

Training and Pruning Your Home Orchard

Jeff Olsen

The Basics

Why train fruit trees?

- Training develops a strong tree structure that can support heavy crops without limb breakage.
- Training helps bring a young tree into production at an early age.

Why prune fruit and nut trees?

- Pruning reduces overall tree size.
- Pruning makes trees easier to spray and harvest.
- Pruning young trees can improve structural strength and induce branching.
- Pruning mature trees can increase their production and improve fruit quality.
- Pruning reduces the need to prop up fruit-laden branches.

Basic terminology

Branch collar—The raised tissue at the base of every branch. It contains specialized cells that seal off pruning wounds from wood rot fungi.

Crotch angle—The angle formed between the trunk and a limb. The strongest crotch angle is 45 to 60 degrees.

Crown—The base of the trunk where the tree meets the soil.

Heading (or head cut)—A pruning cut that removes only part of a branch.

Lateral branch—A side shoot off of another branch, usually at a more horizontal angle.

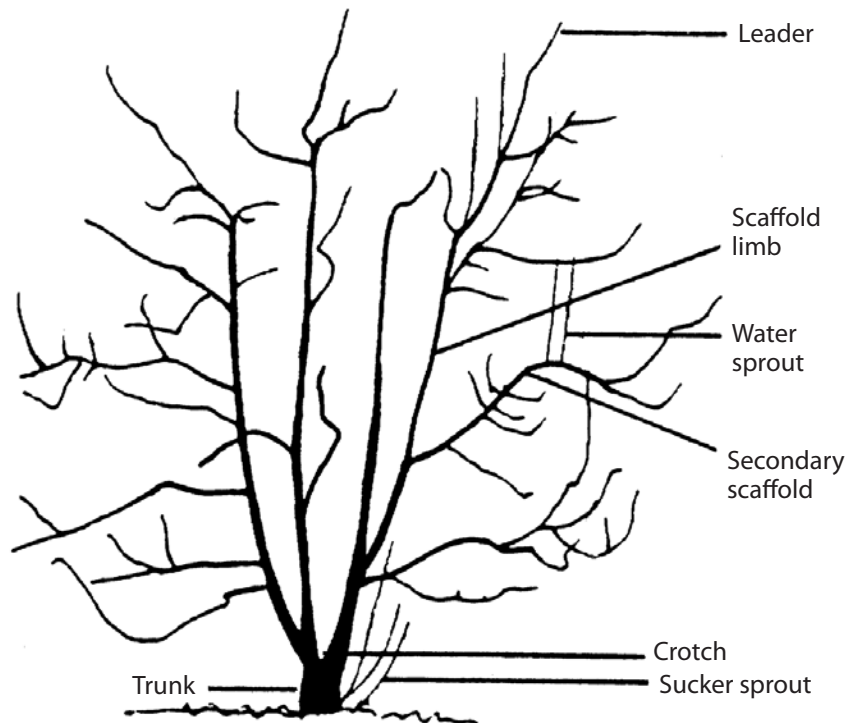


Figure 1. Common terms used in pruning and training fruit trees.

Leader—The uppermost portion of a scaffold limb. In a central-leader trained tree, only one leader is left in the center of the tree. Multiple-leader trained trees usually have three to five leaders per tree.

Scaffold limb—A large limb that forms a tree's framework.

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

Spur—A short shoot that fruits.

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Stub—A short portion of a branch left after a pruning cut. Avoid leaving stubs.

Sucker sprout—A 1-year-old shoot that grows from the root.

Terminal—The end of any shoot.

Thinning cut—A pruning cut that removes an entire branch from its point of origin.

Vertical branch—A branch that grows upright.

Water sprout—A 1-year-old shoot that grows within the tree.

Save the branch collar, and don't use wound dressings.

Prune so that you don't leave a stub (figure 2), and also so that you don't make a wound larger than necessary (as occurs with a "flush cut"). Cut just outside the branch collar (the raised tissue at the base of every branch). Its specialized cells seal off pruning wounds from wood rot fungi.

There's no clear evidence that wound dressings reduce wood rots in pruning wounds. Early tree training helps you avoid large pruning wounds low in the tree, which might become infected.

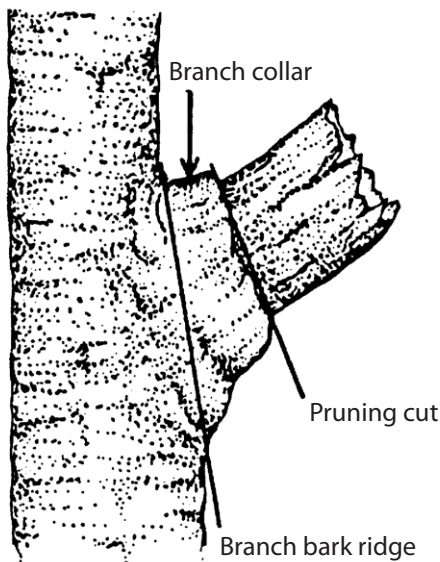


Figure 2. Always preserve the branch collar, the raised tissue at the base of every branch. The branch collar contains specialized cells that allow a tree to seal off pruning wounds and prevent rot from damaging the branch's heartwood.

Make your pruning cut at an equal and opposite angle from the branch bark ridge.

General rules for training

- Start training at planting time.
- Remove unwanted shoots in summer when they're small.
- Train more by limb positioning than by pruning.
- Follow the training program consistently, as often as necessary, so that you complete proper training as soon as possible.

Manage your fruit trees actively

The best ways for homeowners to control the height of a fruit tree are to plant a dwarfing rootstock, prune well, or use a trellis system. Keeping the tree's height low allows for easier harvesting and pest management. As a homeowner, you may have inherited fruit trees on your property from previous owners. You can either choose to manage them or replace them with a variety, rootstock, or training system that controls the overall height of the tree. A post-and-wire trellis system is a popular way to keep fruit trees at a manageable height (see "Espalier training," page 5).

Untended fruit trees can become infestation sites for serious insect and disease pests. Untended trees can make it difficult for commercial growers in the region to control key pests. If you are using an untended fruit tree mostly for shade, perhaps you should replace it with a nonfruiting shade tree.

General rules for pruning

- Prune all fruit and nut trees at planting time to balance the tops with the roots. You'll need much less pruning at planting if you plan to irrigate the young tree frequently during its establishment.
- Prune young trees very lightly.
- Prune mature trees more heavily, especially if they've shown little growth.
- Prune the top portion of the tree more heavily than the lower portion.
- Prune when all danger from fall or early winter freeze has passed, but before full bloom in spring. Sweet cherry trees may be pruned in August when there's less danger of bacterial infection.
- In a mature tree, thin out more of the shoots that grow toward the end of a well-pruned branch. This increases fruit size and quality on the remaining shoots (figure 3, page 3).

- To reduce the height of a tree that's too tall, cut limbs at the top of the tree to a lateral branch that is the height you desire (figure 4). Leave the branch collar but don't leave stubs. Stubs won't heal and could be a starting point for wood rot fungi.
- Thinning out and heading back (figure 11, page 7). Thinning out results in long, flexible limbs that bend down when loaded with fruit. Heading back causes limbs to branch laterally and stiffen. Light heading stimulates branching when you train young trees.
- Bend nearly vertical limbs 45 to 60 degrees from vertical to stimulate fruit production earlier in the life of the tree. Bend limbs to the desired angle and secure them in place by using weights, tying them with twine, or using notched limb spreaders in the crotch of the branch. Keep the bent limb in the desired position for one growing season to allow the branch to stiffen and stay at that angle. Take care to bend but not break the branch. The thicker and more upright a limb is, the more benefit it receives from bending. Bending helps keep a tree small and manageable by channeling the tree's resources into fruit instead of shoot growth.

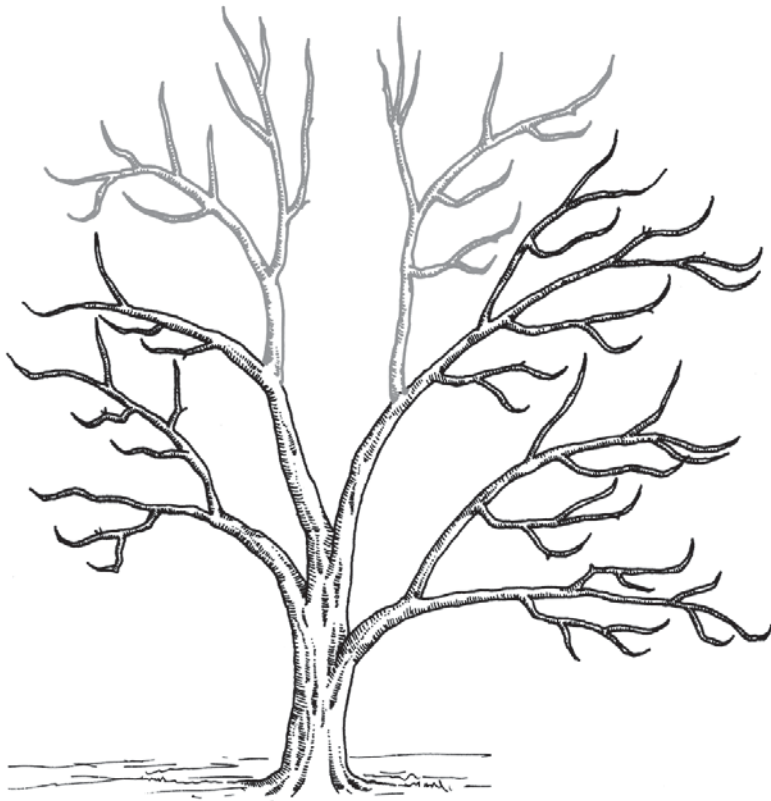


Figure 4. This tree is too tall. To reduce its height, cut out whole limbs at the top (gray).



Figure 3. On this well-pruned branch, thin out more shoots toward the end (gray).

Tree training systems

Open center training (figure 5, page 4).

Choose three or four shoots to form main scaffold branches the first winter. Remove other shoots that might form competing limbs. Or, head them by removing one-fourth to one-third of their length if they're long and not branched.

When you remove large limbs, first cut part way through the branch on the underside, then make the top cut. Don't leave stubs.

To keep a tree small, prune moderately every year and don't apply a lot of fertilizer, manure, or compost.

Central-leader training (figure 6, page 4).

If a nursery tree has few or no branches at planting, head it at 24 to 30 inches above ground. To train trees to a central leader, choose a vigorous shoot near the center of the tree after planting.

During spring or early summer, remove shoots near the leader that will compete with it (because of their upright aspect and vigor)

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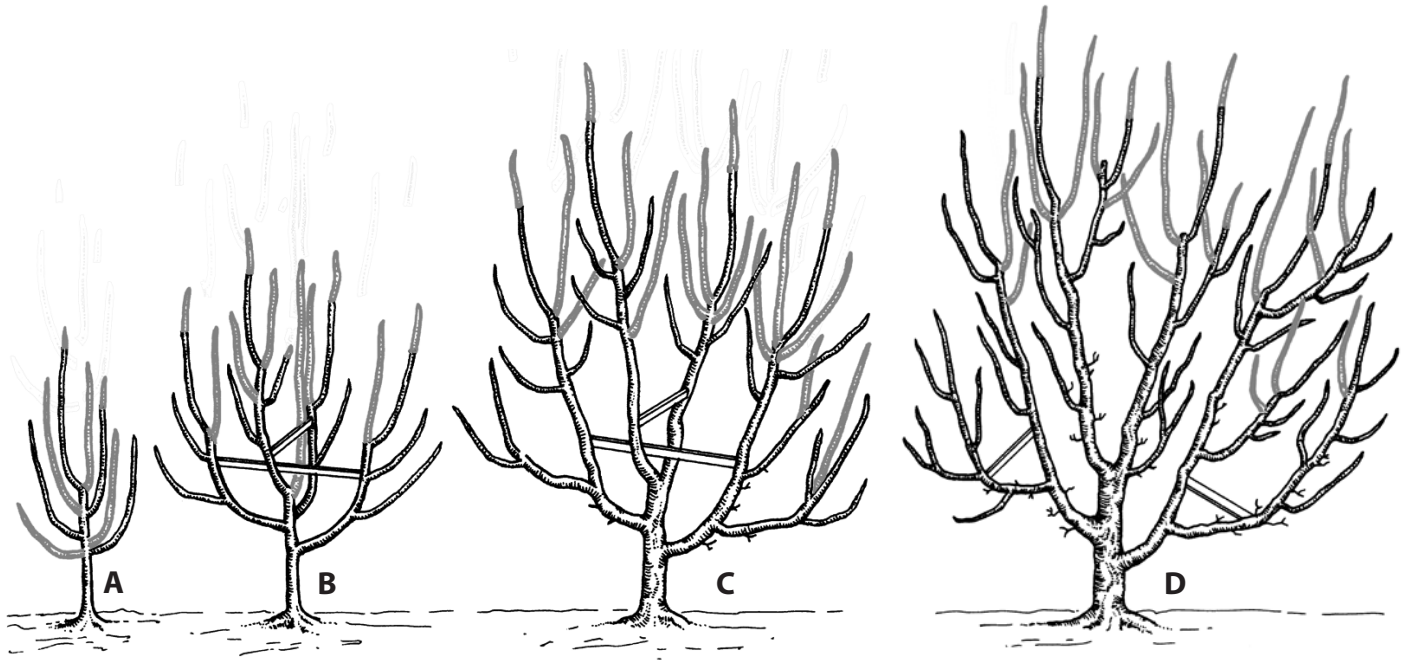
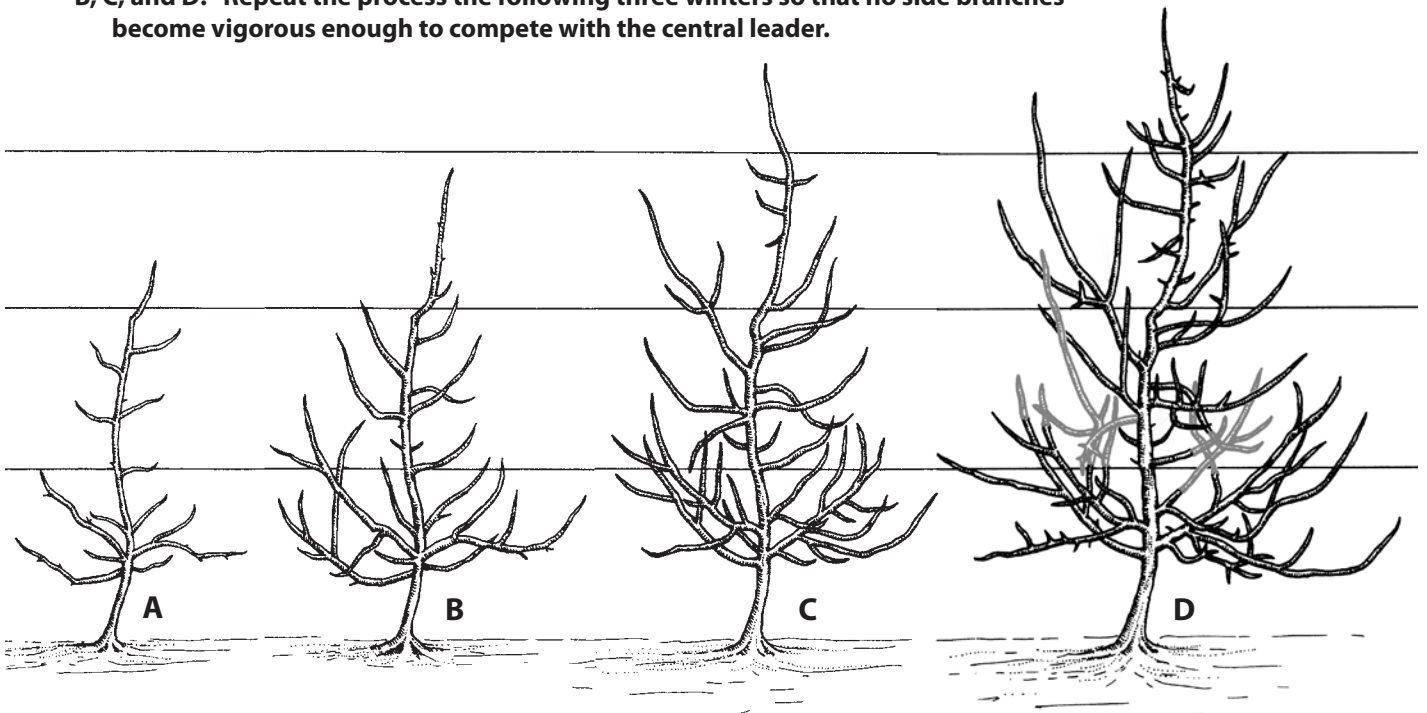


Figure 5. It takes four winters to train trees to an open center (gray indicates removed or headed shoots).

- A:** The first winter, choose three or four shoots to form main scaffold branches. Remove or severely head all others. Scaffold branches should be at least 8 inches apart on the trunk for a strong tree structure.
- B:** The second winter, choose one or two more.
- C:** By the third winter, scaffold selection should be complete.
- D:** The fourth winter shows a good open center. Four main scaffold limbs evenly distributed around the trunk are enough; a fifth limb crowds.

Figure 6. It takes four winters to train trees to a central leader (gray indicates removed or headed shoots).

- A:** The first winter after planting, choose a vigorous shoot high on the tree. Cut off the top to stimulate branching if it's 2 feet long or longer. Head all other vigorous shoots more severely.
- B, C, and D:** Repeat the process the following three winters so that no side branches become vigorous enough to compete with the central leader.



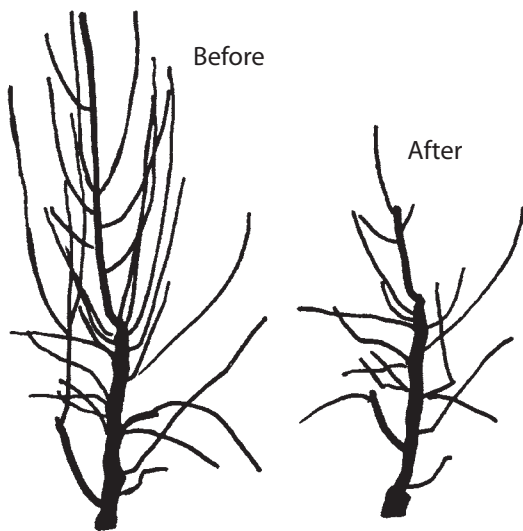


Figure 7. The highest portion of a scaffold limb is called the leader. Thin it to an upright side shoot. Head that shoot and remove all upright shoots that might compete. To avoid overgrowth in the tree top, repeat this process annually.

(figure 7). In the dormant season, head the leader by one-third, and tie down or remove competing shoots.

Each year, spread limbs that are too upright (figure 8). Repeat the process in the following two seasons so that no side branches become vigorous enough to compete with the central leader.

Some dwarf apple varieties (such as Liberty, shown in figure 6, page 4) have wide-angled limbs naturally and don't need heading or spreading if they're supported. Delicious, Newton, and other varieties with narrow crotches or upright limbs—or both—do require spreading. The central leaders of non-supported trees need annual heading to develop short, stout limbs.

Modified central-leader training

A modified central-leader training system follows the same steps described for central-leader training (figure 6). The central leader causes the lateral branches' angles off the trunk to be wider, which increases the crotch strength and helps induce early fruit production. Once you've chosen and established the main scaffold branches (figure 1, page 1), the central leader is no longer necessary. You can remove the

central leader in the third or fourth year of growth. Now, you'll be training the tree to a multiple-leader system.

Espalier training

Espalier training develops trees in two dimensions only. In a home garden, you might use it to save space and to enhance the aesthetic appeal of your fruit trees. It also creates a tree form that is easier to pick, prune, and spray thoroughly for pests.

You can grow dwarf apple trees on a post and wire trellis in a hedgerow. Posts may extend from 6 to 10 feet above the ground. Treated posts are best, but sound, untreated 4 x 4 cedar posts may work well. Anchor the end posts against another post driven several feet into undisturbed soil at an opposing angle.

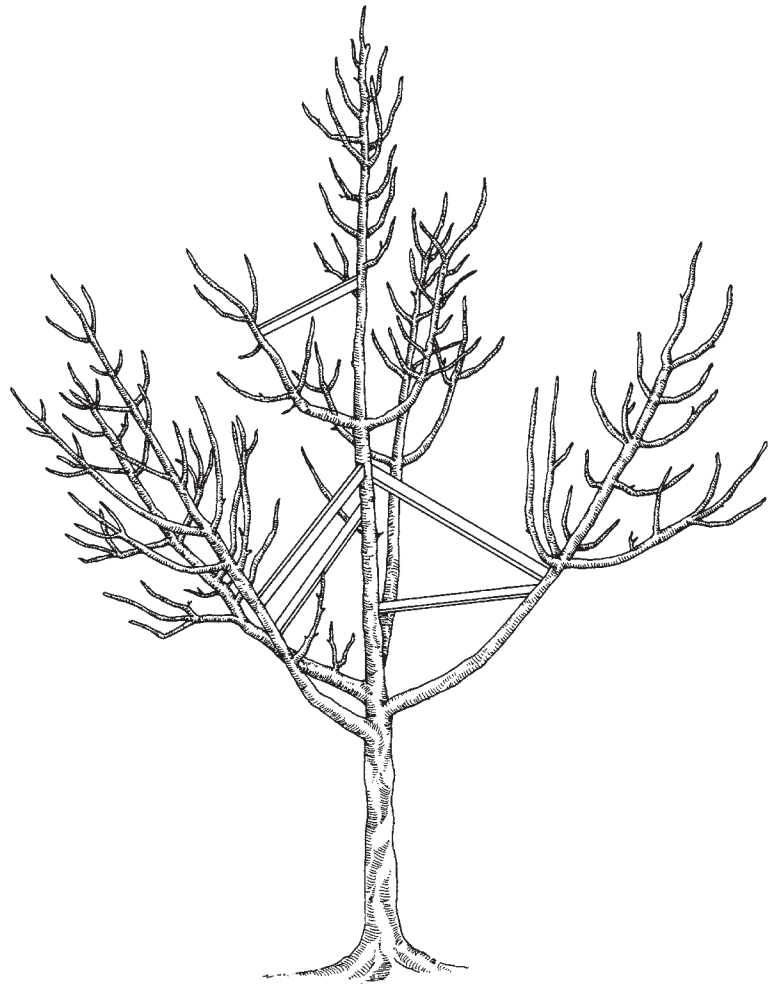


Figure 8. While the tree is young, spread branches that make very narrow angles with the main trunk. If these limbs are allowed to grow to a productive age without being spread, they usually break away from the trunk, often splitting the entire tree.

Use galvanized wire, 12-gauge or heavier. The lowest wire should be about 4 feet above the ground, with higher wires at 2-foot intervals. Tie the main trunk to these wires, using a loop big enough to allow the trunk to grow without being girdled. If you attach the trunk to the trellis wire with $\frac{5}{8}$ -inch box staples, it will graft to the wire and not girdle.

If you use individual posts at each tree, make sure they extend at least 6 feet above the ground, and drive or sink them at least 2 feet into the ground. Wooden tree stakes should be 2 inches or more in diameter.

When training the tree, select buds to form the branches at the proper height and cut off the tree just above them. As these buds grow—and before they've produced enough wood to become stiff—fasten the shoots that grow from them to training wires or sticks with masking tape or other suitable material (figure 9).

Palmette is a specific pattern of espalier training. Develop the lowest branches first, angling them at about 30 degrees at the start. Widen this to 45–50 degrees when they're as long as you want them (figure 10).

Head the central leader just above where you want branches, and develop one or two higher pairs of branches, keeping them shorter and slightly more spreading than the lower pair. It's best to have at least 18 inches vertically between branches.

Fruiting habits

Figure 12 (page 7) shows the difference in fruiting habit between peach and apple. Peaches bloom only on 1-year-old wood; apples usually bloom on spurs or shoots from 2-year-old wood. Figure 13 (page 7) shows a mature apple tree's fruit spurs, which bear the fruit crop. Cherries, plums, pears, and apples all produce their fruit on spurs.

Spurs require good light exposure in order to be fruitful. Thinning cuts that open up the tree to light penetration help to keep fruitful spurs throughout the tree canopy.

Pruning tools

Long-handled pruning shears (figure 14, center; page 8) are the most useful tool for almost all pruning jobs.

Hand shears (figure 14, bottom) are useful for training young trees.

If you need to make large cuts, use a pruning saw (figure 14, upper left).

If you must use a ladder, use only a sturdy stepladder. Set it firmly on the ground to prevent accidents.

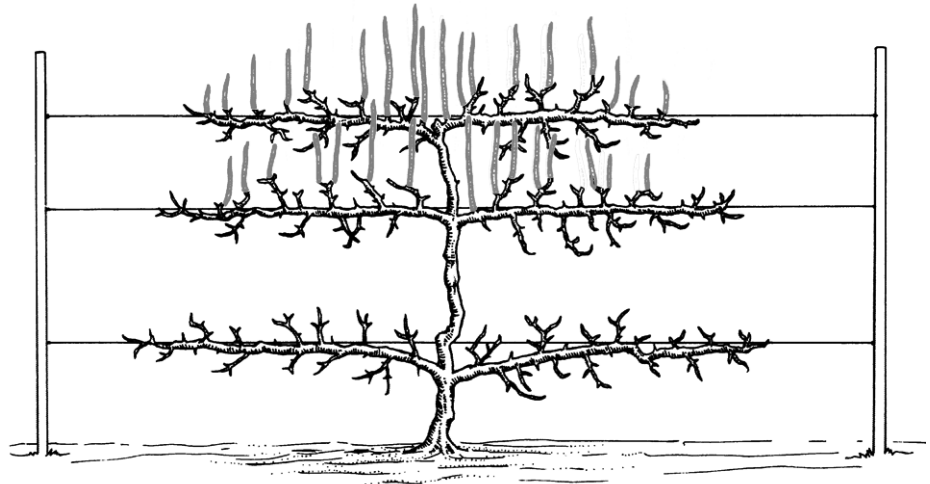


Figure 9. Espalier training.

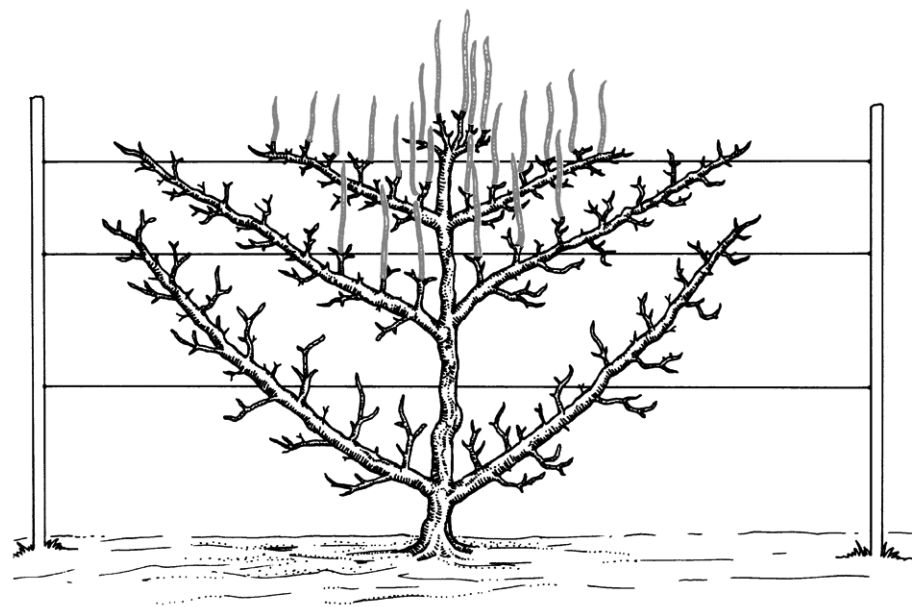


Figure 10. Palmette training.



Figure 11. Thinning out (left) and heading back or “stubbing” (right).

Applying the basics

Fruit trees

Apple

Fully dwarf trees

You must support fully dwarf trees, or they’ll bend to the ground under the weight of their fruit. You can use individual stakes with each tree or build a trellis support system (see “Espalier training,” page 5).

Training fully dwarf apple trees to a central leader supported with a post or trellis (figure 6, page 4) can produce highly productive 6- to 10-foot trees. This system helps avoid bush-like trees only 4 or 5 feet tall that are bent down with the weight of their fruit.

In the spring following planting, when shoots are 3 to 4 inches long, select the uppermost vigorous shoot and remove other shoots near it. Return several times in summer and remove or tie down any shoots that could compete with the lead shoot because of their upright aspect and vigor. Head the lead shoot by a third in the dormant season.

Keep three to five branches that are 18 to 30 inches above ground to form a basic set of

permanent branches. If they’re upright, tie or weigh them down to nearly horizontal. Position higher limbs to below horizontal to reduce their vigor relative to the permanent basic set.

Semi-dwarf trees

You can train a semi-dwarf tree to a central leader or develop it as a multiple leader tree, depending on the tree’s vigor. Central leader training is best for weak-growing varieties on poor soil. Train vigorous varieties with multiple leaders (three or four lead branches) (when trained to central leaders, they may become too tall). When they’re 4 to 6 inches long,

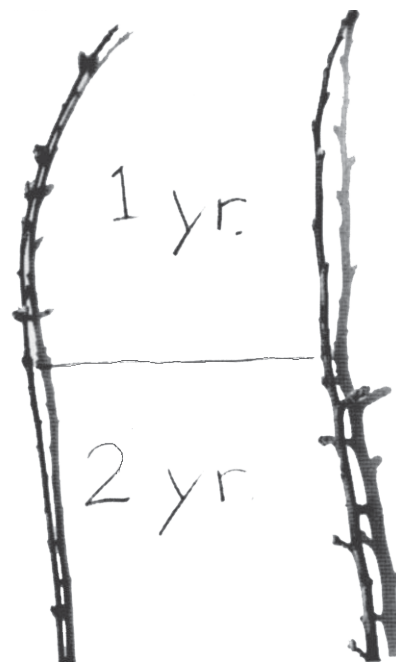


Figure 12. One-year-old wood is the wood that grew during the previous summer: peach (left), apple (right).



Figure 13. The fruit spurs on a mature apple tree bear the fruit crop.



Figure 14. Pruning saw (upper left), long-handled pruning shears (center), hand shears (bottom).

spread these shoots using cocktail-style toothpicks or spring-type clothespins placed in the crotches of the branches. On a windy site, support the tree with a sturdy stake for the first 10 years.

In the following years, spread or tie out the lead limbs to about 30 degrees from vertical. Weigh down the side limbs that arise from these or spread them to horizontal to stimulate early production. As the tree begins to bear fruit, limbs may require propping or tying to prevent breakage.

“Spur type” trees

This type of apple tree forms many small spurs on young growth rather than the usual long shoots and leaf buds (figure 15). This is how it got its name. Because these trees fruit at a young age and are smaller than standard strains of the same variety, they make ideal home orchard trees.

Each spur bears a flower cluster. The leaves are close together, the tree branches are less frequent, and the tree grows slowly.

Spur type trees are available on both vigorous and dwarfing rootstocks. If you grow them on vigorous

rootstocks, they may not require artificial support until they are in production.

Because they branch sparsely, leave more branches in a spur type than in a tree of standard growth habit. To train them to a central leader, space the lower set of limbs several inches apart vertically on the leader, and reduce their number to four or five (figure 6, page 4).

Standard trees (full size trees on seedling rootstocks)

Fruit trees on seedling rootstocks are excessively vigorous, so they are not as suitable for home orchards as trees on growth-controlling rootstocks. If you choose to use a seedling rootstock, cut back the newly planted trees to 24 to 30 inches from the ground. Train them to the modified central-leader system (see page 5).



Figure 15. On this central leader of a 2-year-old, spur-type Delicious apple strain, notice the many short spurs with blossom clusters. Extensive fruit thinning is required to allow this tree to grow and ripen the remaining fruit.

It's best to have only four main scaffold limbs, spaced equally around the trunk and vertically several inches apart. Develop the main scaffold limbs to just a few degrees above horizontal. Make sure that all secondary branches also have a gradual upward aspect (figure 5, page 4).

The branches of a mature, non-dwarf apple tree may spread over 40 feet in diameter and reach a height of 30 or 40 feet. Prune regularly and tie down upright limbs in the top to maintain a height of 12 to 15 feet.

Prune to make the lowest limbs the most vigorous and productive in the tree (figure 16). Shorten, thin out, and bend down the upper limbs to accomplish this. Remove **risers** (these grow straight up) and **hangers** (these grow straight down) from the permanent limbs to open a vertical space of about 3 feet between the lowest limbs and those above, so that light can penetrate.

Pear

Initial research shows promise for growing pears on a trellis, but most commercial pears in the Pacific Northwest are grown with a central leader or modified central-leader training system. If you feel adventurous, you can try growing trellised pears. The following recommendations describe the standard way to train pear trees.

Head pear trees at about 24 inches at planting. If the top is branched, keep three or four branches as leaders. Select these leaders early in the first summer and spread them. Do little or no pruning except to head and spread the leaders annually until the tree starts to bear.

Don't head side branches. Heading would maintain their upright position. Spread or weight all vigorous shoots except the lead shoots.

Open ladder bays between scaffold limbs of mature trees, and regularly reduce tree height to what you can reach from your ladder. Shorten or remove upper limbs so they don't shade the lower limbs. Thin out the branches of mature trees, and do the heaviest pruning in the top.

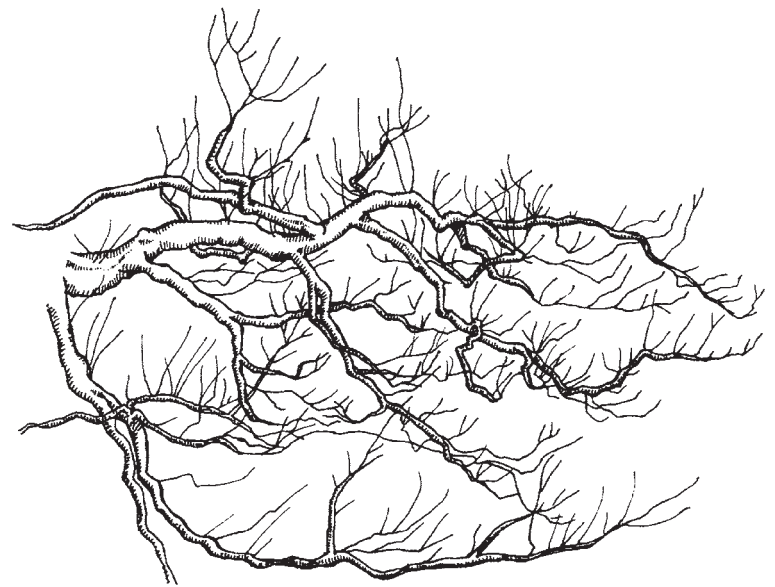


Figure 16. (Above) This old seedling-rooted apple tree is maintained at a height of about 12 feet by extending the branches horizontally, rather than vertically. (Below) This enlarged view shows how the slightly upward aspect of the entire main limb and the terminal part of the side limbs maintain a good balance between shoot growth and fruiting. Pruning consists of many small thinning cuts.

Remove long shoots in the center and top, but leave some short shoots and most spurs. Remove horizontal branches in the top so they won't produce suckers.

Invigorate slow-growing spur systems by cutting them back to about half their length, or remove them and replace them with new shoots. On Anjou and Comice varieties, cut back most of the spur systems and some shoots to increase fruit size.

Sweet cherry

At planting, head nursery trees at the height you desire for scaffold branches. Train sweet cherry trees to the open center system (figure 5, page 4) with three to five scaffold branches. Young sweet cherry trees often grow vertical limbs 6 to 8 feet without branching. You must head them to induce lateral branch formation.

Prune in summer to reduce the re-growth of vigorous trees. If a young tree is growing very rapidly, cut off a foot or more of new growth after about 3 feet of growth has been made in the summer. This will cause branching. You can hasten production by tying down or weighting limbs to horizontal.

To promote branching on trees not pruned in summer, head every shoot in winter to about 2 feet. After 5 or 6 years, stop heading and thin out crowded branches.

Bacterial canker, a common disease of cherry trees, frequently causes gumming and dead areas or “cankers” on limbs. If it infects the crown or trunk, it can kill the tree. If a gummy, dead area encircles most of a limb, you must cut off the limb.

Bacterial infection can enter through pruning wounds. To avoid this, prune in August. You usually can avoid death from bacterial canker by budding or grafting a variety about a foot out on the rootstock limbs.

Mature trees require little pruning except as needed to reduce tree height. If birds are eating a lot of the fruit, you may want to net the tree.

Sour cherry

Sour cherry wood is quite brittle, so give special attention to developing wide-angled crotches in young trees. Either select wide-angled shoots to form limbs, or spread shoots to widen the angles. Three main scaffold limbs are enough for a sour cherry tree. The modified central-leader system helps form wide-angled scaffold limbs without having to spread them.

In the first and second summers, remove excess shoots so that all new growth is on the permanent scaffold limbs. In mature trees, only occasional thinning out of excess branches is needed to keep a good balance of light and fruitfulness throughout the tree.

Peach

Cut off peach trees about 12 to 20 inches above the ground at planting. Train trees to the open center or vase type system (figure 5, page 4). Develop no more than three or four main scaffold limbs. Select shoots that have the widest angles where they attach to the trunk and that are not all at the same height. Peach limbs with poor crotches split out more frequently than limbs of many other fruit trees.

Remove scaffold limbs that may compete with the three or four originally selected. Do this in the spring of the second year and again in the third year if necessary. Head the scaffold limbs in the first and second dormant seasons to cause branching until there are 6 to 8 secondary scaffold branches and 12 to 16 tertiary branches.

Peach trees bear only on 1-year-old shoots (figure 12, page 7). Every year, prune enough to stimulate new shoot growth for the following year's crop. Peach trees branch readily, so they will have too many weak shoots unless you prune them properly. Thin out shoots, leaving those of moderate vigor. Remove all weak or very strong shoots.

Prune hardest in the top and near the ends of the major limbs. Cut top limbs back to side shoots to stiffen them and reduce tree height. Peach trees crop more consistently and have larger fruits if they're pruned heavily. Commonly, up to 50 percent of the previous season's growth is removed each year.

Prune and plum

Train prune and plum trees to the open center system (figure 5, page 4) with three or four main scaffold limbs. Prune very lightly for the first 5 years. Head only the limbs that will be permanent scaffolds, remove scaffold limbs that may compete with the three or four originally selected, and do little else. Weighting or bending limbs stimulates early production.

In mature trees, thin out the top every few years and remove dead limbs as they appear. Most plums and prunes have ample bloom every year, so you only need to prune enough to control height and spread, keep the trees fairly vigorous, and prevent limb breakage.

Japanese varieties (such as Shiro, Redheart, and Burbank) have many long, thin shoots, so heading is far more important in them than it is in most European varieties.

Apricot

Apricot trees usually develop many branches in the nursery. Select some of them to be scaffold branches at planting time. Cut these branches back a few inches and remove other branches. One year after planting, cut back long shoots to induce branching. Train the tree as you would for peaches.

Pruning bearing apricot trees is mostly a process of thinning out excess wood and heading long shoots. After a side shoot has produced for 3 or 4 years, remove it and let a new shoot grow in its place.

Fig

Fig trees can be grown in a multiple or single-trunk form. If you live in a region with severe freezing weather, consider growing the multiple trunk form so you can thin out trunks that suffer freeze damage. In other regions, a single-trunk form with three to five scaffold branches is suitable.

A mature fig tree can reach the size of a walnut tree. Be sure to prune the top for good light penetration into the canopy. Figs produce fruit on the current season's shoots, so heading branches to stimulate shoot growth is helpful.

Persimmon

There are two types of persimmon trees, American and Asian. The Asian persimmon tree is smaller when mature than the American and needs less maintenance pruning to contain its height. A multiple scaffold system with three to five main scaffold branches is suitable for persimmons.

Pruning an old, neglected fruit tree

A tree that hasn't been pruned for several years has a dense thicket of upright shoots in the top and many weak, pendulant (downward facing) spur systems further down (figure 17). It's best to prune the tree back into shape gradually over several years, rather than trying to do the whole job all at once.

After you identify the main scaffold branches, saw out any excess large branches. Cut ladder bays so you can place your ladder in the tree's center. Climb as high on your ladder in the tree's center as you intend to pick, and cut the main scaffold limbs down to the height that you can reach.

Remove limbs that overlap or hang down into other limbs. Thin out most of the upright shoots,

leaving some of the smaller ones. Cut back weak, pendulant limbs. Gradually invigorate the spur systems by cutting back some and removing others. Keep the center of the tree fairly free of limbs so that light can penetrate.

Don't head shoots. Remove them entirely, or let them bear fruit and rely on the weight of the fruit to bring them down. Thin off shoots on the inside of upright branches so that fruit will pull them to the outside.

Nut trees

Walnut

Cut off a newly planted walnut tree 4 or 5 feet above the ground. If you don't make this cut, the tree won't grow much for several seasons. The lowest limbs of a walnut tree have a habit of drooping, so they should originate fairly high on the trunk.



Figure 17. In a poorly pruned tree, upper limbs shade out lower limbs, and a dense thicket of suckers appears in the top. Cut the drooping terminal portion to a more upright branch (arrows). Remove some of the suckers, cutting close to the limb; thin out side shoots on others so that they'll bend over with the weight of the fruit.

Select three to five main scaffold branches in the first and second growing seasons and remove excess branches at that time. Use a modified central-leader system to help form wide-angled scaffold limbs.

After the scaffold branches have developed, no further pruning is required. Pruning doesn't hurt walnut trees, but they're so large that it's difficult to prune the top (where pruning would do the most good). Pruning will invigorate most old, weak walnut trees.

Hazelnut

In nature, hazelnuts grow as bushes, but you can force them to grow in a single trunk by annually removing the sprouts that grow at ground level. Train the tree with three or four scaffolds, similar to training peaches (page 10).

To be most productive, a hazelnut tree should make 6 to 8 inches of new terminal shoot growth

every year on shoots at shoulder height. Frequent pruning helps maintain this growth.

Prune hazelnut trees like peaches, but less severely. Hazelnut wood is especially susceptible to wood-rotting fungi, so it's important to make cuts at the branch collar with limbs or trunk.

Chestnut

Pruning methods for walnuts also work for chestnut trees. Head a newly planted tree around 4 feet from the ground, and select three to five scaffold branches after the first season of growth. Use a modified central-leader system to help form wide-angled scaffold limbs. If scaffold branches have not produced lateral growth in the first 3 feet, then head the scaffold to stimulate lateral branching.

In mature trees, prune in the top to ensure good light penetration throughout the canopy. Fully mature chestnut trees grow to 40 feet tall.

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