at transplanting reduces plant size and does not aid in survival.

However, pruning should begin during a tree's first growing season. The main purpose of early pruning is to train a tree so it will develop a strong, well-balanced shape. When training a new tree, follow these guidelines:

- As a rule, do not prune the central *leader* (main growing axis) unless you don't want to keep it. Pruning the leader is appropriate for some naturally low-branched trees or if you want to develop a multi-stemmed plant.

Trees with a central leader, such as linden, sweetgum, or pin oak, may need little or no pruning except to shorten or head back branches competing with the central leader. Some pruning may be necessary to maintain desired shape and to shorten overly vigorous shoots.

- The height of the lowest branch can range from a few inches above the ground for a screen or windbreak to more than 12 feet above the ground for a canopy. Lower limbs usually are removed over a period of years until the desired height is reached, beginning in the nursery and continuing for several years after transplanting,
- For greatest strength, branches selected for permanent *scaffolds* (the framework of the tree) must have a wide angle of attachment with the trunk (*crotch angle*). Branches with less than a 30° angle frequently break, while those with angles between 60° and 70° rarely do.
- For shade trees, choose branches for major scaffolds that are at least 8 inches apart vertically, and preferably 20 to 24 inches (Figure 1a). Closely spaced scaffolds will have fewer lateral branches, resulting in long, thin branches with poor structural strength.
- Five to seven scaffolds should fill the circle of space around the trunk (Figure 1b). This arrangement prevents one limb from overshadowing another and reducing competition for light and nutrients.
- Remove or prune shoots that are too low, close, or vigorous in relation to the leader and scaffold branches.

Pruning Terminology

Apex—The tip of a shoot.

Apical dominance—The influence of a growing shoot tip on the buds and shoots below it. The shoot tip produces hormones that move with gravity toward the earth. This chemical message prevents growth of most lateral buds below the tip and reduces growth of lower shoots. This effect is inhibited if a branch is growing horizontally.

Bud—An undeveloped shoot, leaf, or flower, or a combination of leaves and flowers, formed on the sides or ends of shoots and in leaf axils (the angle formed where a leaf joins a shoot).

Collar—A swollen area at the base of a branch where it connects to a trunk. Contains special tissue that prevents decay from moving downward from the branch into the trunk.

Crotch angle—The angle formed between the trunk and a main scaffold limb. The best angle is 45° to 60°.

Head—The part of a tree from which the main scaffold limbs originate.

Heading—Cutting off part of a shoot or limb rather than removing it entirely where it attaches to another branch.

Leader—The uppermost portion of a scaffold limb. The terminal is the tip (apex) of the leader.

Root sucker—A shoot that arises from the root system.

Scaffold limb—A large limb that forms the framework of a tree.

Shoot—One season's branch growth. The bud scale scars (ring of small ridges) on a branch mark the start of a season's growth.

Spur—A short shoot that bears flower buds and often fruit, either on the end (terminally) or sides (laterally).

Thinning—Removing an entire shoot or limb where it originates.

Water sprout—A long shoot that grows in an undesirable location on a trunk or a major limb. Vertical water sprouts often arise on the upper side of horizontal limbs.

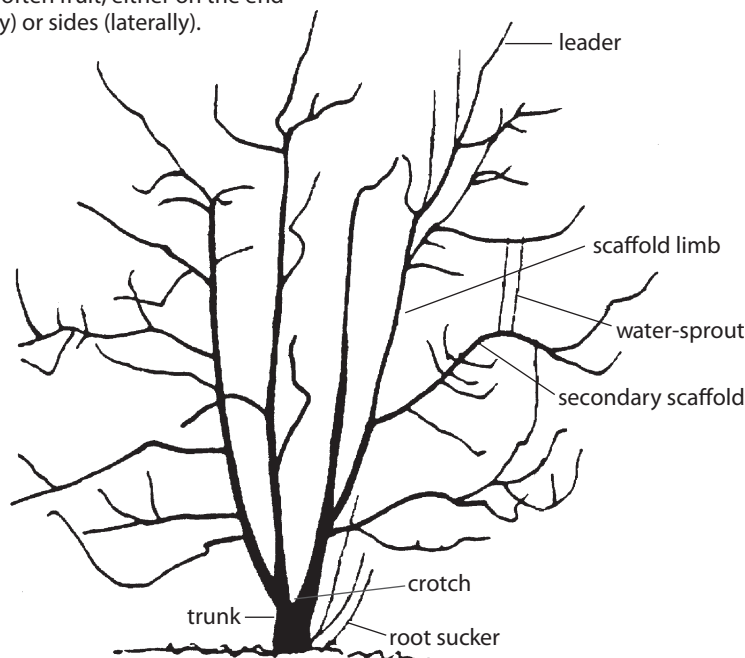
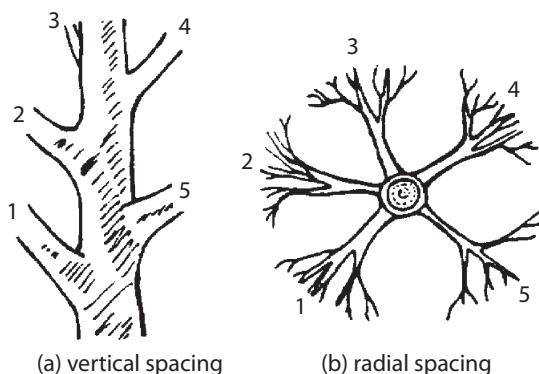


Figure 1. Proper vertical spacing (a) and radial spacing (b) for scaffold branches.



Maintaining Plant Health

In pruning to maintain plant health, first consider sanitation, which includes eliminating dead, dying, or diseased wood. Any dying branch or stub could be an entry point or buildup chamber for insects or fungi that could spread to other parts of the tree.

When removing wood infected with disease, such as a fungal canker or blight, it is important to make the cut in healthy wood beyond the infection. Sterilize pruning tools with alcohol or a mild bleach solution after each cut to prevent transfer of disease to healthy stock.

Keeping a shrub or tree from growing too densely can help prevent disease. Evergreen shrubs, in particular, usually benefit from occasional thinning, which allows light and air to penetrate throughout the shrub and results in even growth of healthy foliage.

Improving Flowers, Fruit, Foliage, and Stems

The more flowers and fruit a plant produces, the smaller they are, as is evident on an unpruned rosebush or fruit tree. Pruning reduces the amount of wood and diverts energy into production of larger, though possibly fewer, flowers and/or fruit. Most flowering shrubs bloom on either last year's growth

or new growth. More flower-bearing wood is produced with properly timed pruning.

Some deciduous shrubs have colored bark that is attractive in winter. Because the best color is produced on young wood, hard pruning produces not only longer stems, but also more intensely colored ones.

Other plants are grown for their foliage. Proper pruning can increase the quality and quantity of foliage produced.

Restricting Growth

Over time, trees and shrubs often grow too big for their space, and regular pruning is necessary to keep them in bounds. Formal hedges are pruned to maintain a uniform growth rate. To reduce labor, select plants that will not exceed their allotted space.

Pruning Tools

Hand Shears

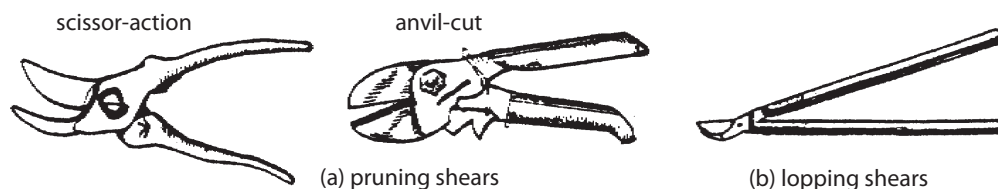
Hand pruning shears are good for branches up to $\frac{1}{2}$ inch in diameter. If you use them to cut larger branches, you risk making a poor cut and/or damaging the shears.

There are two styles of hand shears: scissor-action (or bypass) and anvil-cut (Figure 2a). *Scissor-action* shears have a thin, sharp blade that slides closely past a thicker, but also sharp, blade. This type usually costs more but makes cleaner, closer cuts. *Anvil-cut* shears have a sharpened blade that cuts against a broad, flat blade.

Lopping Shears

Lopping shears have long handles and are operated with both hands (Figure 2b). Even the cheapest can cut material $\frac{1}{2}$ inch in diameter. The better ones can slice through branches 2 inches thick or more, depending on species and condition. For example, pin oak wood is tougher than linden, and until decay sets in, dead wood is tougher than live wood.

Figure 2. Pruning shears (a) and lopping shears (b).



Pole Pruners

Pole pruners have a hooked blade above and a cutting blade beneath (Figure 3). The blades are on a pole and are operated by pulling down a long piece of cord.

The poles can be in sections, which either fit together or telescope. They can be made of several materials. Poles made of fiberglass or a plastic compound probably are best. Wooden poles are heavy. Aluminum poles are light but can conduct electricity if they touch an overhead wire.

Poles can be fitted with saws, but saws are usually frustrating to use.

Pole pruners can be dangerous. Material that is cut overhead can fall on the operator unless it hangs up in other branches. Be careful and wear head and eye protection when using these tools.

Hedge Shears

Manual hedge shears have long, flat blades and relatively short handles, one for each hand (Figure 4). Heavy-duty shears with one serrated blade are good for difficult jobs.

Power hedge shears also are available. For home use, electric models are most common.

Saws

Many makes and models of hand pruning saws are available (Figure 5). Fineness of the cutting edge is measured in points (teeth per inch). Average saws are about 5½

to 6 points. Use an 8-point saw for delicate, close work on small shrubs and trees and a 4½-point saw for fairly heavy limbs.

If a saw suddenly folds while in use, it can injure the operator's fingers. Folding saws have either a slotted-head holding screw or a wingnut that secures the saw blade open or closed. A fixed-blade saw with a leather scabbard is safer.

Saw blades can be either straight or curved. Many people prefer a curved blade that cuts on the draw stroke. A double-edged saw has fine teeth on one side, is coarse on the other, and is difficult to use in densely branched plants.

Bow saws are good only where no obstruction exists for 12 inches or more above the area to be cut.

Chainsaws come in a variety of sizes, both gasoline and electric. However, in general, chainsaws are not appropriate for pruning live plant material. They are better suited to removing trees and cutting firewood.

Caring for Tools

Clean and oil tools regularly by wiping an oily cloth on blades and other surfaces. Several passes with a good oilstone usually suffice. Keep cutting edges sharp. Paint or varnish wooden handles or regularly treat them with linseed oil.

Use tools properly. Don't twist or strain pruners or loppers. Keep the branch to be cut as deeply in the jaws and near the pivot as possible. Don't use pruning tools to cut wires.

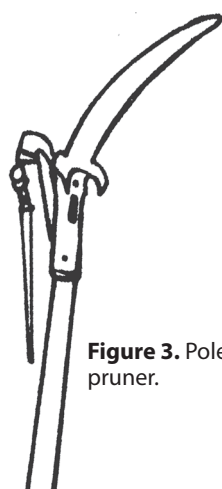
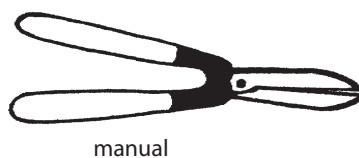
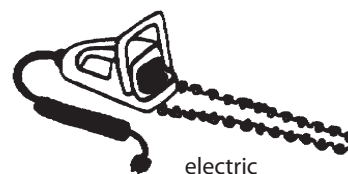


Figure 3. Pole pruner.

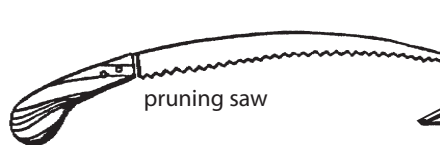


manual

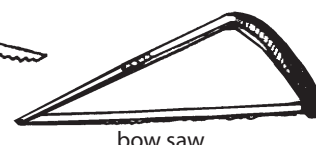


electric

Figure 4. Hedge shears.



pruning saw



bow saw

Figure 5. Saws.

Basic Pruning Techniques

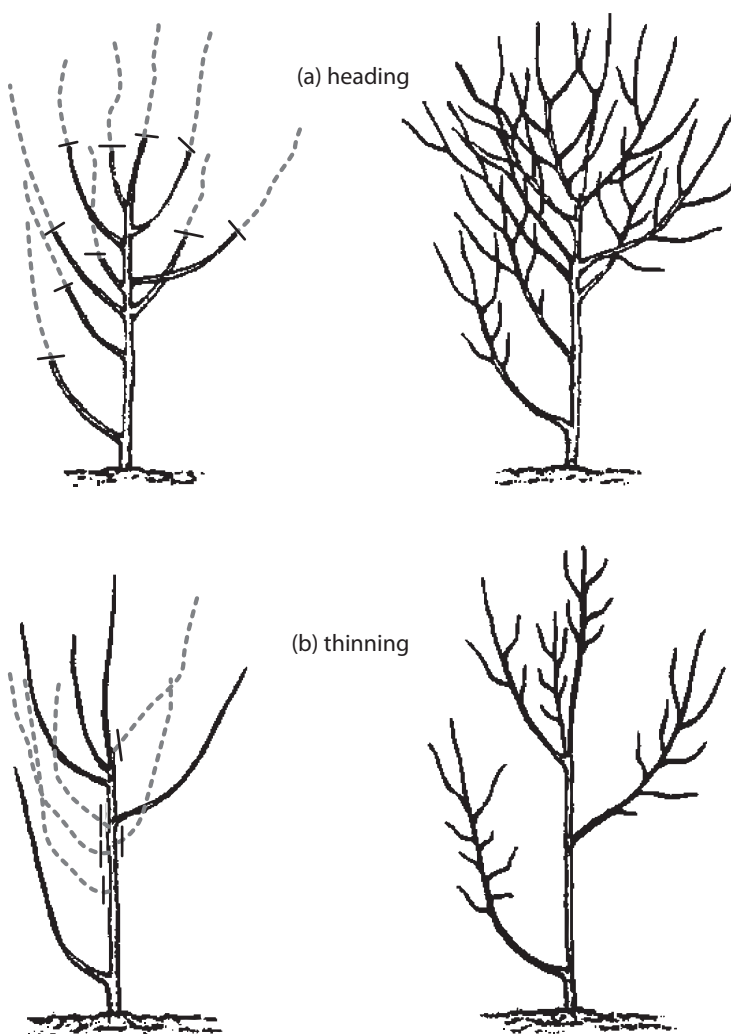
There are only two types of cuts: heading cuts and thinning cuts. Figure 6 shows the effect of each.

Heading involves cutting off part of a shoot or limb (Figure 6a). It increases the number of new shoots and stiffens branches, holding them in position.

Thinning removes undesired wood (Figure 6b). In thinning, a branch or twig is cut off at one of the following places:

- Its point of origin from the parent stem
- A lateral side branch
- The “Y” of a branch junction
- Ground level

Figure 6. Heading cuts (a) increase the number of new shoots formed and stiffen the branches, holding them in position. Thinning cuts (b) reduce the number of new shoots and direct growth.



Thinning results in a more open plant and does not stimulate excessive new growth. By thinning, you can remove considerable growth without changing the plant's natural appearance or growth habit. Thus, you can maintain plants at a given height and width for years while allowing room for side branches to grow.

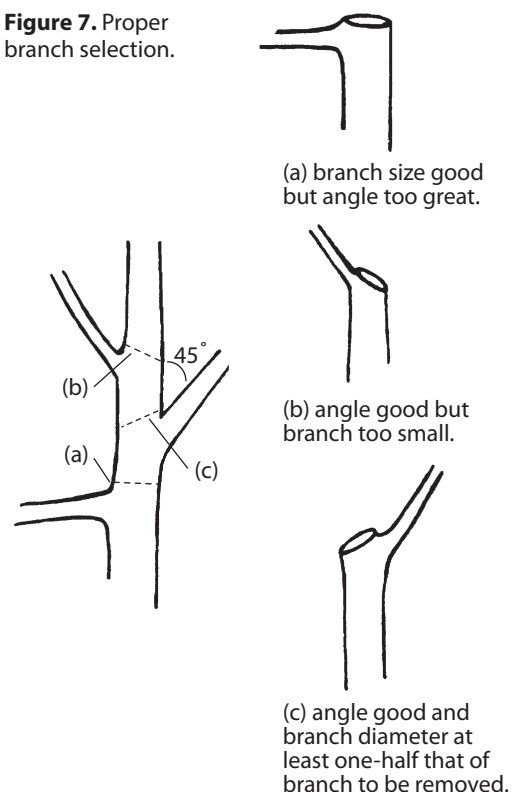
Twigs and Small Branches

When pruning twigs and small branches, always cut back to a vigorous bud or an intersecting branch.

When cutting back to a bud, choose a bud that is pointing in the direction that new growth is desired. Be sure not to leave a stub over the bud or cut too close to the bud.

When cutting back to an intersecting (lateral) branch, choose a branch that forms an angle of no more than 45° with the one to be removed and has a diameter of at least one-half that of the branch to be removed (Figure 7).

Figure 7. Proper branch selection.



Make slanting cuts when removing limbs that grow upward; this technique prevents water from collecting in the cut and speeds up healing.

Thick, Heavy Branches

Remove thick, heavy branches flush with the *collar* at the base of the branch, not flush with the trunk (Figure 8). The collar contains chemically protected tissue. When a dead branch decays naturally, the decay advances downward until it meets this internal protected zone. When it reaches this area of very strong wood, the branch falls away. The remaining small zone of decayed wood is walled off within the collar. If a branch's collar is removed, the protective zone is lost, causing a serious trunk wound that wood-decay fungi can easily infect.

Removing the collar causes injury whether the pruned branch is living or dead.

For more than 50 years, the recommended method of pruning was to cut flush with the trunk and paint. These recommendations have no basis in scientific fact. The flush cut, by damaging the collar, increases a tree's injury. Painting merely hides the wound and makes the person doing the pruning feel that he or she has done

something to "help" the tree. In fact, paints or wound dressings may trap moisture and increase disease problems.

The proper method for cutting branches larger than 1½ inches in diameter is shown in Figure 9:

1. Undercut the bottom of the branch about one-third of the way through, 6 to 12 inches out from the trunk (Figure 9a). If there is danger of the branch damaging lower limbs or objects on the ground, rope it and support it.
2. Make a second cut from the top, about 3 inches farther out from the undercut, until the branch falls away (Figure 9b). If you roped the branch for support, carefully lower it to the ground after the second cut.
3. Cut back the resulting stub to the branch collar (Figure 9c).

Roots

After several years, a tree may develop long roots running 15 to 25 feet or more away from the trunk. These roots, along with many branched side roots, physically support the tree. Most of the small feeding roots that gather nourishment branch off the main roots far from the trunk.

If a tree is balled and moved, most of its feeding roots are cut off, so the tree may die when transplanted. For this reason, nursery growers root-prune plants to force them to grow new feeding roots near the trunk. These new roots are included in the balling operation and ensure growth after transplanting.

To safely move a small tree or shrub, root-prune it a year or so before digging it. In the fall, sever half of the roots to 1 foot deep by forcing a sharp spade into the soil around the plant, leaving a shovel width of untouched soil between cuts. Make the circle of cuts slightly smaller than the size of the ball you'll eventually dig. The next spring, sever the other half of the roots. Move the tree that fall. Another way to accomplish the same thing is to cut all the roots on one side in the spring, cut the other side the following spring, and move the plant that fall.

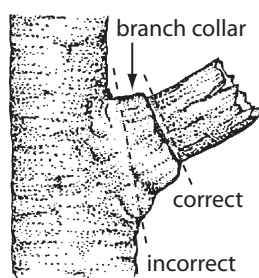


Figure 8. Remove branches flush with the collar, not flush with the trunk.

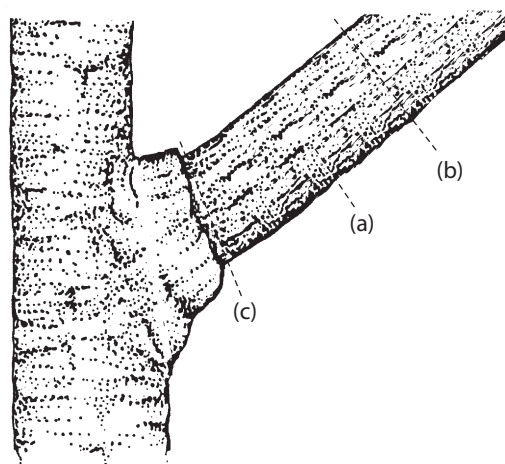


Figure 9. Pruning a large branch: (a) Undercut one-third of the way through the branch. (b) Cut through from the top until the branch falls away. (c) Cut back to the collar.

Recent research indicates that most new roots grow from the ends of pruned roots. Therefore, you must dig a root ball 4 to 6 inches larger than the root-pruned area to get the newly developed roots.

Cutting the roots in a circle early in the spring, as explained above, sometimes forces a tree, shrub, or vine to bloom the following year.

Root pruning also is used to force a vigorously growing fruit tree, wisteria vine, or flowering dogwood into bloom.

Espaliering

Many gardeners prune for decorative purposes. Numerous training systems are based on the art of espalier, which originated in France and Italy about 400 years ago. Some are quite elaborate and require considerable time and patience as well as detailed knowledge of the plant's growth characteristics. Others are relatively simple.

An espalier system can separate yard areas and produce a large volume of high-quality fruit in a limited area. Fruit trees trained in this fashion should be on dwarfing rootstock. Otherwise, they tend to grow too large.

The easiest espalier system is a horizontal cordon (Figure 10). Apples, pears, plums, and some shrubs, such as pyracantha, adapt well to this system. The plant usually is supported by a wall, fence, or wire trellis. Training to a four-tier cordon or four-wire trellis is relatively easy.

You can construct a simple four-wire trellis using two 8-foot posts. Space the posts 12 feet apart and set them 2 feet in the ground. Run wires through the posts at heights of 18, 36, 54, and 72 inches. Plant two unbranched whips of the desired plant 6 feet apart between the two posts.

Before growth begins the first spring, cut off each whip just above the highest bud that is below the lowest wire. Three or more shoots should develop near the cut. Retain the uppermost shoot and develop it as the central leader. Train the other two as main scaffold branches along the lower wire, one on each side of the central stem. Remove all other growth.

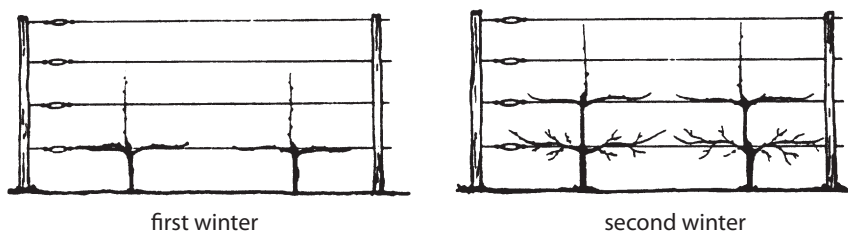
Tie the two scaffold shoots loosely to the wire as soon as they are 10 to 12 inches long. Use twine, plastic chain link ties, or other suitable material. Tie the shoots so they are nearly horizontal. This arrangement reduces vegetative vigor and induces flower bud formation. If you tie the end of the shoot below horizontal, however, growth at the end will stop and vigorous shoots will develop along the upper side.

By the end of the first season, the lateral branches should be established on the lower wire, and the central leader should have grown above the second wire. At the end of the first winter, while the plant is dormant, cut the central leader back to a bud just below the second wire. Choose two scaffold branches to tie to the second wire and allow the central leader to grow above the third wire.

Repeat this process during the next two seasons, at which time a total of eight scaffolds, four on each side of the trunk, should be firmly established. Bend the leader to form one of the top scaffolds, rather than cutting it off at the top wire. By the end of the fourth season, fruit trees should be producing heavily.

In following years, do all pruning during spring and summer. When new spring growth is about 2 inches long, cut it off. Remove about one-fourth of the previous season's growth. Do not prune the scaffolds' terminals.

Figure 10. Training a tree with an espalier system.



About August 1 or as soon as new growth reaches 10 to 12 inches in length, cut it back to two or three buds. Repeat about a month later, if necessary. This pruning encourages flower bud formation and prevents vigorous growth from getting out of bounds.

Shade Trees

Young shade trees may not need much pruning to develop a good framework. Mature trees generally are pruned only for sanitation, safety, or size restriction.

You can prune shade trees at any time of the year. Late-winter pruning often is preferred because it is easy to shape a tree when foliage is gone. Also, fewer precautions are necessary to avoid garden and flower bed damage, and cleanup is easier. A few trees, such as sugar maples, birches, black walnuts, and flowering dogwoods, bleed profusely when pruned in late winter. The bleeding is unsightly but is not harmful.

Summer pruning may be more effective in directing plant growth. It also may cause fewer suckers or *water sprouts* to grow. (A water sprout is a long, vigorous shoot that grows in an undesirable location on a trunk or major limb.)

Fruit and Nut Trees

The basic objectives in directing and guiding the growth of young fruit trees are to encourage early fruit production and develop an optimum tree structure for supporting future crops. You can meet these objectives by maintaining a proper balance between vegetative and potential fruiting wood. Pruning of mature trees is aimed at producing new growth of fruiting wood. This section discusses pruning of various types of fruit and nut trees.

Nonbearing Apple Trees

Avoid excessive pruning of young, nonbearing trees, because it stimulates excessive shoot growth and delays fruiting. Instead, prune to train young trees by redirecting limbs, stimulating branching where desired, and removing growth that is in an undesirable location. To minimize winter injury, do not prune young, nonbearing apple trees before February 1.

Pruning of a mature apple tree is greatly affected by early training, so it's imperative that training begin early. Waiting three or four years after planting results in a poorly developed, weak tree. Correcting such a problem, usually with heavy pruning, only further delays and decreases fruit production.

An integral part of tree training is limb spreading. There are two reasons for limb spreading:

- To develop limb orientation at 60° from vertical, thus balancing vegetative and fruiting growth
- To develop strong, wide crotch angles (greater than 35°)

Limb orientation affects vigor in various ways, as shown in Figure 11. Upright or vertical limbs (Figure 11a) produce their longest shoots near their tip and tend to have high vegetative vigor. Often, fruits hang down against these limbs and rub against them. On the other hand, horizontally oriented limbs (Figure 11b) develop vigorous water sprouts along their upper surface at the expense of potential fruiting spurs.

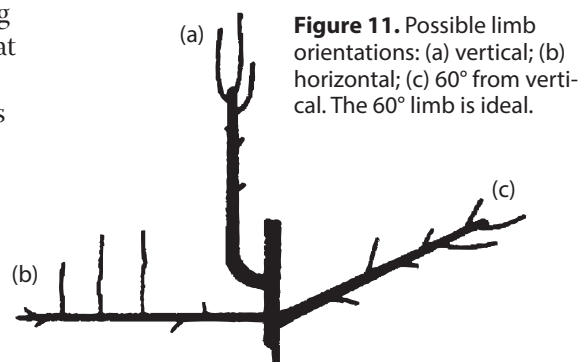


Figure 11. Possible limb orientations: (a) vertical; (b) horizontal; (c) 60° from vertical. The 60° limb is ideal.

The ideal limb orientation is about 60° from vertical. These limbs (Figure 11c) have less vigorous shoots near the tip, more uniform branching, and more fruiting spurs. Fruits hang down from the limb and are less prone to rub.

Another reason for limb spreading is to develop strong *crotch angles* (Figure 12a). Wide crotch angles are strong. Many cultivars, such as Red Delicious (particularly spur types), naturally develop narrow crotch angles. If these crotch angles are not widened to greater than 35° , a condition called *bark inclusion* can develop (Figure 12b). In this condition, bark is trapped between the trunk and scaffold, and layers of annual wood are prevented from growing together. Splitting may occur at these narrow crotch angles.

At planting

Training begins at planting. Early pruning forces the growth of lateral branches from which you'll select future scaffolds.

When planting, cut back spur-type and semidwarf apple trees to a height of 30 to 35 inches. Cut back standard trees to 40 inches. If the tree is branched, head it back to a strong bud to stimulate growth of the central leader. Head back and retain desirably located branches for scaffolds. Remove undesirable side branches.

First growing season

Scaffold selection can begin in summer, especially on cultivars that develop narrow crotch angles. Generally, in the first year, you can select two to four good scaffolds (Figure 13). They should be evenly distributed and not directly above one another. Vertical spacing between scaffolds can vary from 3 to 12 inches, depending on the ultimate size of the tree. Remove shoots developing below the lowest desired scaffold (18 to 24 inches above ground).

Figure 12. Strong, wide crotch angle (a) and narrow crotch angle with bark inclusion (b).

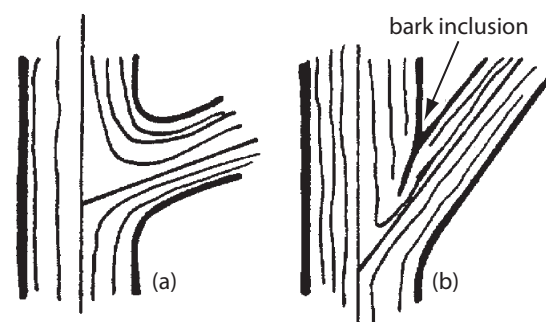
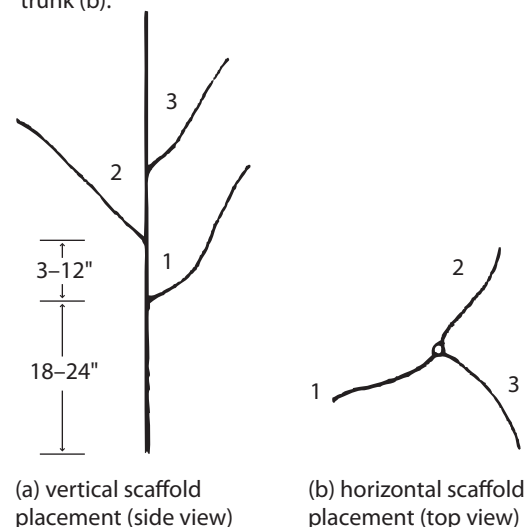


Figure 13. Selecting well-spaced scaffolds. Scaffolds should be spaced 3–12 inches apart vertically (a) and as equally as possible around the trunk (b).



Spread or remove limbs with crotch angles of less than 35° . In early summer, while shoots are soft, it's easy to spread limbs. Place a clothespin or short piece of wood with a notch in one end between the trunk and the shoot. Use the notch to push the shoot outward. Weigh down the shoot with a light weight such as a fishing weight. Remove undesirably located shoots at this time.

Figure 14. Natural branching of a shoot.

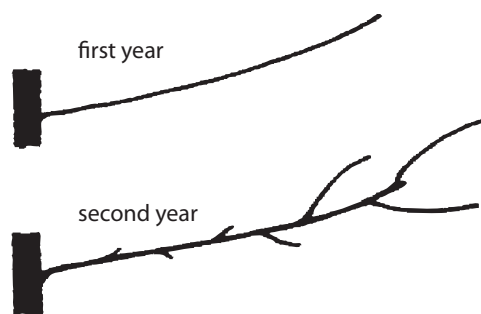


Figure 15. Shorten limbs with thinning cuts.

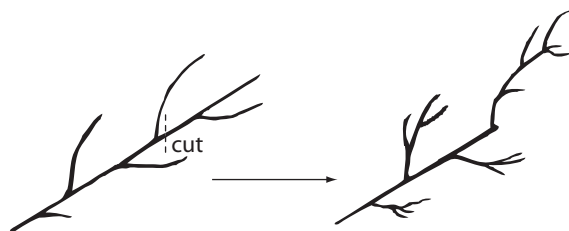
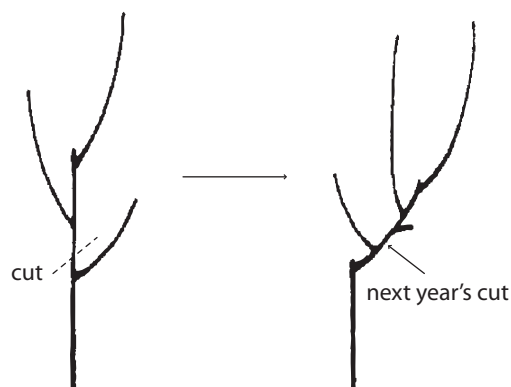


Figure 16. Prune to a lateral to maintain height.



First dormant season

If you haven't yet selected shoots to retain as scaffolds, do so now. Spread selected scaffolds before doing any pruning, since spreading changes the shape of the tree and may influence pruning decisions. Next, remove shoots that you didn't select as scaffolds. Head the central leader to maintain dominance and induce branching; cut it back 3 to 5 inches above the point where you want the next tier of scaffolds.

Scaffolds usually do not need to be headed; generally shoots branch naturally in their second season (Figure 14). All you need to do is spread the scaffolds to encourage uniform branching. However, a scaffold

often exhibits excess vigor and upsets the balance of a tree's growth, in which case you should head it to shorten and stiffen it. You also can use heading cuts to encourage growth and branching on spur-type trees.

Second growing season

Limbs not previously trained can be spread easily early in the growing season, when wood is flexible. Remove fruit developing on the central leader to maintain vigor in the tree's center. Select and train the new tier of scaffold limbs, choosing limbs that are well spaced in relation to lower scaffolds.

Second dormant season

Again, spread scaffolds before pruning. Some of the first-year scaffolds may have turned upward and resumed vertical growth. Use longer spreaders to spread them back to the desired orientation. Move the smaller spreaders farther up into the tree. Head the central leader to maintain vigor and stimulate branching.

Succeeding years

Continue training and pruning following the principles of central leader dominance and proper scaffold selection and training. Keep scaffolds at a 60° angle from vertical.

Maintain a conical tree shape, with upper branches shorter than lower ones. Always prune the top portion of the tree more heavily than the lower. After the third year, you can shorten upper scaffolds with thinning cuts (Figure 15), which remove an entire shoot or branch at its junction with a lateral scaffold or trunk. Thinning cuts are less invigorating than heading cuts. They also improve light penetration and can redirect a limb's growth.

Remove crossing branches, vigorous water sprouts, shoots growing up into the tree, and shaded hanging branches.

Once the tree is as tall as you want, cut it back each year to a weak lateral on the central leader (Figure 16). This practice maintains vigor in the center top of the tree while maintaining desired tree height.

Bearing Apple Trees

Mature apple trees often need to be pruned vigorously to encourage new growth of fruiting wood. To bear fruit, spurs must be at least 2 years old. After several years of production, however, they lose vigor.

Figure 17. Light distribution zones in a large apple tree.

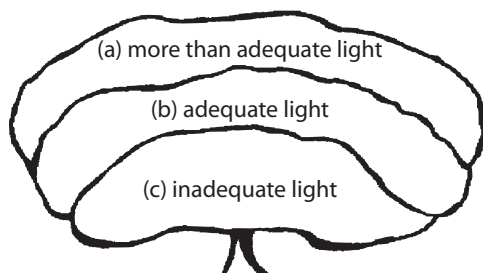


Figure 18. The shaded area increases as tree size increases.

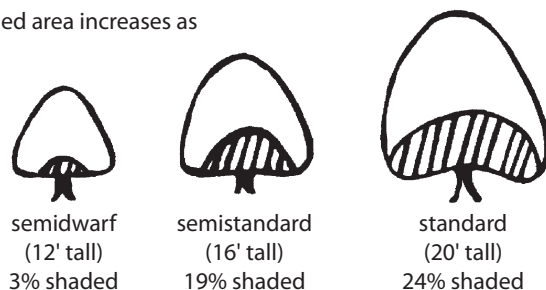


Figure 19. Tree shape influences shaded areas.



Good fruiting wood requires both moderate vigor and exposure to good light.

Fruiting may be poor if vigor is too high or too low. Too-high vigor can be the result of inadequate fertilization, no pruning, excessive cropping, or shading of fruiting wood. Too-low vigor can be because the bearing wood is shaded, which can result in small, poorly colored fruits.

Good light exposure is necessary for development of flower buds as well as fruit of optimum size, color, and sugar content.

A typical tree canopy is composed of different layers or zones in terms of light exposure (Figure 17):

- The outside zone of leaves and fruit (a), which receives a high proportion of direct light. This zone receives more light than needed for good growth and fruiting
- The middle zone (b), which receives adequate light
- The inner zone (c), which receives inadequate light and is unproductive

The relative proportion of these zones is influenced by tree size and shape. As tree size increases, the percentage of the tree that is shaded and unproductive increases (Figure 18). Trees with wide tops and narrow bottoms also have a high percentage of shaded area (Figure 19).

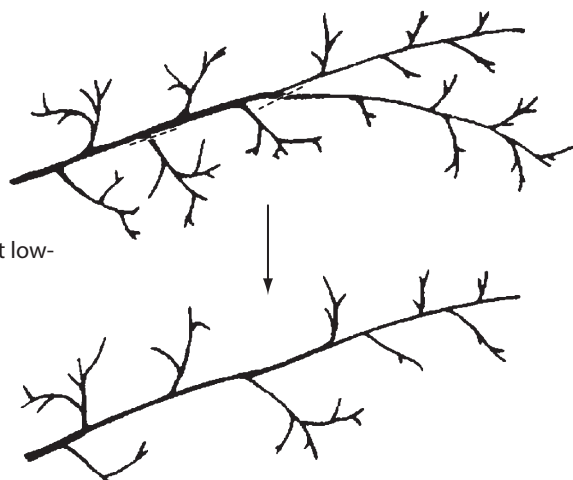
Use thinning cuts to maintain good light exposure in the canopy. Make moderate cuts throughout the tree to distribute vigor and provide good light penetration. Use heading cuts only where branching is desired or vigor is low.

Another problem with overly dense trees is that spray penetration is reduced and problems such as scale may develop in the dense areas. In this situation, make many thinning cuts throughout the tree, especially in the upper, outer portions. This procedure will open up the tree canopy and reestablish good tree shape.

When pruning mature trees, also remove the following:

- Drooping or low-hanging branches (or prune them to a lateral that is positioned above horizontal—see Figure 20)
- Crossed, dead, diseased, or damaged limbs
- Water sprouts, unless some are needed to develop new fruiting wood

Figure 20. Thin out low-hanging branches.



Keep the following precautions in mind when pruning bearing trees:

- Avoid pruning terminal shoots back to horizontal branches (often called a bench cut, Figure 21). Such cuts result in weak limbs and an umbrella shape that encourages water sprouts.
- Remove no more than one or two large limbs per year. If a lot of pruning is required, spread the process over a two- or three-year period. In the one or two years before and after heavy pruning, reduce or eliminate nitrogen application, depending on soil type, tree variety, and your experience.
- The excessive vigor that can result from severe pruning can decrease fruit quality. The effect is much the same as from

excessive nitrogen application. It may include excessively large, poorly colored, soft apples that do not store well. Vegetative growth competes with fruit for calcium; thus, under conditions of excessive vigor, cork spot or bitter pit may develop due to calcium deficiency in the fruit.

- Use heading cuts only to maintain tree size when trees are at or near the desired size. Such pruning often is used in an attempt to reduce tree size, but misuse of this technique can disrupt vigor and reduce yield so much that it takes several years for the tree to recover. Heading, especially of 1-year-old shoots, induces masses of shoots to grow close to the cuts. These abundant shoots can shade and weaken inner areas of the tree.
- Invigoration from pruning is, in part, a nitrogen response. Pruning alters the balance between the treetop and root system. Removing part of the treetop increases the amount of nitrogen available for the remaining growing points. Always combine a pruning program with a good fertilization program.

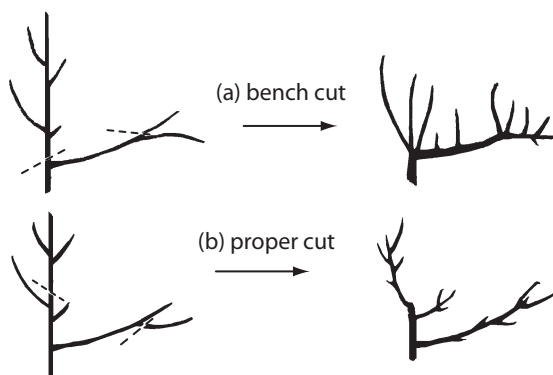
Pear Trees

Train pears to have multiple leaders with three to five main scaffold branches. Avoid excessive pruning of young trees, except to stimulate scaffold development.

When trees are mature, use thinning cuts to improve light penetration. Do the heaviest pruning in the treetop. Remove upper horizontal branches so they won't shade the rest of the tree or produce excess water sprouts.

Do not head back trees after their framework has been developed. Doing so encourages the tree to sprout soft terminal shoots, which are highly susceptible to fire blight.

Figure 21. Bench cuts (a) and proper cuts (b).



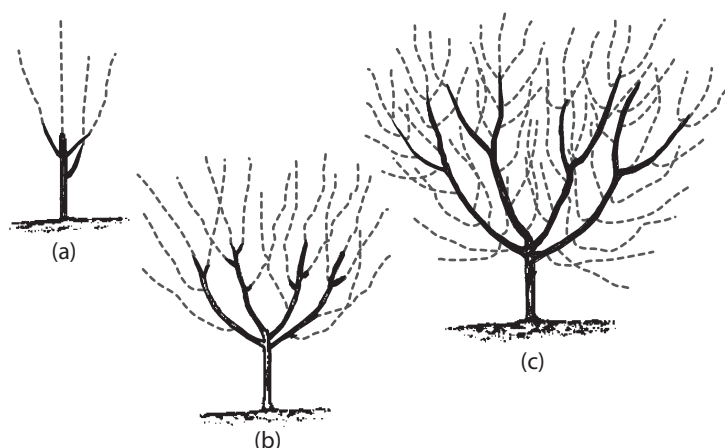


Figure 22. Pruning to a vase shape: (a) At planting time, head the tree about 18 to 30 inches above ground. Choose two or three scaffold branches and head the selected scaffolds to 3 to 6 inches. (b) In the first dormant season, head the scaffolds 24 to 30 inches away from the trunk. Thin all vigorous shoots that compete with the secondary scaffolds. (c) During the second dormant season, select three or four secondary scaffold limbs 12 to 18 inches above the primary scaffolds.

Peach and Nectarine Trees

To train young trees in a vase shape, head back young peach or nectarine trees to 18 to 30 inches at planting time, depending on how much room you want under the tree. Choose two or three scaffold branches evenly spaced around the tree. Head the selected scaffolds to 3 to 6 inches and remove all other side shoots (Figure 22a). In the first summer, pinch unwanted shoots in order to direct most of the growth into the scaffolds.

In the first dormant season, head the scaffolds 24 to 30 inches away from the trunk (Figure 22b). The result will be stiff scaffolds with strong secondary limbs. Thin all vigorous shoots that compete with the secondary scaffolds.

During the second dormant season, select three or four secondary scaffold limbs 12 to 18 inches above the primary scaffolds (Figure 22c).

In the third dormant season, thin the fruiting wood. Keep the more outward-growing wood for better sunlight penetration.

Once the scaffold system is established, prune as little as possible until the tree begins to bear. Remove all strong, upright shoots growing in the center of the tree, and lightly head back terminal growth on the

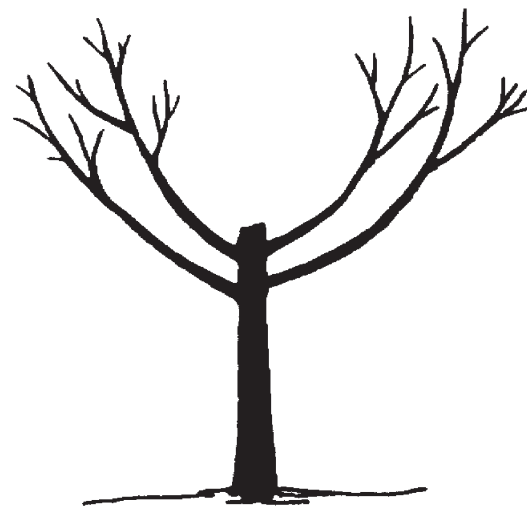


Figure 23. A vase-shape tree has an open center and outward-growing branches.

scaffolds to outward-growing laterals. The result will be an open-center (vase-shaped) tree (Figure 23).

Pruning bearing trees

Peach and nectarine trees bear fruit on the previous season's wood. Yearly pruning ensures good fruit production.

During the dormant season, prune to counteract the tendency of fruiting wood to move away from the trunk in an upward and outward direction. The procedure is as follows:

- Remove shoots that fruited the previous year.
- Cut back to shoots of moderate vigor.
- Remove strong-growing shoots in the treetop by thinning them to more upright shoots.
- Thin out the weakest shoots.
- Leave shoots well spaced for good light penetration.
- Prune out dead and diseased wood, particularly that with cankers or severe oozing. (Peach and nectarine trees are notorious for their susceptibility to disease.)

In mid to late summer, head back the upper, outer shoots in order to allow better light distribution throughout the tree. Again, prune out dead or diseased wood.

Plum Trees

To train trees into a vase shape, head plum trees at 18 to 24 inches at planting. The following year, select three or four main shoots to be scaffold limbs. If the scaffold crotch angles are narrow, spread them to 45° to 60° using clothespins or wooden sticks with notches in the ends. Remove the rest of the shoots with thinning cuts, then head the selected scaffolds at 2 to 2½ feet from the crotch to stimulate branching into secondary scaffolds.

In the third dormant season, thin third-year scaffolds to one or two per secondary scaffold. In Japanese plums, thin interior shoots to spread the tree.

Pruning bearing trees

Prune European prune trees to lighten the ends of heavily bearing branches to prevent breakage. Cut back annual shoot growth, being careful not to cut away long-lived fruiting spurs. These trees bear on 1-year-old shoots as well as older ones.

Fruiting limbs tend to arch under the fruit load. Water sprouts arise from the upper side of these limbs. To renew fruiting wood, cut back to the arch and thin water sprouts. Those sprouts remaining will become fruiting wood.

On Japanese plum trees, thin 1-year-old shoots, but leave enough to renew fruiting wood. Thin out a few branches that have old, weak spurs.

Cherry Trees

Sweet

Train sweet cherry trees to the modified leader system recommended for apple trees. Give special attention to selecting scaffold

limbs with wide crotch angles. Sweet cherry trees are subject to winter injury, often splitting where limbs join the main stem. It is essential to develop crotch angles as widely as possible to ensure a strong framework.

When planting a cherry tree, head the tree about 18 to 24 inches above the ground. Head all shoots to 24 to 36 inches after the first and second year's growth. Remove the terminal buds of short shoots in order to promote branching (Figure 24). In the third and fourth years, head the most vigorous shoots.

When the tree begins to bear fruit, remove all but seven or eight scaffold branches. Head all shoots in the dormant season to develop a low, spreading tree that is easy to manage.

Established trees require minimal pruning. Lightly thin out new shoots and cut out weak wood and interfering branches.

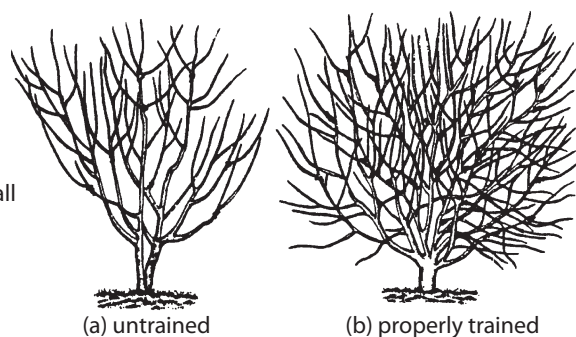
Sour

If a sour cherry tree has no strong branches at the time of planting, head it to about 24 inches above the ground. Select laterals when growth begins the second year.

If the tree has some good laterals when planted, remove those lower than 16 inches from the ground. Select about three permanent scaffold limbs along the leader, 4 to 6 inches apart and not directly above one another. Do not head them back, since doing so tends to stunt terminal growth.

In following years, select side branches until there are five or six scaffold limbs well distributed along 3 to 4 feet of the main stem above the lowest branch. Then modify the leader by cutting to an outward-growing lateral.

Figure 24. Training a cherry tree: (a) Without proper training, this sweet cherry tree is too tall and sparsely branched. (b) Heading all shoots of a young sweet cherry tree produces more branches and a lower tree.



After fruiting begins, pruning consists mainly of annually thinning out excessive and crowded growth to allow sunlight into the tree and renew fruiting wood. Sour cherries bear mostly on 2- to 5-year-old spurs.

Shrubs

Prune both evergreen and deciduous shrubs in late winter before new growth starts. Minor corrective pruning can be done at any time. Specific pruning situations are discussed below.

Deciduous

When deciduous shrubs are planted bare-root, some pruning may be necessary. Lightly prune roots if any are broken, damaged, or dead. Prune branches by thinning (not shearing) to reduce overall plant size by one-half or more.

Balled and burlapped (B&B) or container shrubs require little if any pruning. Occasionally, branches are damaged in transit; remove them at the time of planting. Prune only to develop desired size and shape.

Pruning for most mature deciduous shrubs consists of thinning, gradual renewal, and rejuvenation.

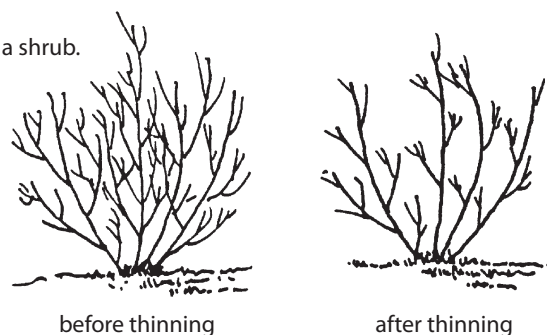
Thinning cuts are used to maintain a shrub's desired height and width (Figure 25). Thin out the oldest and tallest stems first. Use hand pruning shears, loppers, or a saw rather than hedge shears.

Gradual-renewal pruning involves annually cutting a few of the oldest and tallest branches back to slightly above ground level (Figure 26). Some thinning may be necessary to shorten long branches or maintain a symmetrical shape.

To rejuvenate an old, overgrown shrub, remove one-third of the oldest, tallest branches at or slightly above ground level before new growth starts.

Time pruning of flowering shrubs to minimize disruption of blooming. Spring-flowering shrubs bloom on last season's growth (Table 1). Prune them soon after they bloom so there is time for vigorous summer growth, which provides flower buds for the following year. Some shrubs that bloom after June do so from buds that are formed on that spring's shoots (Table 2). Prune these shrubs in late winter to promote vigorous spring shoot growth.

Figure 25. Thinning a shrub.

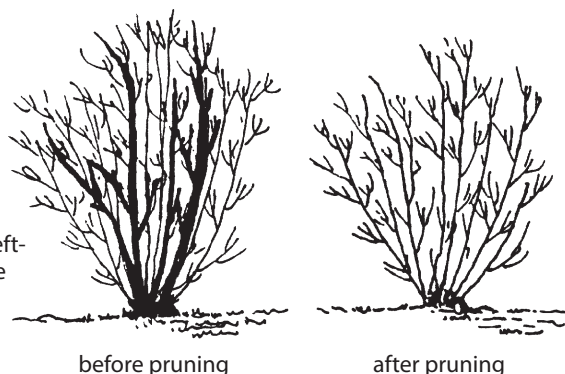


Evergreen

Most evergreen trees and shrubs are sold B&B or in a container. Unlike deciduous shrubs, they require little pruning at planting time.

Thinning out is the best way to prune most mature evergreen shrubs. Some evergreens can be sheared to achieve a stiff, formal appearance. However, you'll still need to thin them occasionally.

Figure 26. Gradual renewal of a shrub. (Dark branches in left-hand illustration are removed.)



Hedges

Hedges are plants set in a row so they merge into a solid linear mass. They have been used for centuries as screens, fences, walls, and edgings. A well-shaped hedge is no accident. It must be trained from the beginning.

Establishment of a deciduous hedge begins with the selection of nursery stock. Choose young trees or shrubs 1 to 2 feet high, preferably with multiple stems. Cut the plants back to 6 to 8 inches to induce low branching. Late in the first season or before bud break in the second, prune off half the new growth. The following year, again trim off half.

In the third year, start shaping. Trim to the desired shape before the hedge grows to the desired size. Once it reaches its mature size, it will be too late to achieve maximum branching at the base. Do not let lower branches be shaded out; trim so the base of the hedge is wider than the top (Figure 27). After the hedge reaches the desired dimensions, trim frequently in order to maintain its size.

Figure 27. Correct (a) and incorrect (b) hedge pruning.



Evergreen nursery stock for hedging need not be as small as deciduous material and should not be cut back when planted. Trim lightly after a year or two. Start shaping as the individual plants merge into a continuous hedge. Do not trim too closely, because many needle-bearing evergreens do not easily generate new growth from old wood.

Hedges often are shaped with flat tops and vertical sides and are sometimes conical in shape (Figure 28a and b). This

Table 1. Shrubs that bloom on last season's growth.

Botanical name	Common name
<i>Cercis chinensis</i>	Chinese redbud
<i>Chaenomeles japonica</i>	Japanese quince
<i>Chionanthus virginicus</i>	Fringe tree
<i>Daphne</i> spp.	Daphne
<i>Deutzia</i> spp.	Spring-flowering deutzia
<i>Exochorda racemosa</i>	Pearlbush
<i>Forsythia</i> spp.	Forsythia
<i>Kerria japonica</i>	Kerria
<i>Lonicera</i> spp.	Honeysuckle
<i>Magnolia stellata</i>	Star magnolia
<i>Philadelphus</i> spp.	Mockorange
<i>Pieris</i> spp.	Andromeda
<i>Rhododendron</i> spp.	Azalea and rhododendron
<i>Rosa</i> spp.	Rambling rose
<i>Spiraea</i> spp.	Early white spirea
<i>Syringa</i> spp.	Lilac
<i>Viburnum</i> spp.	Viburnum
<i>Weigela florida</i>	Old-fashioned weigela

Table 2. Shrubs that bloom on the current season's growth.

Botanical name	Common name
<i>Abelia x grandiflora</i>	Glossy abelia
<i>Buddleia davidii</i> or <i>globosa</i>	Butterfly bush
<i>Callicarpa japonica</i>	Japanese beauty bush
<i>Caryopteris x clandonensis</i>	Bluebeard
<i>Ficus carica</i>	Fig
<i>Hibiscus syriacus</i>	Shrub althea
<i>Hydrangea arborescens</i>	Hills of snow
<i>Hydrangea paniculata</i>	Peegee hydrangea
<i>Hypericum</i> spp.	St. Johnswort
<i>Lagerstroemia indica</i>	Crape myrtle
<i>Rosa</i> spp.	Bush rose
<i>Spiraea bumalda</i>	Anthony Waterer spirea
<i>Spiraea japonica</i>	Mikado spirea
<i>Symphoricarpos</i>	Coralberry and snowberry
<i>Vitex agnus-castus</i>	Chaste tree

unnatural shaping seldom is successful. The best shape, as far as the plant is concerned, is a natural form—a rounded or slightly pointed top with sides slanting to a wide base (Figure 28c and d). This shape aids in shedding snow, which otherwise can break branches. Also, by trimming the top more narrowly than the bottom, you enable sunlight to reach all of the leaves.

Before shaping a hedge, think about the plants' natural shape. E.g., common buckthorn, a spreading plant, is easily shaped to a Roman arch (Figure 28c). Naturally conical arborvitae does particularly well in a Gothic arch shape (Figure 28d).

Two questions often arise: "How often should this hedge be trimmed?" and "When should I trim?" Answers depend on the kind of shrub, the growing season, and the degree of neatness you desire.

In general, trim before new growth begins to shade lower leaves. Trim slow-growing plants such as boxwood when new growth is more than 3 or 4 inches long. Yews, for example, may need shearing only once annually. Shear faster growing evergreens before new growth exceeds a foot. Laurel and photinia may need to be sheared every four to six weeks during spring and early summer.

What can be done with a large, overgrown, bare-bottomed, and misshapen hedge? If it is deciduous, the answer is fairly simple. In spring, before leaves appear, prune to 1 foot below the desired height. Then trim carefully for the next few years to give it the shape and fullness desired. Occasionally, hedge plants in very poor

shape do not recover from this treatment and must be replaced.

Rejuvenating evergreen hedges is more difficult. As a rule, evergreens cannot stand severe pruning. Arborvitae and yew are exceptions. Other evergreen hedges may have to be replaced.

Tools

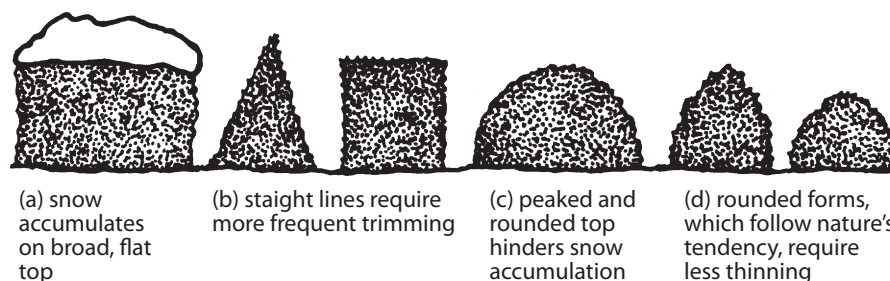
Traditional scissor-action hedge shears are the best all-around tool for trimming hedges. They cut much better and closer than electric trimmers, which often break and tear twigs. Electric trimmers do poorly on large-leaved and wiry-twigged varieties, and sometimes jam on thick twigs, but hand shears work on any type of hedge. Hand shears also are quieter and less likely to gouge the hedge or injure the operator.

Hand pruners are useful for removing a few stray branches and are essential if you want an informal look. Use loppers and/or a pruning saw to remove large individual branches. Chainsaws are not recommended for use on hedges.

Rose Bushes

All rose bushes need some type of pruning. If they are not pruned for several years, they deteriorate in appearance, often develop more than the usual disease and insect problems, and produce smaller and smaller flowers. Proper pruning encourages new growth from the base, makes the plant healthy and attractive, and results in large blossoms.

Figure 28. Improper (a and b) and proper (c and d) hedge shapes.



Hybrid tea, grandiflora, and floribunda roses require annual pruning in the spring after winter protection is removed. As a guideline, prune roses when the forsythia blooms. If you prune too early, frost injury may make a second pruning necessary.

For small pruning jobs, the only tools necessary are sharp hand-pruning shears and gloves. Use loppers to reach in and cut out large, dead canes. A small saw with a pointed blade can also be helpful.

Remove all dead and diseased wood by cutting at least 1 inch below the damaged area. Remove all weak shoots and those growing toward the center. If two branches rub or are close enough that they will rub soon, remove one of them. On old, heavy bushes, cut out one or two of the oldest canes each year.

Cut back the remaining healthy canes. The height to which a rose should be cut depends on the cultivar. The average pruning height for floribundas and hybrid teas is between 12 and 18 inches, but taller growing hybrid teas and most grandifloras may be left at 2 feet.

Make cuts at a 45° angle above a strong outer bud (Figure 29). Aim the cut upward from the inner side of the bush to push growth outward and promote healthy shoots and quality flowers.

Some types of roses have special pruning considerations, as discussed below.

Standard or Tree Roses

A tree rose is a hybrid tea, grandiflora, or floribunda budded at the top of a tall trunk. Prune tree roses like hybrid teas, cutting the branches to within 6 to 10 inches of the base of the budded top in order to encourage rounded, compact, vigorous new growth.

Miniature Roses

Miniatures are 6 to 12 inches high, with tiny blooms and foliage. They do not need special pruning. Cut out dead, diseased, and weak growth and remove the hips.

Ramblers

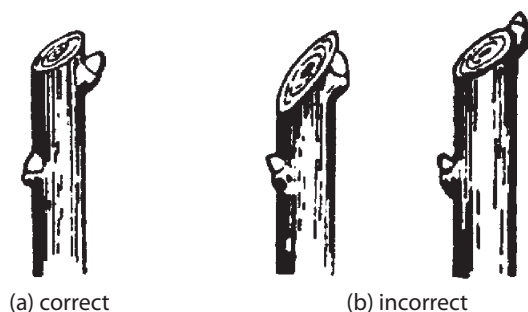
Old-fashioned rambler roses have clusters of flowers, each usually less than 2 inches across. They often produce pliable canes 10 to 15 feet long in one season. Ramblers produce best on 1-year-old wood, so this year's choice blooms come on last year's growth. Prune immediately after flowering. Remove some of the large, old canes. Tie new canes to a support for the next year.

Large-flowering Climbers

Climbing roses have large flowers, more than 2 inches across, borne on wood that is 2 or more years old. Canes are larger and sturdier than those of ramblers. Some flower only once in June, but some, called everblooming climbers, flower more or less continuously throughout the summer.

Prune these roses in autumn, any time before cold weather sets in. First cut out dead and diseased canes. Next, remove one or two of the oldest canes at ground level to make room for new canes. Shorten laterals (side shoots) by 3 to 6 inches after flowering. If the plant is strong, keep five to eight main canes and tie them to a trellis, fence, wall, or other support. If the canes are not strong, keep only a few.

Figure 29. Proper pruning angle (a) and improper angles (b).



Vines and Groundcovers

Pruning procedures for ornamental vines are similar to those for ornamental shrubs. Be sure to prune flowering vines at the right time. Prune those that flower on new wood before growth begins in spring. Prune those that flower on last season's growth immediately after flowering.

Prune vines that are grown for foliage to control growth and direction. Timing is less critical than for flowering vines.

Groundcover plants require very little pruning. Remove dead or damaged stems whenever you notice them. Some trailing groundcovers, such as English ivy, may need pruning to prevent encroachment on lawn areas or other plants. The appearance of St. Johnswort, a woody, yellow-flowered groundcover, is improved by trimming it back every three or four years in early spring. For large plantings, a lawn mower set to cut 3 to 4 inches above the crowns makes fast work of this job.

For More Information

See the following publications from the UK Cooperative Extension Service:

Pruning Landscape Trees, HO-45

Pruning Landscape Shrubs, HO-59

