

# Tree Fruits

## Keys for Success

Choose cultivars that are hardy in your area. Dwarf cultivars bear fruit earlier than standard trees and are easier to manage in home plantings.

Except for peaches (which are self-fruitful), plant at least two different cultivars for good pollination.

Start with nursery-grown one- or two-year-old bare-root plants. Older plants are more difficult to train.

Choose a site with good air drainage that is not vulnerable to late spring frosts.

Plant trees in early spring as soon as the soil has warmed and drained. Begin preparing soil (adjust pH and add organic matter) and controlling weeds a year before planting.

Mulch with bark or wood chips to provide a grass-free zone within 2 feet of each tree.

Stake dwarf and semi-dwarf trees, and commit to timely pruning and fruit thinning.

Protect trees from deer, rodents, and other pests and diseases.

Tree fruits became popular in America in the early 19th century, thanks, in part, to the efforts of John Chapman, also known as Johnny Appleseed.

Today, New York is the nation's second-leading apple producer. The Northeast also produces significant quantities of sweet and tart cherries, peaches, pears, plums, nectarines, and apricots. The New York State Agricultural Experiment Station at Geneva, New York, maintains one of the world's foremost tree fruit breeding programs and a collection of apple germplasm from around the world.

Tree fruits are classified according to the type of fruit they produce. Apples and pears are pome fruits. They are fleshy with several seed chambers. Stone fruits have a hard pit in their center and include cherries, peaches, plums, nectarines, and apricots.

## Choosing Cultivars

There are so many cultivars (short for cultivated varieties) to choose from! Deciding what to plant is one of the most enjoyable tasks of growing fruit trees. But it also can be frustrating for those who are new to growing fruit.

Fortunately, there are many tried-and-true cultivars to consider (see Table 3 and “Sure-Fire Winners,” pages 16 and 15, respectively). Lengthy test periods have proven the value of many newer fruit tree cultivars that offer home fruit growers the widest choice ever of high-quality fruit with other desirable characteristics, such as disease resistance.

Many older cultivars are still available, but they are planted infrequently because either the trees are too challenging to grow or the fruit they produce is often of poor quality.

When choosing cultivars, look for those with outstanding hardiness, disease resistance, and fruit quality. Many of the newer cultivars provide top-quality fruits not often available in local markets. For example, try growing the disease-resistant apple cultivar Liberty rather than the popular but apple scab-susceptible McIntosh. Home fruit growers whose livelihoods do not depend on their garden harvest may find a lower-yielding yet higher-quality cultivar the best choice.

Keep in mind that peaches and sour cherries are the only tree fruits grown in New York that are self-fruitful. When growing other tree fruits discussed in this publication, you need to plant at least two different cultivars to get good pollination and fruit set (see “Pollination and Fruit Set,” page 8). Look in nursery catalogs for information about which cultivars make good “pollenizers.”

Cultivars also need to be winter hardy in your area. For more information, see “Climate Concerns,” page 4.

The cultivars listed in Table 3 are adapted to a wide range of conditions and yield fruit for eating fresh as well as for storing or preserving. By choosing early-, mid-, and late-ripening cultivars from this list, you can stretch your tree fruit harvest season.

## Rootstocks

Most home gardeners prefer small, size-controlled fruit trees grown on “dwarfing” rootstocks. Smaller trees make picking, pruning, and pest control easier, and they set fruit at a younger age than full-sized trees.

Rootstocks for apple trees are special apple varieties that control the height of the tree and give it other special characteristics, such as resistance to insects or diseases, solid anchorage in the ground, and early fruit production. A cultivar is grafted onto this special rootstock, so you are essentially buying two plants—the rootstock that anchors the tree and the cultivar that produces the fruit.

In this publication and elsewhere, you may read references to “dwarf apple cultivars.” This is usually shorthand for “apple cultivars grown on dwarfing rootstock.” For example, the cultivar Yellow Delicious can be grown on a dwarfing rootstock or on a rootstock that allows it to grow into a full-sized tree. This is different from most landscape trees, where dwarf cultivars are distinctly different genetically from their full-sized relatives.

Mature tree size depends on the vigor of the rootstock, the scion cultivar (the cultivar grafted onto the rootstock), the depth and physical characteristics of the soil, and cultural practices. Fully dwarf apple trees grow just 8 feet tall when fully mature at 15 to 20 years of age. The fruit of a small tree is as good in flavor as, or better than, the fruit of the same cultivar grown on intermediate- or full-sized trees.

Common apple rootstocks include:

**M.9**—A strongly dwarfing rootstock that produces a very short, 8- to 10-foot-tall tree (see Figure 1). It needs a soil with high water-holding capacity and good drainage. Plants should be staked or trellised, and they are very susceptible to the disease fire blight. Trees grown on M.9 rootstock can bear fruit the second or third year after planting and reach full production in six years.

**M.26**—Produces slightly larger, 11- to 14-foot-tall trees that tend to be poorly anchored in the ground. Trees must be planted in well-drained soil but cannot tolerate very dry conditions. Trees grown on M.26 rootstock can bear fruit the second or third year after planting and reach full production in six years.

### Sure-Fire Winners

These apple cultivars are easy to prune and set fruit most every year. (You'll still need to tend to pest management.)

- Jonamac
- Sansa
- Liberty
- Empire
- Golden Delicious
- GoldRush

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**Fruit trees grown on dwarfing rootstock bear fruit sooner and are easier to manage.**

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**Table 3: Recommended tree fruit cultivars (listed in order of ripening for each fruit type)**

<i>Fruit</i>	<i>Cultivar</i>	<i>Fruit</i>	<i>Cultivar</i>
<b>Apple</b>	Williams Pride*	<b>Nectarine, white flesh</b>	Morton
	Sansa*		Nectacrest
	Gala	<b>Peach, yellow flesh</b>	Harrow Diamond
	Jonamac		Brighton
	Freedom*		Redhaven
	Priscilla*		Madison
	Liberty*		Canadian Harmony
	Empire		Cresthaven
	Golden Delicious		
	Keepsake		
GoldRush*			
<b>Apricot</b>	Harcot	<b>Peach, white flesh</b>	Surecrop
	Harogem		Raritan Rose
	Harlayne	Eden	
	Goldcot		
<b>Cherry, sweet</b>	Stella	<b>Pear</b>	Bartlett
	Emperor Francis		Gorham
	Royalton		Bosc
	Hartland	<b>Plum, European (prune)</b>	Green Gage
	Hedelfingen		Richards Early Italian
<b>Cherry, tart</b>	Montmorency	Stanley	
	Balaton	French Damson	
<b>Nectarine, yellow flesh</b>		<b>Plum, Asian</b>	Early Golden
	Pocohontas		Shiro
	Mericrest		Seneca
	Nectared 4		
	Nectared 6		

\* Scab-resistant apples

**M.7**—Produces 15- to 18-foot-tall trees with deep roots. But if for any reason the soil has a restrictive layer, trees will be poorly anchored. Roots also are susceptible to root rot and crown gall diseases. Trees will take at least one year longer to fruit than those grown on M.9 or M.26 rootstocks, usually bearing in their third or fourth year after planting and reaching full production in 8 to 10 years. These trees are a good size for planting in areas with heavy deer pressure if you can protect them from browsing deer when they are small.

**MM.106**—Produces large, 18- to 20-foot tall trees, nearly standard size. Trees often grow late into the fall, making them more susceptible to winter injury. They will not tolerate poorly drained soils, and collar rot

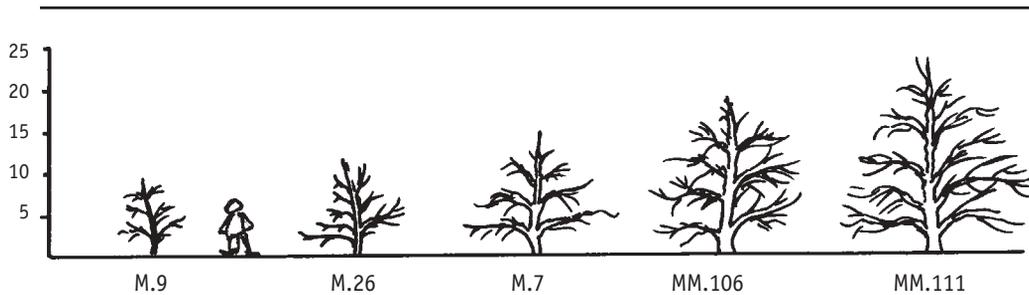


Figure 1. The type of rootstock that apple varieties are grafted onto determines the mature height of the tree. For example, M.9 rootstock produces an 8- to 10-foot-tall dwarf tree that can be pruned and harvested from the ground. Varieties grown on M.111 rootstock grow to be 19 to 24 feet tall.

is a common problem. Trees grown on MM.106 rootstock can bear fruit their third or fourth year after planting and reach full production in 8 to 10 years. These trees are a good size for planting in areas with heavy deer pressure if you can protect them from browsing deer when they are small.

**MM.III**—Produces large, standard-sized, 19- to 24-foot-tall trees. Roots tolerate a wide range of soil conditions, including dry soil, and plants are less subject to collar rot than are those grown on MM.106. Trees grown on MM.III rootstock can bear fruit their third or fourth year after planting and reach full production in 8 to 10 years. These trees are a good size for planting in areas with heavy deer pressure if you can protect them from browsing deer when they are small.

The recently developed Cornell Geneva rootstock series has two rootstocks that are highly resistant to fire blight:

**CG.16**—Produces dwarf trees similar in size to M.9. The trees are very productive at an early age, fruiting during the second or third year and reaching full production in six years.

**CG.30**—Produces mid-sized trees similar in size to M.7, but it sets fruit a year or two earlier and produces fewer root suckers.

Bud.9 is a fully dwarfing rootstock similar to M.9 but more cold hardy and fire blight resistant.

Size-controlling rootstocks are also available for other tree fruits. For pears, Old Home x Farmingdale rootstock offers good fire blight resistance. OHxF 333 performs well in New York and produces trees that are about 10 to 12 feet tall. Pear trees grown on OHxF 97 rootstock are nearly as tall as standard trees but produce fruit much sooner.

For peaches, Lovell and Bailey are acceptable rootstocks wherever peaches can be grown in New York and produce 12- to 15-foot-tall trees.

Plum and prune cultivars grafted on sand cherry or Nanking cherry rootstocks grow just 15 feet tall. Plum trees are commonly propagated on *Prunus* St.

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**Apple trees can grow from 8 to 24 feet tall depending on the rootstock you choose.**

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Julian A and myrobalan (*Prunus cerasifera*) rootstocks. Myrobalan grows in a wide range of soils, including poorly drained sites.

Cherry trees were traditionally propagated mostly on Mahaleb and Mazzard rootstocks, which usually don't produce fruit until about their seventh year. Mahaleb is the more winter hardy of the two and produces a smaller, 15- to 18-foot-tall tree. However, it is damaged by collar rot in poorly drained soils. Mazzard rootstock generally produces larger, 24- to 28-foot-tall trees and is preferred for sites with questionable drainage. Giessen rootstock, developed in Germany, produces smaller trees and begins fruiting as early as the third year.

## Nursery Stock

To get off to a good start, buy high-quality plants from a reliable nursery. The most commonly sold stock are half-inch-diameter, bare-root, one-year-old "whips," usually just a single stem. Nurseries sometimes sell two-year-old trees that may have several branches (sometimes called "feathers"). These two types of stock usually perform better than larger and older trees because small trees are easier to transplant and train to a desired shape. When ordering, request that plants arrive before growth has started, to prevent damage from shipping.

Improper care after plants arrive from the nursery can cause serious injury. The ground should be prepared and ready to plant before plants arrive. If the ground hasn't yet been prepared, unpack the plants immediately and "heel in" the trees in a well-drained, shady, cool location. Dig a temporary trench about 1 foot deep, and set the trees close together in the trench. Pack soil firmly over all the roots, mounding it so excess water will drain away. Make every effort to set the plants in their permanent location before growth starts, and never let the roots dry out or expose them to prolonged direct sunlight.

You also can store plants in a walk-in cooler for a short time before planting or heeling-in. But do not store them in coolers with ripening fruits, which give off ethylene gas that can damage the nursery stock.

## Planting

Early spring is the best time to plant fruit trees. Plant as soon as you can after the soil has thawed and drained enough to work without destroying its structure and before your nursery stock starts to break bud and leaf out. It is best to prepare the soil the year before planting. See the section "Before You Begin" (page 1) for detailed instructions.

Before you plant trees, trim off broken or injured roots. Do not let the roots dry out. Plants can die if roots are exposed to sun and wind. You may want to soak the roots in a pail of clean, cool water for 6 to 12 hours before planting.

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**"Heel in" young trees if you can't plant them immediately.**

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Dig planting holes large enough to accommodate the tree roots in their natural position. Put aside the topsoil so you can replace it after planting. Don't skimp on the digging and preparation of the planting hole. Your tree has a much better chance of surviving and thriving if you do a good job.

Plant rootstocks with the graft union about 2 inches above ground level. If the graft union is below the soil line, roots may develop on the base of the scion cultivar (upper portion of the graft), which results in the loss of the effect of the rootstock.

Carefully spread the roots out over loose soil in the bottom of the hole. Move the tree up and down slightly as you spread the first few shovels of topsoil back on top of the roots. This helps to settle the soil under and around the roots and gets rid of air spaces. Tamp the soil firmly while filling the hole.

Water trees immediately after planting and water at weekly intervals for four to five weeks unless rainfall is adequate. Do not mix dry fertilizer with the soil used to fill the hole. It can damage the tender new roots. Add 1 tablespoonful of starter solution (high-analysis, water-soluble fertilizer similar to 20-20-20) to 1 gallon of water and apply this solution to the soil around each tree immediately after planting.

The root system of M.9 rootstock is brittle, and trees on this stock may tip over when the tops become large enough to catch a strong wind. These trees need the support of a stake, post, trellis, or fence. (You may want to stake other trees as well, especially on exposed sites.) A 1-inch-diameter metal electrical conduit pipe makes an ideal support. These are 10 feet long and are easy to pound into the ground. Place the post about 4 inches from the trunk and about 2 feet into the soil. Secure the tree to the post with several strong, durable ties. Specially made tree ties or a heavy wire covered by a section of garden hose work well. Always be certain when tying trees or branches to posts or other supports that the tie is loose enough to prevent binding or girdling as the trunk grows.

## Managing Grass and Weeds

You need to minimize competition for water and nutrients from weeds and grass growing adjacent to your trees. Two approaches commonly used in home fruit plantings are mulches and permanent sod.

When planting trees into a lawn, follow the planting steps described previously. In addition, remove the sod within 2 feet of the tree to prevent competition between the tree and grass. If you don't water your trees or if they otherwise fail to thrive, you may want to expand this cleared area as the tree grows. Keep grass mowed short near the trees.

Mulches have several advantages. In addition to suppressing weed growth, they can reduce moisture loss, helping to keep the soil evenly moist. As they

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**Don't plant a 10-dollar tree in a 10-cent hole.**

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**When planting into lawn, remove sod from within 2 feet of the tree.**

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decompose, they improve soil structure and release nutrients that the trees can take up and use. Mulches also cushion fruits that drop from the trees and reduce soil erosion.

Using mulches also has disadvantages, but if you recognize the drawbacks and deal with them, mulching is an excellent cultural practice. Mulches can carry in noxious weed seeds, be a fire hazard, and attract rodents. They may be expensive or difficult to obtain, and some people consider them unsightly.

In wet years or on poorly drained soils, mulches can hold excessive moisture, forcing growth that fails to harden off in the fall and resulting in winter injury or collar rot. When using mulch, it is difficult to judge how much nitrogen fertilizer to apply. If you use high-carbon materials, more fertilizer may be needed for the first few years. But as the mulch decays, less is required.

Although there are many different types of mulches, wood chips or bark mulch work best, in part because they are less attractive to voles, which can damage trees over the winter. Apply these mulches 4 inches deep, and they will settle into a mat less than half this thickness. For good weed control, add more mulch as it decomposes to maintain a 2- to 4-inch layer. The mulched area should extend from near the tree trunk to a point just beyond the spread of branches. To prevent tree injury by voles and other rodents, do not place mulches against the trunk of the tree, and place a hardware cloth ring around the trunk base. (See “Vertebrate Pest Control,” page 9.)

A thick layer of mulch slows soil warming in the spring. This can delay flowering, which can be an advantage if your site is prone to late spring frosts.

## Fertilizing

Fruit trees require little if any fertilizer the year they are planted, particularly if you did a good job preparing the soil—adjusting pH and adding organic matter—the previous year. A starter solution applied at planting usually supplies enough nutrients for the first season’s growth. In subsequent years, some fertilizer may be needed for good annual growth.

Most soils contain many of the elements essential for plant growth. Fruit trees have large root systems. Under favorable conditions, the roots tap a large volume of soil, foraging for nutrients. Fertilizer is needed only when plants are unable to get sufficient quantities of these elements from the soil. When trees can’t get enough nutrients from the soil, the result can be decreased vegetative growth, light fruit set, and small fruit.

Whatever you do, don’t overdo the application of fertilizers! Too much fertilizer can be as detrimental as too little, particularly when it comes to nitrogen. Nitrogen fertilizers, represented by the first number on the fertilizer

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**Wood chip or bark mulch is least attractive to voles.**

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bag, fuel the annual extension growth in the trees (see Figure 12, page 31). Annual extension growth is the amount that a branch grows each year.

To gauge annual extension growth, measure the distance from the tip of the branch back to the “ring” formed by the scars from the previous year’s buds that encircle the branch, marking the end of the previous season’s growth. You generally should get about 18 to 24 inches of annual extension growth during the first several years. Thereafter, 10 to 12 inches is sufficient for mature trees.

As a general rule, determine how much fertilizer to apply based on the guidelines in the chart below. These are the rates that you should apply if your trees are **not** producing enough annual extension growth as described above.

Note that the amounts are small, but don’t be tempted to overapply! Overfertilization with nitrogen, phosphorus, and potassium can cause deficiencies in other nutrients. If your young trees are growing as described above, then apply no fertilizer and reevaluate your need next year.

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**Too much fertilizer is as bad as too little.**

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	Nitrogen rate	Ammonium nitrate		
		(33% N)	10-10-10 (10% N)	20-20-20 (20% N)
Young trees	0.04 lb./tree	2 oz./tree	6 oz./tree	3 oz./tree
Mature trees	0.08 lb./tree	4 oz./tree	12 oz./tree	6 oz./tree

If your trees flower every year but don’t produce fruit, a micronutrient deficiency might be the cause. After eliminating other possibilities, such as late frosts, have a leaf tissue analysis done. (For more information about leaf analysis testing, contact the Cornell Nutrient and Elemental Analysis Laboratory, telephone: 607-255-1785, or via the web at [www.hort.cornell.edu/departments/facilities/icp](http://www.hort.cornell.edu/departments/facilities/icp))

## Pruning and Training Basics

Apples, pears, cherries, and plums produce their best fruit on two- to three-year-old wood. Peaches bear their fruit on the last year’s vegetative growth. One of the prime reasons for annual pruning is to encourage lots of productive fruiting wood—one-year-old wood on peaches and two- to three-year-old wood on the others. Unpruned trees can quickly become unproductive, while 70-year-old fruit trees can still bear lots of fruit because annual pruning promotes the right amounts and kinds of growth.

How you prune your trees affects how they grow as well as how much they fruit (see Figures 3 and 4). The buds at the tip of each branch produce plant hormones that suppress the growth of buds below the tip. You can manipulate the effects of these hormones by pruning and bending branches. For

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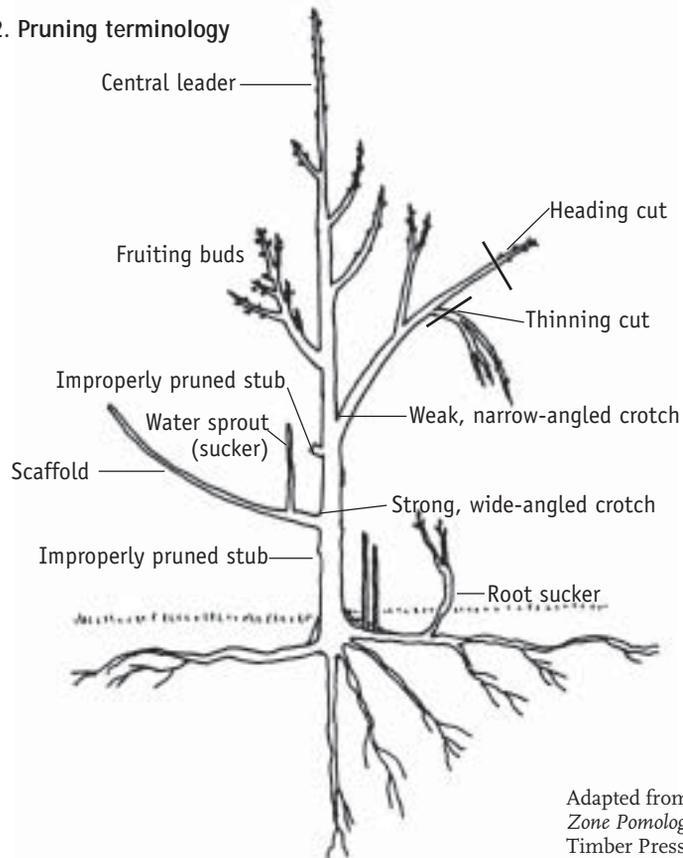
**Annual pruning keeps trees productive.**

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example, when you cut off buds while pruning the tip of a branch, you release dormant buds farther back on the branch, which grow and produce new branches.

The effects of plant hormones are greatest on vertical shoots and least on horizontal limbs. Spreading branches from vertical positions so that they are nearly horizontal has an effect similar to that of pruning off the buds at the tip of the branch. This spreading promotes new shoot development, initiates fruit buds, and slows the extension growth at the branch tip. That is why most fruit trees are pruned and trained to produce horizontal branches that yield more fruit, while much of the vertical growth is pruned out of the tree (see Figures 3 and 4).

Figure 2. Pruning terminology



Adapted from Figure 6-25, *Temperate Zone Pomology* by Melvin N. Westwood. Timber Press, Oregon. 1988

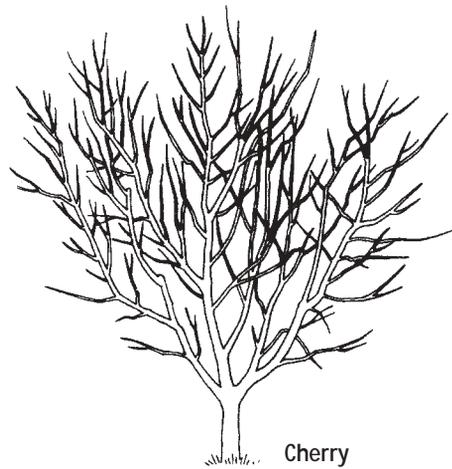
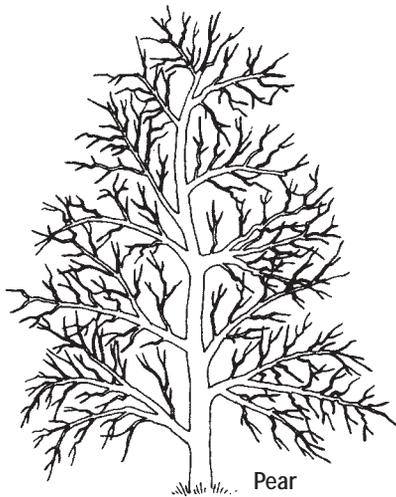
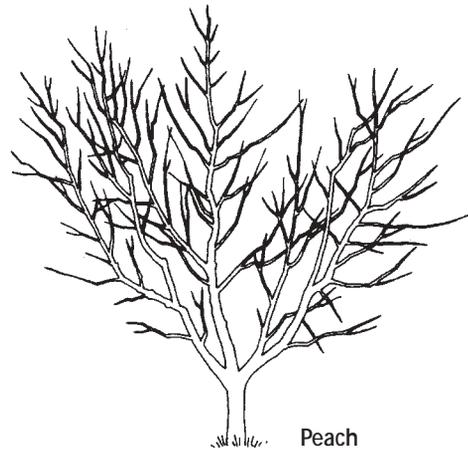
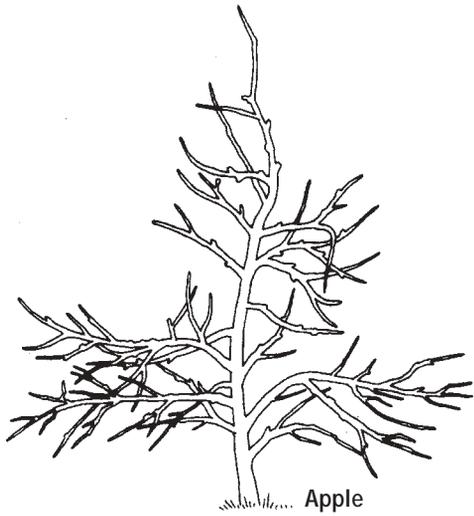
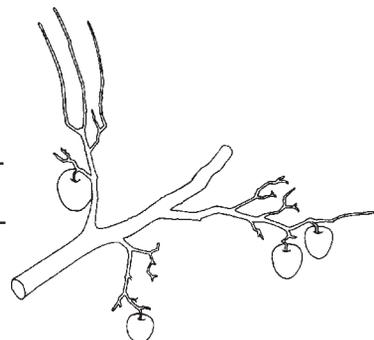


Figure 3. When pruning and training a young tree, it's important to keep in mind the form of the mature tree. Note the central leader and conical shape of the apple and pear trees and the more vase-like shape of the peach and cherry trees.

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Figure 4. Horizontal branches produce more fruit. The upright branch produces lots of vegetative growth but little fruit. What fruit it does produce is often soft and poorly colored. The branch growing from the underside of a larger branch is heavily shaded. As a result, it produces little vegetative growth and small fruits of poor color. Therefore, prune to encourage horizontal branches. They produce moderate vegetative growth and are very fruitful. Because of good light exposure fruits have better color.



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The other reason for encouraging horizontal growth is that branches with narrow crotch angles—where the angle formed between a branch and a vertical leader is less than about 60 degrees—are weak and break more easily under the weight of fruit. Narrow crotches also can serve as an entry point for organisms that cause disease and decay.

Each growing season, the diameter of each branch enlarges a bit, and each branch grows longer. You can follow the sets of “rings” on a branch to see how much annual extension there has been in preceding years and study the effects from past pruning, rainfall, and fertilization. Ten to 12 inches of annual extension growth is about right for mature fruit trees.

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**February to April  
is the best time  
to prune apple  
and pear trees.**

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You should do most of your pruning during the dormant season—after the leaves have fallen from the trees but before new growth starts in the spring. The ideal pruning time is usually from February to April. (Pruning in early winter can sometimes cause injury.) Other training tasks are carried out in the spring and summer. Older trees sometimes need additional pruning in the summer, but pruning too late in the season can encourage growth that won’t harden off by winter and can weaken the tree.

Many people tend to prune too much. Prune what needs pruning, but don’t overprune, either (Figure 5). Too much pruning can cause excessive vegetative growth at the expense of fruiting.

To get started, you need to know three basic types of pruning cuts:

- Pinching—removing growth near the apical meristem (the growing tip of a shoot) while it is still young and succulent.
- Heading—removing some, but not all, of a branch or shoot (called a shortening cut on older wood).
- Thinning—removing an entire shoot at its point of origin (called a renewal cut on older wood).

Normally, when pruning trees of all kinds, you make your cut flush with the branch collar that forms where the shoot meets the branch or trunk. Where larger branches meet the main trunk, it's important to undercut the branch a few inches away from the trunk, then finish the cut from above. Remove the stub by cutting close to the branch collar. This helps prevent damaging the bark on the trunk.

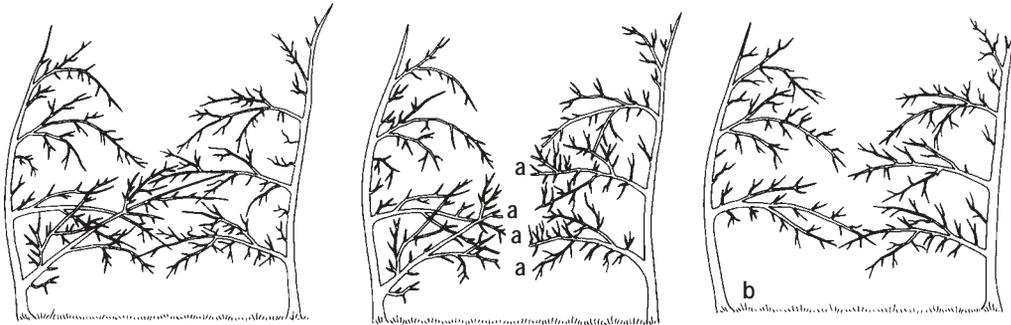


Figure 5. Thinning cuts (removing branches at their base) are usually better than heading cuts (removing the ends of branches). Here, branches from two adjacent trees are crowding each other.

Incorrect pruning: Numerous heading-back cuts (a) stimulate undesirable vegetative growth in the vicinity of the cuts and result in loss of fruitfulness farther back on the branches.

Correct pruning: Removing the large branch (b), eliminates crowding without stimulating undesirable vegetative growth.

## Training and Pruning Young Apple and Pear Trees

Pruning is especially critical just after planting and during the first few years of growth to make sure that the overall structure of the fruit tree is correct and to encourage early fruiting. Pruning cuts on young trees stimulate vegetative growth below the cuts and delay fruit bearing. So keep the number of cuts made on a young tree to a minimum, making only cuts that are necessary for proper structural development. If you do a good job of pruning and develop a structurally strong tree with limbs that are well exposed to full sunlight, you'll greatly reduce the amount of corrective pruning needed during the production years.

The pruning guide "Recipe for Training Young Trees to a Central Leader" (starting on page 28) is for semidwarf apples and pears, but it also can be used for cherries and plums. Your goal with this type of pruning is to develop a single central trunk with "scaffold" limbs spaced evenly around the trunk at

**Proper pruning is especially critical in the first few years after planting.**

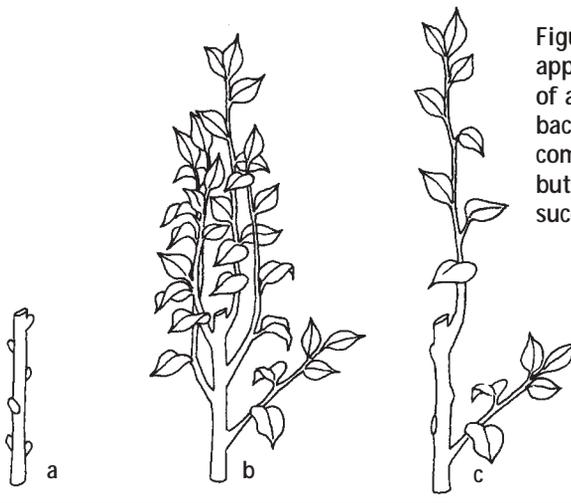


Figure 6. It's important to prune young apple trees to maintain the dominance of a single central leader. After heading back at planting (a), several leaders will compete for dominance (b). Remove all but the strongest while they are still succulent (c).

different levels, allowing for optimal exposure of the leaves to sunlight (see Figure 10). The tree will eventually assume a nearly conical shape, with longer scaffolds at the bottom of the tree and shorter ones near the top (see the apple and pear trees in Figure 3). In addition, you will need to spread or train the scaffold limbs so that they are nearly horizontal with the ground and their crotch angles (the angle formed where the limbs meet the central leader) are at least 60 to 70 degrees (Figure 7).

Keep in mind that the “central leader” method is just one way of pruning trees. There are many other methods—especially for high-density plantings of dwarf apple trees—that are variations of this method and designed to produce earlier harvests and high yields. (The general principles of central leader training can be used on dwarf trees as well.) As long as you keep in mind the effects that the different pruning cuts will have on your tree, you

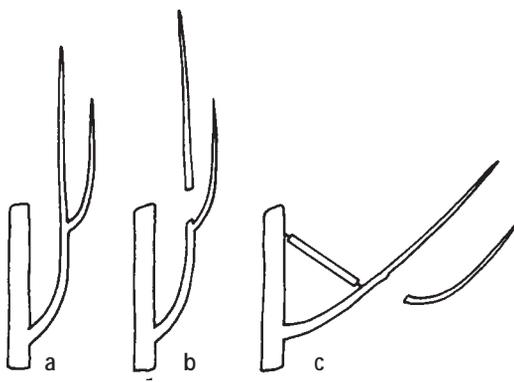


Figure 7. Use spreaders to train scaffold limbs to wide angles. The narrow crotch angle and small, upright lateral branch make this a poor scaffold without pruning and spreading. Incorrect pruning (b) does not improve the crotch angle or limb position, and because the limb is near vertical, the cut will stimulate vigorous vegetative growth. The correct procedure (c) spreads the limb to improve the crotch angle and properly positions the scaffold. Remove the lateral because it will be shaded by growth from the main scaffold limb.

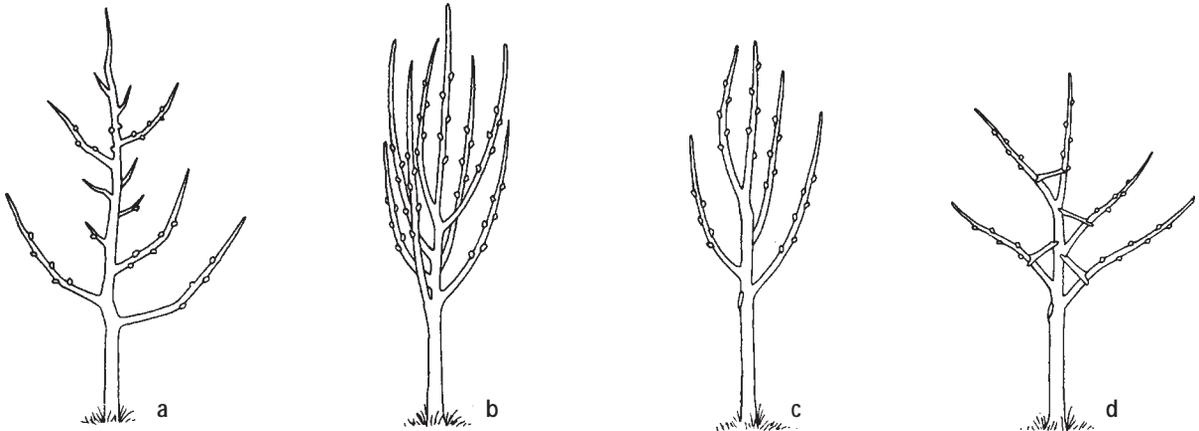


Figure 8. The cultivar Golden Delicious (a) is great for home gardens because its natural growth habit features a well-defined central leader, wide-angled crotches, and moderate extension growth, making it easy to prune.

At the other end of the spectrum, young Red Delicious trees (b) are more difficult to prune because their vigorous, upright growth competes with the central leader and they have an excessive number of scaffold limbs and narrow crotch angles. Red Delicious and cultivars with difficult growth habits can still be trained to grow into structurally sound trees.

Note the improved form of the Red Delicious tree (c) after scaffold selection and heading back the central-leader shoot.

The insertion of limb spreaders (d) improves the crotch angle, reduces scaffold vigor, favors flower bud formation, reduces competition with the leader, and eliminates interference of lower scaffolds with the growth of scaffolds originating higher on the trunk.

can modify this pruning method to meet your needs. For example, if deer pressure in your area is heavy, you may want to limit heading cuts on the leader or start your scaffold branches higher so that the trees more quickly outgrow their reach. Also keep in mind that different cultivars and different rootstocks may require or respond differently to various pruning strategies (see Figure 8).

For additional information on pruning and training, refer to the Cornell Cooperative Extension publications *Training and Pruning Apple Trees* and *Cultural Practices for Commercial Vineyards*. For ordering information, see “Related Cornell Cooperative Extension Publications,” page 103.

As your trees develop, continue with dormant-season pruning, fruit thinning, branch spreading, and scaffold supporting as needed, similar to the fourth-year recommendations given in the following pruning guide. By the sixth or seventh year, you may need to remove the least desirable scaffold in the bottom tier so that no more than four remain in that tier. Remove larger limbs in the top of the tree if their diameter is more than half the diameter of the leader where they join or they cast too much shade on the scaffolds below. Continue pruning to maintain the pyramidal shape of the trees.

## Recipe for Training Young Trees to a Central Leader: First Year

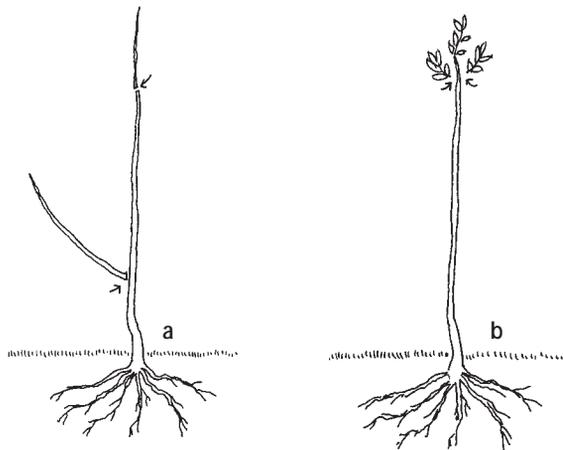
<i>When:</i>	<i>What to do:</i>
<b>At planting</b>	Plant so that the graft union is 2 inches above the soil level. (Tamp soil firmly.) Remove any shoots below about 18 inches. “Head” (cut off) the leader at about 32 to 36 inches (26 inches for pear trees) to stimulate branch development (see Figure 9). If the tree is well-feathered (has lots of side branches), head the leader about 12 inches above the top branch.
<b>Soon after planting</b>	Stake trees, especially those on M.9 rootstock (see “Planting,” page 18).
<b>1/4 to 1 inch of new growth.</b>	Choose a strong bud (usually the one just below your heading cut) to be the central leader, and pinch off the two or three competing buds below it. Remove any flowers that appear on the trees.
<b>2 to 4 inches of new growth</b>	<p>Choose several sideshoots to become scaffolds. They should be spaced about 3 to 4 inches apart on dwarf varieties and up to 8 to 12 inches apart on larger varieties. Make sure they are well distributed around—as well as along—the central leader (see Figure 10). Especially make sure that no two branches arise from the trunk at the same height.</p> <p>Attach clothespins to the main trunk so that their opposite ends gently spread the scaffolds to near-horizontal positions (see Figure 11).</p>
<b>Mid-July</b>	<p>Remove any vigorous sideshoots that compete with the central leader (see Figure 6). Tie the developing leader to the stake.</p> <p>Remove clothespins. If any scaffolds are turning up at the end and trying to grow vertically, hang one or more clothespins from near the end of the scaffold (attach extra weight to the clothespins if necessary) to bring them back closer to a horizontal position.</p>
<b>Fall</b>	Install a permanent plastic tree tie above the first tier of scaffolds, leaving a 2-inch diameter loop to allow for trunk growth.

## Recipe for Training Young Trees to a Central Leader, Second Year

<i>When:</i>	<i>What to do:</i>
	Remove any vigorous sideshoots that are competing with the central leader. The leader should have grown at least 18 inches the previous season (see Figure 12).

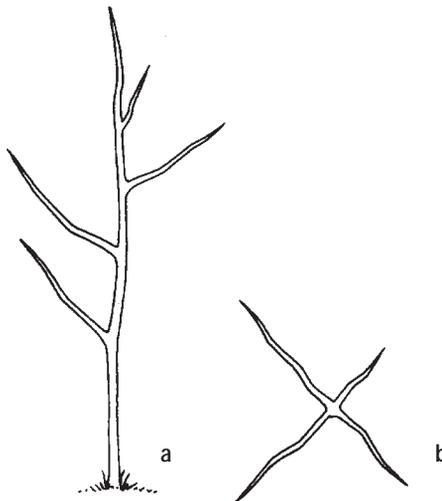
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Figure 9. To train semidwarf apple trees to a central leader, it's important to start pruning right after planting. Remove any shoots below about 18 inches, and "head" (cut off) the leader about 32 to 36 inches from the ground to stimulate branch development (a). After heading, several side branches will grow just below the cut. While they are still small, choose a strong one to become the new central leader and remove the two or three competing buds just below it (b).



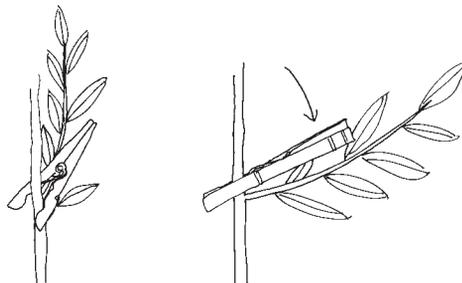
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Figure 10. When training a young tree, choose scaffold branches that form wide angles with the central leader and are spread out along the trunk (a). From above (b), the scaffolds also should be evenly spaced around the trunk. Keep upper scaffolds pruned shorter so that they don't shade the lower scaffolds.



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Figure 11. Use clothespins to gently spread the scaffolds to near-horizontal positions.



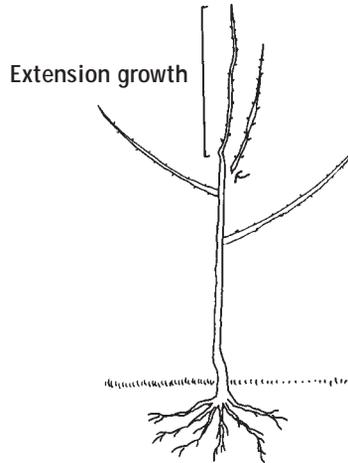
<b>Late winter</b>	<p>If the leader grew more than 18 inches, head it back by about one-fourth to encourage the formation of sideshoots for scaffold selection. If growth was less than 18 inches, head the leader and scaffolds, removing about one-third of last year's growth.</p> <p>If the tree has less than three acceptable scaffold limbs, remove all scaffolds, rehead the leader at about 36 inches, and repeat the first-year training procedure.</p> <p>If you are trying to encourage quick vertical growth or are growing dwarf trees that you want to encourage to fruit early, skip heading the central leader.</p> <p>As a rule of thumb, remove sideshoots that are more than one-half to two-thirds of the diameter of the trunk where they meet.</p>
<b>2 to 4 inches of new growth</b>	<p>Choose and clothespin the second tier of scaffolds growing from one-year-old wood on last year's leader, similar to your scaffold selection the previous year. Again, make sure they are well spaced along the central leader and well distributed around the trunk.</p> <p>Choose a new central leader (if you headed off the old one), and remove any vigorous sideshoots that compete with it.</p>
<b>Mid-July</b>	<p>Tie the developing leader to the stake and remove the clothespins. Remove any vigorous sideshoots that compete with the central leader.</p> <p>Use "spreaders" of various lengths to spread vigorous scaffold limbs selected the previous year that have crotch angles less than 45 degrees, bringing them down to nearly horizontal (see Figure 8d). You can make your own spreaders by cutting notches into the ends of a wood lathe or driving finishing nails into the ends of one-by-twos and sharpening the protruding head. (The sharp ends hold fast in the branches without doing permanent damage.) Alternatives to spreaders include hanging weights from the limbs or tying them down to the base of the tree.</p>

### Recipe for Training Young Trees to a Central Leader: **Third Year**

<i>When:</i>	<i>What to do:</i>
<b>Late winter</b>	<p>Make sure the tree is tied securely to the stake.</p> <p>Remove any vigorous sideshoots that compete with the central leader. Head the leader if needed, following the directions given for late winter of the second year.</p>
<b>2 to 4 inches of new growth</b>	<p>Choose and clothespin more scaffolds growing from the one-year-old wood on last year's leader, similar to the scaffold selection of the previous year. Again, make sure they are well spaced along the central leader and well distributed around the trunk.</p>

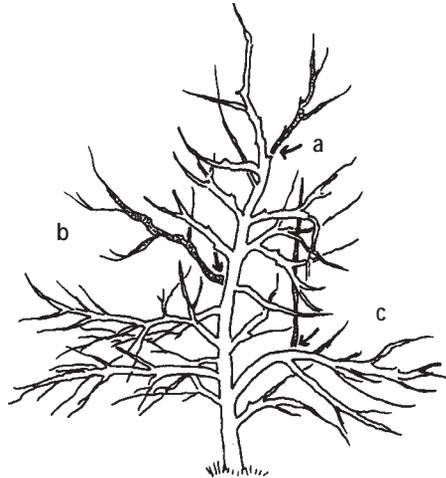
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Figure 12. In late winter following planting, remove sideshoots competing with the leader. The leader should have grown at least 18 inches (extension growth) the previous season.



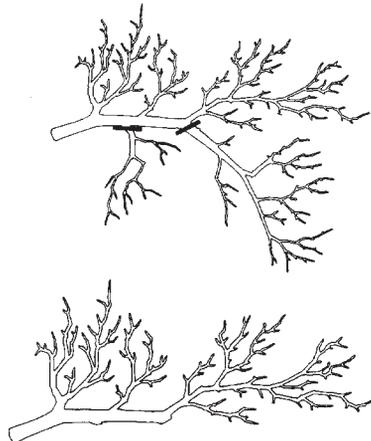
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Figure 13. As the tree matures, remove vigorous sideshoots that compete with the central leader (a), scaffolds that threaten to overtake and shade lower ones (b), and suckers (c).



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Figure 14. Remove drooping branches because they produce less fruit, are not well exposed to light, and usually shade other branches. Remove the ends of such branches back to a lateral in a near-horizontal position, and remove all branches growing downward from the bottom of larger branches.



<b>2 to 4 inches of new growth</b>	Choose a new central leader (if you headed off the old one), and remove any vigorous sideshoots that compete with it.
<b>June</b>	Hand-thin the fruit to singles spaced 6 inches apart (see “Thinning Fruit,” page 36).
<b>Mid-July</b>	<p>Tie the developing leader to the stake and remove the clothespins. Remove any vigorous sideshoots that compete with the central leader.</p> <p>Use spreaders or alternatives to spread scaffolds with narrow crotch angles.</p> <p>Use twine, heavy string, or wooden props to tie up permanent scaffolds if it appears they will not support the fruit load.</p>

### Recipe for Training Young Trees to a Central Leader: **Fourth Year**

<i>When:</i>	<i>What to do:</i>
<b>Late winter</b>	<p>Remove any vigorous sideshoots that compete with the central leader (see Figure 13). Head the leader if needed.</p> <p>Thin out overcrowded areas. Remove branches whose tips hang below horizontal, or prune them back to a new shoot that is pointing up slightly (see Figure 14). Reposition the spreaders if necessary.</p> <p>Remove any vigorous upper scaffolds so that they do not overtake and shade the lower ones (see Figure 13). If the diameter of any of those branches is greater than half the diameter of the central leader where they meet, remove them completely with a thinning cut.</p>
<b>Budbreak to Mid-July</b>	Spread the scaffolds where necessary.
<b>June</b>	Hand-thin the fruit to singles spaced 6 inches apart (see “Thinning Fruit,” page 36).
<b>July</b>	Use twine, heavy string, or wooden props to tie up the permanent scaffolds if it appears they will not support the fruit load.

## Pruning Bearing Apple and Pear Trees

For apples and pears, a cone-shaped tree—with longer scaffold branches at the bottom of the tree and shorter ones at the top—intercepts light most efficiently. While this shape is easy to maintain in a young tree, it is difficult to preserve as the tree ages. The top of the tree, which has the most vigorous growth, tends to spread and shade the lower limbs.

When pruning mature trees, avoid small cuts, which can encourage too much vigorous vegetative growth. Making one or two large cuts, either removing an entire branch or cutting a major portion back to a vigorous fruitful lateral, is more effective. For fruit-bearing central leader trees, follow these guidelines:

- First, remove diseased, broken, or dead branches completely.
- Make big strategic cuts first, especially high in the trees. Thinning cuts (removing entire branches at their bases) are almost always preferable to heading cuts, which can encourage unwanted vegetative growth just below them.
- If two limbs overshadow, cross, entangle, or otherwise compete with each other for the same space, don't head both of them. Instead, remove one of them completely with a thinning cut at its base.
- To reduce overall tree height, cut off the top just above a weaker side limb or sucker. Often, the top of the tree will take care of itself, with upright suckers bending into more horizontal positions under the weight of fruit or even breaking off, limiting the height of the tree.
- Remove any limb above the bottom tier of scaffolds that is more than half the diameter of the branch that it originates from.
- Remove suckers or water sprouts (vigorous vertical limbs growing straight up from nearly horizontal branches) that are larger than 1/4 inch in diameter.
- Use a pruning saw or bypass blade (not anvil-type) pruning shears. Make cuts close to the branch collar at the base of the limb. Under cut large limbs first to avoid tearing the bark, which can damage the tree.
- Stand back from the tree frequently and check your work. Try to develop a clear mental image of what you want the tree to look like.

While the central leader system works with pears as well as apples, pears have some differences. They tend to grow more vertically, but branches with narrow crotch angles are less likely to split. Branches that spread more than 45 degrees tend to produce water sprouts from their bases. Because of the risk that fire blight may girdle the leader, pear trees are sometimes pruned to multiple leaders; if one dies it won't take the whole tree.

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**Step back and picture what you want the tree to look like.**

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## Rejuvenating Old Apple and Pear Trees

Many old, neglected apple trees can be rejuvenated by proper pruning during the dormant season. Many will have grown too tall to manage and harvest conveniently. Most will have too much old wood and not enough young, productive fruiting wood. Here are some suggestions for bringing them back into production, but keep in mind that it usually takes several years of corrective pruning. Don't try to make up for years of neglect in a single season.

- Remove dead branches, rotten and diseased wood, and water sprouts (suckers).
- Next, make big thinning cuts to the top and middle of the tree, removing whole limbs from their point of origin. Reduce the height of the tree by as much as a third, cutting just above a large side branch. Remove water sprouts that grow just below those cuts in July and August to keep them from shading the center of the tree.
- Remove shoots that are growing toward the ground.
- Make thinning cuts to remove limbs that cross or compete with each other.
- Leave some well-positioned vigorous shoots, which will eventually replace older limbs and laterals.

## Pruning and Training Cherry and Plum Trees

Unlike apple and pear trees, the best time to prune cherry and plum trees is late spring, after the trees have flowered. At this point, you can see how pruning will affect your crop.

You can train young cherry and plum trees as central leader trees, as described for apples and pears (see the steps beginning on page 28). Or you can train them as open-center (vase-shaped) trees (see "Pruning and Training Peaches," next page). Perhaps the best way is somewhere in between, as a modified central leader tree.

Weak unions between the rootstock and the scion cultivar are common with most cultivars of sweet cherry. To prevent damage, stake young trees using an elastic tie to prevent canker formation where the tie contacts the tree.

Training a tree as a modified central leader is similar to training a central leader tree, except that after you've selected four or five good scaffold limbs with wide crotch angles where they meet the leader, you top the central leader.

After this initial training, cherry and plum trees need few corrective cuts during the next five or six years or until the trees begin bearing. During this time, limit pruning to removing water sprouts and limbs that cross and rub

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**After initial training, cherry and plum trees require less pruning than other fruit trees.**

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against a permanent branch. Also, prune to prevent the development of narrow crotches that could split and ruin the shape of the tree when it bears a crop. A narrow crotch is a fork where two branches of equal length and diameter arise at a common point. Generally, you can simply remove one of the branches of a narrow crotch.

Cherry and plum trees that have had proper corrective pruning from the beginning need little if any pruning during their early bearing years. But overpruning during the formative years delays bearing.

Once mature, cherry and plum trees require the least pruning of all fruit trees. They bear fruit on spurs in two- to six-year-old wood, so prune to maintain bearing wood in these age classes. When pruning, also observe the following:

- Remove dead, broken, or diseased branches.
- To keep the tree from growing too tall, head back leaders to a strong lateral branch.
- Thin out branches to provide good light exposure to remaining limbs.

## Pruning and Training Peaches

Like cherry and plum trees, peach trees are best pruned in the late spring. They are unique among major tree fruits in that they bear most of their fruit on lateral buds in the lower half of vigorous one-year-old shoots. To maintain a constant flush of this growth for the next crop, prune peaches hard every year.

Peach and nectarine trees are very susceptible to perennial canker, which is caused by a fungus that infects open wounds when temperatures are cool. Don't prune them unless the weather is expected to be dry with temperatures over 60 degrees F for two to three days after pruning. Delaying pruning until flowering helps reduce the spread of this organism, and you can see how your pruning will reduce the crop.

Because of the way they grow, you should not train peaches as central leader or modified central leader trees. They are best trained as open-center trees, selecting three to five scaffold limbs that give the tree a vase-like shape.

One-year-old nursery peach trees are usually 3 to 6 feet tall with some lateral branching. At planting

- head the leader back to about 8 inches above the first side shoot.
- prune off any side shoots below 18 inches from the ground.
- prune off all side shoots that have crotch angles of less than 45 degrees.

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**Unlike most other tree fruits, peaches bear on one-year-old wood.**

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- head back all remaining shoots so that each has just two buds remaining.

If you don't have at least three to five branches with wide crotch angles, leave some narrow ones and spread them using clothespins, as described for apple trees. If you have more than five with wide angles, wait until early June, after they've grown a few inches, and select three to five of the strongest. They should be spaced evenly around the trunk with about 4 to 6 inches between them.

Later that summer, around late July, remove any additional shoots that started growing closer than 18 inches from the ground or that have narrow crotch angles (less than 45 degrees).

In late spring of the second year, remove the central leader just above the first wide-angled side limb to create an open-centered tree. Keep only four to six wide-angled scaffold limbs on the main trunk, and remove other limbs. Lightly head back the scaffolds to outward-growing laterals, and thin out shoots growing from the scaffolds that are less than pencil-sized.

The purpose of heading back scaffolds is to continue the development of an open-center tree that will be low, strong, and spreading for convenient thinning, pest control, and harvesting. Leave some small shoots that cross in the center because they will bear the first fruits.

Pruning during the third and fourth years should be limited to removing decidedly crowded limbs or low-hanging, shaded branches in the center of the tree. Also, head back main scaffold limbs to laterals if they are too high or out of balance with the others. Fruit will be produced on one-year-old branches, which should be spread evenly throughout the tree.

As trees reach full size, severe pruning maintains and renews vigorous fruiting wood throughout the tree. Terminal shoot growth of 12 to 18 inches is desirable. If the shoot growth is weak or the lower limbs become too long, cut the branches back into two- or three-year-old wood. Make the cuts to an outward-growing side branch.

After heading back all of the main branches, thin and space the fruiting shoots so they are about 6 to 8 inches apart. This spacing provides good light exposure to the fruiting shoot and allows development of new shoots for next year's crop. The fruiting shoots should not be headed back, but the fruits should be thinned because fruit set generally is excessive.

## Thinning Fruit

Young trees seldom set so much fruit that they need to be thinned. But once apple, pear, peach, and plum trees start bearing well, thinning produces larger, better-colored, and higher-quality fruit. If you don't thin fruit, trees

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### Train peaches to vase-shaped trees.

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may expend so much energy ripening the crop that they will not rebloom the following year.

The proper time to thin fruit is about two to three weeks after bloom, after early fruit drop when fruits are about the size of a quarter. The first step is to remove small and insect- or disease-injured fruit. Then remove all but one fruit where there are several in a single cluster, leaving the largest of the fruit.

Then with peaches remove additional fruit so that the remaining ones are spaced 4 to 8 inches apart (early cultivars require wider spacing). Thin plums so the fruits are 4 inches apart (cherries do not require thinning).

Fruit thinning is especially important with apples. Excessive fruit set reduces flower bud formation for the next season and results in alternate bearing—a heavy crop of small-sized fruit one year and little or no crop the next. Thinning within the month after bloom helps prevent alternate bearing. Space apples 4 to 6 inches apart so that one apple occupies every second or third spur. Thinning actually requires very little time, and the improvement in size, quality, and repeat bloom is worth the effort.

Be cautious about postbloom use of the insecticide carbaryl (Sevin), which also acts as a fruit thinner.

## Diseases and Insects

Your ability to grow terrific tree fruits depends in large part on your ability to control pests and diseases. You will face many of the same challenges as commercial growers, but it's unlikely that you will have the same powerful pest control tools that they have. For example, home fruit growers typically use hand-operated sprayers or those run by small electric or gasoline motors. Compared with commercial-sized sprayers, these machines have a smaller capacity and lower pressure and require more energy to do an effective spraying job.

This makes it especially important for you to follow cultural practices that keep trees healthy and minimize disease and pest buildup. If you plan to spray your trees, it's easier to get good coverage with home-scale equipment if you plant dwarf or semidwarf cultivars.

In addition to doing a good job of site preparation, choosing a location with good air drainage, and planting disease-resistant cultivars, there are several easy steps you can take to help prevent pest and disease problems:

- Maintain a complex ecosystem around your plantings that provides habitat for beneficial insects.
- Prune out dead twigs and branches during the dormant season.

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**Without the pest control tools of commercial growers, you need to follow best cultural practices to keep trees healthy.**

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## Dormant oil sprays can control mites, scabs, and pear psylla.

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- Rake up and destroy leaves and diseased fruit in the fall, after harvest.
- Familiarize yourself with disease and insect life cycles so that you can correctly time control measures.
- If sprays are necessary, always use pesticides according to the label.

One particularly effective treatment that home fruit growers should consider is the use of dormant oil spray. If applied when up to 1/2 inch of green is showing on the buds, it can effectively control mites, scales, and pear psylla.

Home gardeners should be aware of the following major diseases and insects of tree fruits. For a more complete description of pests and control methods, see the Cornell Cooperative Extension publication *Pest Management around the Home: Part I, Cultural Methods*. For ordering information, see: “Related Cornell Cooperative Extension Publications,” page 103.

**Apple scab.** This fungal disease is easily recognized by the olive-green to black spots it causes on fruit and foliage. Severely infected leaves are dwarfed, cupped, or curled and drop prematurely. Fruits infected during the early season may be severely deformed or may drop by early June. The scab organism survives the winter in dead apple leaves on the ground. Primary infections occur during rainy periods from the time green tissue appears in the spring until the end of June. Many secondary spores are produced within the primary lesions. These are washed from the lesions by rain and are spread to other susceptible tissues, where, under appropriate environmental conditions, they cause secondary infections.

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## Choose scab-resistant apple cultivars.

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Good scab control early in the season makes control in late summer easier. Home gardeners should seriously consider selecting cultivars that are resistant to scab. McIntosh and Cortland are likely to become infected with apple scab in home orchards. Freedom, Liberty, Prima, Jonafree, GoldRush, and MacFree are very resistant.

**Powdery mildew.** This fungal disease overwinters in dormant buds. Leaves that emerge from infected buds are covered by a white, powdery fungal growth. Secondary spread of the disease to other plant tissues occurs from the time the buds open until the terminal buds form in late June. If powdery mildew is a serious disease in your area every year, do not plant the susceptible cultivars Idared, Monroe, Rome Beauty, Jonathan, Paulared, Gingergold, or Cortland.

**Fire blight.** This bacterial disease causes severe damage to pear and apple trees during warm, rainy spring weather. Branches blacken and droop rapidly as if scorched by fire. Fire blight bacteria overwinter between live bark tissue and the tissue killed the previous season. In the spring, the bacteria

are spread by windblown rain, insects, or pruning tools. The disease usually affects blossoms but also can directly infect succulent shoots during late spring and summer.

To avoid fire blight, do not grow trees on poorly drained, highly acidic, or overfertilized soils. Cut off infected twigs and branches in late winter, making the cuts at least 6 inches below the dead area. If you are pruning during the summer, disinfect pruning tools with denatured alcohol or a 10 percent bleach solution between each cut. Be sure to clean and oil pruning tools after use. All pear cultivars except Seckel are very susceptible to fire blight. Susceptible apple cultivars are Idared, Jonagold, Jonathan, Lodi, Crispin (Mutsu), Greening, Paulared, Rome, Sir Prize, Spigold, Twenty Ounce, York, and Gala.

**Brown rot.** This fungus attacks peaches, plums, cherries, and nectarines. This disease is easy to diagnose by the unsightly brown rot that forms on the fruit, rendering it inedible. Spores are released during rainy periods in the spring and summer, infecting the blossoms and fruit. The fungus overwinters in infected twigs or fruits that remain on the tree or nearby on the ground. Remove and destroy diseased fruits to help reduce infection.

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**Remove and destroy diseased fruit to reduce brown rot.**

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**Black knot.** This fungus infects plum and cherry trees, causing rough, black enlargements on the twigs. The knots are often two to four times the diameter of the twigs and up to 8 inches long. Prune black knot–infected twigs at least 8 inches below the knot in winter or early spring and destroy them. Do not allow this disease to build up, or severe pruning will be necessary.

**Cytospora canker.** This fungal disease is very devastating to peach trees and also infects apricot, plum, nectarine, and cherry trees. Cytospora canker can girdle scaffold branches, reducing yields or even killing trees. The disease first appears in April or early May as an oozing, light amber to dark brown gum near the point of infection. Beneath the gum, the inner bark begins to collapse, leaving a depressed area on the surface. By the second year, this area develops into an elongated or elliptically shaped canker. Although the bark dries out, it usually remains intact during the first year. In later years, the bark becomes broken, malformed, and covered with a black fungal overgrowth.

To avoid cytospora canker, plant cold-hardy cultivars, fertilize only in the early spring, and follow proper pruning procedures. Do not apply excessive nitrogen, and do a good job of controlling other stressors, especially brown rot and insects such as the peach tree borer and the lesser peach tree borer. Trees already stressed are most likely to suffer from cytospora infection.

**Cedar-apple rust.** This fungus can defoliate apple trees and blemish fruit. It requires two hosts to complete its life cycle—an apple tree and an eastern red cedar tree (*Juniperus virginiana*). It survives the winter in spherical galls

on cedar trees. Spring rains promote the growth of hornlike structures that extrude from the galls. These structures release spores that travel by wind to apple trees and cause orange pustules on the upper surfaces of the leaves. One to two months after the appearance of these pustules, the fungal rust produces other structures on the undersides of the leaves or on the fruit. Fruit becomes infected during moist conditions when the temperature ranges between 46 degrees F and 75 degrees F. Spores produced on the leaves and fruit are released into the air during the dry conditions of summer and infect the leaves of cedar trees, completing the cycle.

Control strategies include applying fungicides, removing nearby red cedars, and using resistant cultivars. Very resistant apple cultivars include Delicious, Liberty, Nova Easygro, Novamac, and Tydeman. Susceptible cultivars are Golden Delicious, Jonathan, Lodi, Prima, Rome, Twenty Ounce, and York.

**Apple maggot.** This is the most destructive of all the insects that attack apples. The adult flies are slightly smaller than houseflies. They emerge from the soil between mid-June and mid-August and feed for about a week. Then the females lay eggs under the skins of apples. After hatching, the maggots bore through the fruit. In heavy infestations, many larvae can be found in a single fruit. Picking up and destroying fallen fruit once a week from early August through harvest reduces the potential for maggot infestations the following year. Apple maggot emergence and activity can be monitored by hanging red ball sticky traps.

**Cherry fruit fly.** This pest is closely related to the apple maggot and has a similar life cycle, but it attacks only sweet and tart cherries. Adults emerge for about a month beginning in early June. Use red ball sticky traps to monitor adult activity.

**Plum curculio.** This small, 1/4-inch-long weevil attacks all tree fruits. Adults overwinter in hedgerows or other sheltered areas and emerge in the spring when newly formed fruit is exposed—around petal fall in apples and shuck split in stone fruits. The most serious damage occurs when females deposit eggs in the fruit, causing small crescent-shaped scars. The larvae bore to the center of the fruit to feed. Infested fruits often drop to the ground in June. Picking up and destroying all drops in early June helps reduce developing larvae. If your planting is near woodland or other areas that provide good shelter for overwintering adults, infestations can destroy the entire crop. Chemical control measures are usually directed at the adults during the three weeks after bloom.

**Apple tree borers.** These pests are often found in home fruit plantings, especially in the trunks of young, unsprayed trees. Roundheaded apple tree borers are a particular problem. Adults feed on the fruit, bark, and foliage, but larvae cause the most significant damage. Females make a longitudinal slit in the bark of trunks and insert an egg. When the egg hatches, the larva bores into the sapwood and moves along the trunk, developing and enlarg-

ing tunnels. These tunnels weaken the tree structurally, cut off the flow of sap, and create a wound site that predisposes the tree to diseases and other insects. The downy woodpecker is the only known natural enemy of the roundheaded apple tree borer.

**Pear psylla.** This is the most common insect pest of pear trees. Adults resemble tiny cicadas. The nymphs secrete a sticky exudate called honeydew, which supports the growth of an unsightly black, sooty mold that soils leaves and fruit. If not controlled, psylla can cause early defoliation and crop loss.

**Peach tree borers.** These pests feed on the inner bark of peach trees and other stone fruits, girdling the conductive tissue. The two species, the peach tree borer and the lesser peach tree borer, are both clear-winged moths that lay eggs on the bark of the trees. The peach tree borer deposits its eggs at the base of the trunk and can kill the entire tree. The lesser peach tree borer attacks individual branches. Look for a gummy exudate mixed with a sawdust-like material excreted from small holes in the trunk. Gum secretions also can be caused by other injuries to the tree. To ensure positive identification of borers, cut away the bark and look for the larvae in their burrows. Avoid borers by painting tree trunks with a mixture of one part white latex paint and one part water.

**San Jose scale.** This insect pest infests apple, pear, plum, sweet cherry, apricot, peach, and nectarine trees. It sucks sap from all parts of the tree, including the fruit, causing the tree to decline in vigor. Badly infested areas on the bark appear ashy gray with encrusted scales. Fruit spotting can occur, particularly on apples. Females are about the size and shape of a pinhead and do not look like insects. To control scale insects, prune infested branches and suckers.

**Codling moth.** The larva of this moth is a worm found commonly in home-grown apples. As an adult, this iridescent gray moth deposits eggs on leaves and fruit. The eggs hatch about 6 to 20 days later, usually after the petals have fallen. Although other generations may occur during the season, it is most important to control this first generation, especially the adults before they lay eggs and the larvae that hatch from eggs deposited on fruit and foliage. If you spray trees for plum curculio and apple maggot, codling moths probably won't be a problem.

**Aphids.** These tiny insects—often called plant lice because of their small size and large populations—cause apple leaves to twist and roll. Two species are destructive—the rosy apple aphid and the green apple aphid. The rosy apple aphid damages fruit early and causes the fruit of certain apple cultivars to become dwarfed and deformed. Both aphids secrete honeydew, and sooty spots may develop on fruit and foliage. Green apple aphids should not require chemical control in home orchards.

**Mites.** While technically not insects, these tiny pests can bronze or discolor the leaves of many fruit trees. The European red mite and the two-spotted

mite are common in the Northeast and thrive in hot, dry weather. Both reside on the undersides of leaves and cause damage by sucking plant juices. Natural enemies usually keep populations low.

## Harvest

For best quality and flavor, allow fruit to ripen on the tree. The best way to tell when they are ripe is to taste them. When they are sweet and full-flavored, they are ready to pick.

If you plan to store apples or pears, however, you should harvest them before they are fully ripe. In general, early-ripening apple and pear cultivars do not keep well. Their fruit should be eaten or preserved as soon as possible.

Always harvest with care. Handle fruit gently to avoid bruising it. For long-term storage, keep fruit in a refrigerated area or cold cellar. Store only fruit that is in excellent condition and of the highest quality. Do not store diseased or damaged fruit.