GROWING TREE FRUITS IN THE HOME ORCHARD

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
COLLEGE OF AGRICULTURE
COOPERATIVE EXTENSION SERVICE
CIRCULAR 1013
GROWING TREE FRUITS IN THE HOME ORCHARD

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Issued in furtherance of Cooperative Extension Work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. JOHN B. CLAAR, Director, Cooperative Extension Service, University of Illinois at Urbana-Champaign.
Growing tree fruits in the home orchard can be an interesting and satisfying hobby for home gardeners. Fruit trees do, however, require considerable care. Thus people who are not willing or able to devote some time to their home orchard probably will be disappointed in their harvests. When fruit trees are carefully selected, properly located, and well managed, they can enhance the home landscape and provide high-quality, tree-ripened fruits.

Fruit trees differ considerably in the amount of care required because the severity of insect and disease attacks and the length of time from bloom to harvest vary among types of fruits and among varieties. Generally speaking, the flowers and fruits must be protected from insects and diseases by sprays applied from blossom time until harvest. Other sprays may be required to protect the leaves, trunk, and branches.

The length of the spray schedule should be considered in the selection of fruits and varieties. Cherries, for example, have the shortest spray schedule. The spray schedule for Stark Earliest apples which ripen in July is two months shorter than the spray schedule for Golden Delicious ripening in September and October. A general rating of the length of spray schedules is given below. Spray schedules are given in Circular 1001, Home Orchard Pest Control.

**Length of Spray Schedule**

<table>
<thead>
<tr>
<th>Order</th>
<th>Fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortest</td>
<td>Cherries, Early peaches, apricots, Later peaches, summer apples, Plums, pears</td>
</tr>
<tr>
<td>Longest</td>
<td>Fall and winter apples</td>
</tr>
</tbody>
</table>

In apple-maggot-free areas, an abbreviated schedule for pears may be used with some success. In Illinois, the apple-maggot area runs from the Wisconsin border south to a line from Danville to Quincy.

**SIZE OF PLANTING**

In addition to the amount of care required, other factors should be considered in choosing the size of the fruit planting. These are available space, fruit production per tree, pollination requirements, space required per tree, spraying equipment, time from planting until bearing, and average useful life of the tree.
Small to moderate plantings (two to six trees) are suggested for the beginner. More trees can be added later, if desired. More usable fruits will be harvested from a small, well-cared-for orchard than from a large, poorly cared-for planting.

Table 1 gives information on production, tree life, and start of bearing of the various fruits.

**SITES FOR THE HOME ORCHARD**

The choice of location for fruit trees is necessarily limited on the average city or suburban lot. Sometimes it is simply a question of whether any location on the lot is satisfactory or can be made satisfactory with modification. The farm frequently offers more latitude in choice of location, but air drainage is usually more critical in rural areas.

**Soil.** Fruit trees prefer an easily worked, deep, and well-drained soil with a subsoil that permits deep rooting. Fruit trees dislike “wet feet” caused by wet soils with poor water drainage. Cherries, peaches, nectarines, and apricots are especially sensitive to wet soils. Water drainage sometimes can be improved by diverting surface water away from the area or by installing drainage tile.

Soils with a hardpan or claypan layer in the subsoil are not ideal for fruit trees. However, if surface drainage is adequate, fruit trees will grow when given special care. Trees planted above hardpans will be shallow rooted and will require watering during drouths.

**Elevation and air drainage.** Spring frosts and winter cold are both frequent hazards to fruit crops in Illinois. Cold air, being heavier than warm air, will flow to lower areas and warmer air will rise to higher areas when the wind is not blowing. Therefore high elevations should be selected for fruit plantings, especially in rural areas. In urban areas, heat from chimneys, buildings, houses, and factories frequently keeps the temperature 3° to 6° F. warmer than the temperature in surrounding rural areas.

Resistance to damage by cold temperatures varies among types of fruits. Also, varieties within a type of fruit frequently differ in their cold hardness. A general rating of sensitivity to winter cold and spring frost damage is given below.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Type of fruit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most sensitive</td>
<td>Apricots, sweet cherries</td>
</tr>
<tr>
<td>Very sensitive</td>
<td>Peaches, nectarines</td>
</tr>
<tr>
<td>Moderately sensitive</td>
<td>Plums, pears, sour cherries</td>
</tr>
<tr>
<td>Least sensitive</td>
<td>Apples</td>
</tr>
</tbody>
</table>
Table 1.—Production, Tree Life, and Start of Bearing of Various Fruit Trees

<table>
<thead>
<tr>
<th>Fruit tree</th>
<th>Years from planting to bearing</th>
<th>Useful life in years</th>
<th>Estimated production per tree at 3 years</th>
<th>6 years</th>
<th>10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dwarf</td>
<td>2 to 4</td>
<td>10 to 15</td>
<td>0 to 2 pecks</td>
<td>1 to 2</td>
<td>3 to 5</td>
</tr>
<tr>
<td>Semidwarf</td>
<td>3 to 4</td>
<td>15 to 20</td>
<td>0 to 2 pecks</td>
<td>1 to 3</td>
<td>4 to 10</td>
</tr>
<tr>
<td>Spur type</td>
<td>3 to 4</td>
<td>15 to 20</td>
<td>0 to 2 pecks</td>
<td>1 to 3</td>
<td>4 to 10</td>
</tr>
<tr>
<td>Standard</td>
<td>4 to 6</td>
<td>15 to 20</td>
<td>none</td>
<td>0 to 2</td>
<td>5 to 15</td>
</tr>
<tr>
<td>Apricot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>3 to 5</td>
<td>15 to 20</td>
<td>0 to 1 peck</td>
<td>1 to 2</td>
<td>2 to 4</td>
</tr>
<tr>
<td>Nectarine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>2 to 3</td>
<td>10 to 15</td>
<td>1 to 2 pecks</td>
<td>1 to 3</td>
<td>3 to 5</td>
</tr>
<tr>
<td>Peach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>2 to 3</td>
<td>10 to 15</td>
<td>1 to 2 pecks</td>
<td>1 to 3</td>
<td>3 to 5</td>
</tr>
<tr>
<td>Pear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dwarf</td>
<td>3 to 4</td>
<td>10 to 15</td>
<td>0 to 2 pecks</td>
<td>1 to 2</td>
<td>1 to 3</td>
</tr>
<tr>
<td>Plum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>3 to 5</td>
<td>15 to 20</td>
<td>0 to 2 pecks</td>
<td>1 to 2</td>
<td>3 to 5</td>
</tr>
<tr>
<td>Sour cherries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meteor, North Star, and Suda Hardy</td>
<td>2 to 3</td>
<td>10 to 15</td>
<td>0 to 1 peck</td>
<td>1 to 2</td>
<td>2 to 3</td>
</tr>
<tr>
<td>Standard</td>
<td>3 to 5</td>
<td>15 to 20</td>
<td>0 to 1 peck</td>
<td>2 to 4</td>
<td>8 to 12</td>
</tr>
<tr>
<td>Sweet cherry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>4 to 7</td>
<td>15 to 20</td>
<td>none</td>
<td>0 to 3</td>
<td>8 to 16</td>
</tr>
</tbody>
</table>

Sites for the Home Orchard—5
Midwinter temperatures of 0° usually kill some fruit buds on apricot, peach, and nectarine trees. All the fruit buds on these trees are usually killed when the temperature drops to −10°. Spring frosts of 30° or below during or after bloom may kill some or all of the blossoms or young fruits on all types of fruit trees. The earlier in the spring the tree blooms, the more likely that frost damage will occur. Though individual varieties vary, the general order of bloom from earliest to latest is: apricots, sweet cherries, peaches and nectarines, pears, sour cherries and plums, and apples.

**Sunshine.** Fruit trees do best in full sun. They can tolerate partial shade, but the quality of fruits produced will be lower.

**Windbreaks.** In rural areas fruit trees need protection from spring and summer prevailing winds. In Illinois these winds are southwesterly so windbreaks should be located on the south and west sides of the fruit planting. Protection from northern winds during the winter is not needed. Windbreaks protect an area on the downwind side five times the height of the windbreak. Do not plant fruit trees closer than one windbreak height away from the windbreak.

In urban areas shade trees and buildings usually provide enough protection from the wind.

**SELECTION OF FRUITS AND VARIETIES**

Fruit trees are produced by budding or grafting a bud or shoot (scion) of a desired variety onto a root or rootstock. Various kinds of rootstocks are now being used. Some have a dwarfing effect on the scion.

**Seedling Rootstocks and Standard Trees**

Seedling rootstocks are obtained by planting seed such as Elberta peach seed or Red Delicious apple seed. The young plant growing from the seed is called a seedling. If it is used as a rootstock, it is called a seedling rootstock. To make a Red Delicious tree on a seedling rootstock, the nurseryman grafts a scion (small branch) of a Red Delicious tree onto an apple seedling root (Fig. 1).

Varieties grafted onto seedling rootstocks are called standard trees. In nursery catalogs they may be listed as standard trees, or as trees on seedling roots, or as seedling rootstocks. If no rootstock is listed and the tree is not called a dwarf or semidwarf, one can assume the trees are on seedling rootstocks.

Seedling rootstocks have little or no dwarfing effect on the scion. Standard trees are large, productive, and long lived.
The method of making a standard apple tree. A branch of a variety such as Red Delicious is grafted on a seedling rootstock. The graft union is usually below the ground line. (Fig. 1)

Dwarf and Semidwarf Trees

Reduced size in fruit trees can be obtained by genetic selection, use of dwarfing rootstocks, use of dwarfing interstocks, and by cultural practices.

Genetic selections. Some plants, such as North Star and Meteor cherries, are naturally dwarfs. In apples, bud mutations, called sports, have been selected for spur-type trees of Red Delicious, Golden Delicious, Lodi, and Winesap. These spur types form fewer lateral (side) branches and more spurs (shortened, fruit-bearing branches) than non-spur-type trees (Figs. 2 and 3). In general, they grow more slowly than non-spur types, may come into bearing earlier, and usually make a smaller tree. They may be grafted or budded on dwarfing stocks. Such a combination is sometimes called a double-dwarf. In nursery catalogs spur types have the word "spur" included in the variety name or the variety is listed as a spur type.

Dwarfing rootstocks. Dwarfing rootstocks are natural dwarfs or semidwarfs that reduce the growth of scion varieties grafted onto them (Fig. 4).

Dwarfing interstocks. Dwarfing interstocks are grafted onto seedlings or other rootstocks. The scion variety is then grafted onto the interstock. These are called double-worked trees (Fig. 5).

Cultural practices to encourage dwarfing. Early, heavy, and regular bearing is an essential part of keeping trees small. Apply enough
nitrogen fertilizer to keep trees healthy but not enough to make them grow excessively (see page 21). Prune dwarf trees regularly and moderately. Summer tip pruning discourages growth and is a valuable aid in keeping trees small.

**Dwarfing Rootstocks for Specific Fruits**

Apricots, nectarines, peaches, plums, sour cherries, and sweet cherries. Though dwarfing rootstocks are sometimes used for these fruits, the tree combinations usually are weak and short lived. Standard trees are suggested for these fruits. If dwarf sour cherry trees are desired, use the natural dwarfs Meteor, North Star, or Suda Hardy.

Pears. Quince is a satisfactory dwarfing rootstock for pears.
A non-spur apple tree on a dwarfing rootstock. This tree has fewer spurs and more lateral branching than spur-type trees. (Fig. 3)

**Apples.** Many dwarfing stocks are used for apples. They vary in the degree of dwarfishness imparted to the scion. The natural vigor of the scion also affects tree size. Red Delicious, a vigorous scion, will make a larger tree on a specific rootstock than will the moderately vigorous scions, Golden Delicious and Jonathan. Because of its vigor, Red Delicious is difficult to keep small even on the most dwarfing rootstocks.

Currently the most popular dwarfing stocks belong to the Malling (M), East Malling (EM), and Malling-Merton (MM) groups. With proper care they can be kept within the following height ranges.

<table>
<thead>
<tr>
<th>Rootstock</th>
<th>Height range</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM IX, Clark</td>
<td>8 to 12 feet</td>
</tr>
<tr>
<td>MM 106, EM VII, M 26</td>
<td>10 to 14 feet</td>
</tr>
<tr>
<td>MM 111</td>
<td>14 to 18 feet</td>
</tr>
<tr>
<td>Spur types on seedling roots</td>
<td>10 to 14 feet</td>
</tr>
</tbody>
</table>
An apple tree on a dwarfing rootstock. (Fig. 4)

An apple tree with a dwarfing interstock. (Fig. 5)
EM IX and EM VII tend to be weak-rooted and need support to prevent blowing over during windstorms. Clark interstock dwarfs also need support. Guy wires may be used to brace the trunk, but are a nuisance when mowing. A single post placed on the southwest side of the tree usually is adequate. Use a 3- or 4-inch × 7-foot post. Dig the posthole about 1 foot from the trunk and make it 3 feet deep. Attach the tree to the post with wire. Use a short piece of garden hose to protect the trunk from the wire (Fig. 6).

**Fruitfulness and Pollination**

Some tree-fruit varieties are self-fruitful. A tree of a self-fruitful variety will set fruits when pollinated by pollen from its own flowers or by pollen from another tree of the same variety. In either case such pollination is called self-pollination. Self-fruitful trees may be planted alone or in solid blocks of one variety. Most peach, nectarine, and sour cherry varieties are self-fruitful.

Other fruit-tree varieties have various degrees of self-unfruitfulness varying from partially self-unfruitful to completely self-unfruitful. A self-unfruitful tree will not set a normal crop of fruits when pollinated by its own pollen or by pollen of another tree of the same variety. Self-unfruitful trees require pollination by pollen from a tree of a different variety. For example, a Jonathan apple tree usually will not set a normal crop of apples unless the flowers are pollinated by pollen from another apple variety such as Lodi, Red Delicious, or Golden Delicious. A tree of a self-unfruitful variety should have a pollinator tree planted within 300 feet.

Cross-unfruitfulness may occur in tree fruits. In some cases, pollen from trees of one variety will not cause fruit-set by flowers of another variety. For example, European-type plums will not cross-pollinate most Japanese-type plums. Winesap apple pollen is sterile and will not pollinate Winesap or any other variety.
In planning a fruit planting, pollination requirements must be considered if normal crops are to be produced. Pollination requirements are given in the list of suggested varieties for Illinois home orchards.

Honey bees are the most important means of transferring pollen between blossoms. Solitary bees, bumble bees, some types of flies, and other insects also aid in pollen transfer.

Fortunately for the home gardener, sufficient numbers of bees are usually present to accomplish pollen transfer.

Protect bees from injury by insecticides. Do not apply insecticide sprays during bloom. Fungicides such as captan, zineb, and sulfur can be applied during bloom with little or no adverse effect on bees.

Suggested Varieties for Illinois Home Orchards

Fruit varieties were selected on the basis of general availability from nurseries as well as on their performance in Illinois. Hundreds of varieties have been named and released for sale. Some of those not included here will also perform satisfactorily in Illinois.

**Apples.** All Illinois areas. Use dwarf, semidwarf, or spur-type trees.

- Summer eating and cooking: Stark Earliest, Quinte, Beacon.
- Fall eating: Red Delicious and its spur-type sports.
- Fall eating and cooking: Barry, Jonathan, Grimes Golden, Golden Delicious and its spur-type sports.
- Winter eating and cooking: Winesap and its spur-type sports, Turley (a Winesap type), Ruby, Gallia Beauty.

Add McIntosh to fall eating group for the northern one-fourth of Illinois.

Plant any two of these varieties, except Winesap and Turley, for cross-pollination. The pollen of Winesap and Turley is sterile. Plant any two of the other varieties with Winesap or Turley.

**Pears.** All Illinois areas. Use dwarf trees.

Maxine or Starking Delicious, Seckel, Moonglow.

Seckel and Moonglow will cross-pollinate and both varieties will cross-pollinate with Maxine or Starking Delicious. Maxine and Starking Delicious do not cross-pollinate.

**Peaches, freestone.** Use standard trees. All varieties listed are self-fruitful.

- Northern Illinois: None recommended.
- Central Illinois: Listed in order of ripening: Yellow-fleshed varieties
— Colora, Reliance, Madison. White-fleshed variety — Belle of Georgia. Varieties for southern Illinois may be planted in favorable locations.

Southern Illinois: Listed in order of ripening: Yellow-fleshed varieties — Sunhaven or Harbelle, Redhaven or Commanche, Golden Jubilee, Halehaven or Glohaven, Madison or Cresthaven. White-fleshed varieties — Early White Giant, Belle of Georgia.

**Nectarines.** Use standard trees. All varieties listed are self-fruitful.

Northern and central Illinois: None recommended except in favorable locations in central Illinois where the varieties listed for southern Illinois may be planted.


**Apricots.** Northern and central Illinois: None recommended. Even in southern Illinois the blossoms and young fruits are frequently killed by frost because apricots bloom early in the spring.

Southern Illinois: Earli-Orange, Superb, Stella. These varieties are normally self-fruitful but cross-pollination may help set crops.

**Plums.** Use standard trees.

European types (all Illinois areas): Stanley, Bluefre, Green Gage (Reine Claude), Damson (Shropshire). Plant any two of these European types for cross-pollination for best production.

Japanese types and hybrids:

Northern Illinois: None recommended.

Central and southern Illinois: Ozark Premier, Methley, Santa Rosa, Redheart, Star king Delicious. Plant any two of these Japanese types and hybrids for cross-pollination. European types will not pollinate Japanese types.

**Sour Cherries.** All Illinois areas.

Montmorency (use standard trees).

If dwarf trees are desired, the natural dwarf varieties Meteor, Suda Hardy, and North Star are suggested. All four sour cherry varieties are self-fruitful.

**Sweet Cherries.** Northern and central Illinois: none recommended. In southern Illinois occasional crops can be expected.

Southern Illinois: Yellow Glass or Gold Sweet, Van, Windsor, Black Tartarian. Plant any two of these varieties for cross-pollination.
Sources of Varieties

Many of these varieties may be carried by your local nurseryman. If your local nurseryman does not carry them, he can obtain most of them from wholesale nurseries.

Each of the fruit varieties listed may also be obtained from one or more of the following mail-order nursery firms. Inclusion in this list does not imply recommendation by the University of Illinois. Exclusion does not imply inferior plant material.

Bountiful Ridge Nursery, Princess Anne, Md. 21853
Clyde Nursery, Clyde, Ohio 43410
Cumberland Valley Nursery, McMinnville, Tenn. 37110
Emlong Nursery, Stevensville, Mich. 49127
Haley Nursery, Smithville, Tenn. 37166
Hilltop Nursery, Hartford, Mich. 49057
Inter-State Nursery, Hamburg, Iowa 51640
Kelly Bros. Nursery, Dansville, N.Y. 14437
Neosho Nursery, Neosho, Mo. 64850
New York State Fruit Testing Coop. Assoc., Geneva, N.Y. 14456
Stark Bros. Nursery, Louisiana, Mo. 63353
Steelman Nursery, Princeton, N.J. 08540
Waynesboro Nursery, Waynesboro, Va. 22980

Selecting Nursery Stock

Medium-sized nursery trees are most satisfactory for apple, pear, cherry, and plum trees. Large-sized trees are more difficult to train, require more severe pruning at planting, and are slower to recuperate from the shock of transplanting than are medium-sized trees.

Small-sized peach and nectarine nursery trees are preferred. These trees are trained to the open-center-type form in which the central leader is removed. Small trees are easier to train and they start bearing as early as larger trees. The preferred size range of nursery trees is as follows: apples, cherries, plums, and pears—3- to 6-foot height with trunk caliper % to 3/8 inch; peaches, nectarines, and apricots—2- to 4-foot height with trunk caliper 5/16 to 7/16 inch.

PLANTING

Spring planting is preferred in all Illinois areas, but late fall planting is satisfactory for southern Illinois. The ideal time for spring planting is just after the soil thaws and before plant growth starts. This is in March for southern Illinois and in April for northern Illinois.
Tree Spacing

Soil, climate, cultural practices, variety, and rootstock all should be considered in choosing spacing distances. Suggested spacings are given below. The closer spacings will require more careful pruning and management practices to keep trees within the allotted spaces. Spacings are within row and between row spacings. For example, with a $10 \times 16$ spacing the trees are planted 10 feet apart in the row with the rows 16 feet apart.

<table>
<thead>
<tr>
<th>Fruit or variety</th>
<th>Rootstock</th>
<th>Spacing in feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple (non-spur)</td>
<td>M IX, Clark</td>
<td>$10 \times 16$ to $14 \times 20$</td>
</tr>
<tr>
<td>Apple (non-spur)</td>
<td>M 26, M VII</td>
<td>$14 \times 20$ to $17 \times 22$</td>
</tr>
<tr>
<td>Apple (non-spur)</td>
<td>MM 106, MM 111</td>
<td>$16 \times 22$ to $20 \times 26$</td>
</tr>
<tr>
<td>Apple (non-spur)</td>
<td>Seedling (standard)</td>
<td>$20 \times 30$ to $25 \times 35$</td>
</tr>
<tr>
<td>Apple (spur)</td>
<td>Seedling (standard)</td>
<td>$14 \times 20$ to $18 \times 24$</td>
</tr>
<tr>
<td>Apple (spur)</td>
<td>Dwarfing stock</td>
<td>$10 \times 16$ to $14 \times 20$</td>
</tr>
</tbody>
</table>

(Use the wider spacings for Red Delicious and Winesap. These two varieties are vigorous growers.)

Peach, apricot, nectarine, and plum

Pear

Sour cherry
- Montmorency
- Meteor
- North Star
- Suda Hardy

Sweet cherry

How to Plant

Fruit trees are usually sold with bare roots and the roots must be kept damp at all times to prevent them from dying. If trees are purchased from a local nursery, plant them immediately. If they are obtained from a mail-order firm, open the package as soon as it is received. Place the trees in a tub of water, completely immersing the roots, but for no longer than 2 days.

If planting must be delayed more than 2 days, the trees should be heeled in. Dig a shallow trench in a shaded area. Open the bundle, separate the trees, and spread out the roots. Place the trees so their roots are in the trench and the trunk makes a 45-degree angle with
the ground. Cover the roots with loose soil and work it around the roots to remove air pockets. Add more soil, firm by trampling, and water if dry (Fig. 7).

To plant in the permanent location, dig a hole large enough to accommodate the roots extended in their natural position. Cut off any broken, damaged, dead, or diseased root parts. Excessively long roots should be shortened. Shortening a root is preferable to bending it around in the hole.

For shipment, tree roots frequently are kept in a vertical position. They should be spread to their normal position in plantings (Fig. 8).

Place the tree in the hole and spread out the roots. Hold the tree with one hand and work loose soil around the roots with the other hand.

A tree heeled-in in a shady area to keep it in good condition until it can be planted. (Fig. 7)

Tree roots are tied straight down for shipping as shown on the left. Spread them out to their natural position as shown on the right before planting. (Fig. 8)
Apply fertilizer in a 1-foot-wide band 1 foot from the trunk. (Fig. 9)

Firm the soil occasionally as it is being put around the roots to remove air pockets. Fill the hole to ground level, then tramp firmly. Water the tree, then fill in the remainder of the loose soil without firming.

Apply \( \frac{1}{2} \) pound of mixed fertilizer (such as 10-10-10) to each tree. Spread the fertilizer in a circular band from 1 to 2 feet from the trunk (Fig. 9).

Trees, except apple trees on dwarfing rootstocks, should be planted so that they are about 2 inches deeper in the soil than they were growing in the nursery row. Apple trees grafted high on dwarfing rootstocks should be planted 7 to 10 inches deeper than they were growing in the nursery row. However, do not place the graft union below ground level. The soil line on the trunk can be determined by the difference in appearance of the bark.

Pruning the top at planting time is necessary to balance the root loss and to start the training process. See the section on pruning (page 38) for suggestions on pruning at planting time.

**CARE OF YOUNG TREES**

**Prevent Competition from Grass and Weeds**

Young fruit trees have difficulty competing with grass and weeds for water and nutrients. An area extending 3 feet in all directions from the trunk of the tree should be kept cultivated or mulched in order to eliminate grass and weeds. Fertilizing will not eliminate the need for cultivating or mulching.
Mulch culture offers practical advantages for the home fruit grower. The mulch eliminates some cultivation, conserves moisture, reduces temperature fluctuation in the soil, and adds organic matter. Hay, straw, sawdust, wood shavings, and corncobs are good mulch materials. The mulch should extend as far as the limbs extend and should be 6 to 8 inches deep.

Mulch materials tie up nitrogen in the soil. Fertilization rates should be increased 50 percent when using mulch culture (see page 21).

Mulches may harbor mice that damage fruit trees by eating the bark at or just below the ground line. In the early fall, pull the mulch material away from the trunk and bait or trap the mice. Continue mouse control throughout the fall and winter. The gravel collar discussed in Circular 1001 may be used in conjunction with a mulch.

For suggestions on fertilization, see page 21.

Prevent Premature Bearing

Keep all fruits off the young trees during the first two growing seasons in the home orchard. Fruit removal encourages shoot growth and facilitates training. After two seasons' growth, trees may be allowed to bear light to moderate crops. Thin out heavy crops to prevent limb breakage and distortion of the tree shape. Increase the space between fruits to twice that suggested on page 23.

Special care must be given to the modified leader (main trunk) of dwarf apple trees. Thin fruits to avoid bending the modified leader out of shape. If a fruit load bends the modified leader, the leader will become a lateral fruiting branch and the central leader will be lost.

Bringing Young Trees Into Bearing

Usually no special treatments are necessary to initiate bearing. Vigorous growth, however, sometimes delays bearing, especially of Red Delicious apples. The onset of bearing can be encouraged by reducing growth. If a young tree is slow to start bearing, do not fertilize. Some trees may need special treatment to induce bearing. One way is to tie the branches into a partially horizontal position. Changing the branches from a vertical (or upright) position to a more horizontal position slows down growth and encourages the development of fruit buds. Tie the branches at a 45-degree angle, not into a completely horizontal position (Fig. 10), or use branch spreaders (Fig. 11). Keep the branches spread until they set a crop of fruits. This may require more than one season because the fruit buds are initiated during the summer and bloom the following spring. The ideal time to spread
Branches tied to a 45-degree angle to improve the shape of the tree and to encourage the start of bearing. (Fig. 10)

Branch spreaders in a 4-year-old Red Delicious apple tree to improve the shape and encourage bearing. The spreaders are wood laths with V-notches at each end to hold them in position. (Fig. 11)
branches is in early spring after pruning, but they may be spread at any time.

When tying branches, protect the branches from wire damage by using a short piece of garden hose (or other protective material, like plastic) over the branch.

Another method of attempting to initiate bearing in apple trees (usually Red Delicious) that are slow in coming into bearing and are at least 5 years old is scoring. Scoring, however, is a dangerous treatment and should be used only when the methods given above fail. About three to five weeks after apple bloom time, cut through the bark (including the inner bark) with a sharp knife, making a circle on the trunk just below the lowest branch. Do not score other types of fruit trees (Fig. 12).

An apple tree may be scored as shown to induce bearing. Three to 5 weeks after bloom, cut through the bark completely around the trunk with a sharp knife. Scoring may be dangerous to the tree and should be done only after other methods of inducing bearing fail. (Fig. 12)

**Pest Control on Nonbearing Trees**

Rabbits may eat the bark from the trunks of young fruit trees, especially during the winter. Mice may eat the bark from fruit trees from just above the soil surface to several inches below the soil surface. See Circular 1001, Home Orchard Pest Control, for control recommendations.

A regular spray schedule usually is not necessary for nonbearing trees except for borer sprays on stone fruits (peaches, plums, apricots, cherries, and nectarines). Spray or paint the trunk and lower branches of these stone-fruit trees with 2 tablespoons of 50W carbaryl (Sevin) per gallon of water about June 15, July 15, and August 15.
Care of Bearing Trees

General feeding insects such as grasshoppers and caterpillars sometimes attack young fruit trees. When needed, spray with 1 level tablespoon of 50W carbaryl (Sevin) per gallon of water.

More details on spraying are contained in Circular 1001.

CARE OF BEARING TREES

Fertilization

Because of variations in soil and climate throughout Illinois, the home gardener must adjust fertilization to local conditions. Dark-colored prairie soils in many areas of Illinois may provide adequate amounts of nitrogen, phosphorus, and potassium for fruit trees with little or no fertilizing. Fruit trees growing in lighter-colored silts, clays, and sands usually need fertilization for optimum production.


Phosphorus and potassium are the other nutrients frequently needed by fruit trees in Illinois. Excessive amounts of these nutrients usually do no harm to trees. Soil levels of phosphorus and potassium similar to those suggested for gardens are adequate. Fruit trees prefer a moderately to slightly acid soil, with a pH range of 5.6 (moderately acid) to 7.0 (neutral).

Determining nitrogen needs. Observing the shoot growth is a satisfactory way for the home fruit grower to manage the nitrogen nutrition of his trees. In early spring before the buds open, look at the shoot growth of the past season. This growth will start at the bud scars (compressed scars that circle the twig) and will extend to the tip. The previous year’s shoots are usually a more intense color (brighter red or yellow) than older wood. Two-year-old and older wood has heavier bark that is beginning to develop a grayish or dull appearance.

Measure the length of the previous year’s shoots on several branches and determine the average length. Table 2 suggests average length of shoot growth for healthy trees. Increase the fertilization rate if shoot growth is below average, and decrease the rate if growth is above average.

Fertilizer recommendations. Apples, plums, apricots, and cherries need $\frac{1}{2}$ to $\frac{1}{2}$ pound of mixed fertilizer (such as 10-10-10) per
Table 2. Shoot Growth on Healthy Trees

| Fruit tree                                      | Average shoot growth in inches |
|                                               | Young trees up to 6 years old | Bearing trees over 6 years old |
|                                               | 10 to 20                      | 4 to 8                        |
| Apple, dwarf and semidwarf                    | 10 to 20                      | 4 to 8                        |
| Apple, standard and spur types                | 10 to 20                      | 6 to 10                       |
| Peach, nectarine, and apricot                 | 10 to 24                      | 8 to 15                       |
| Sour cherry and plum                          | 10 to 20                      | 8 to 12                       |

year of age of tree, depending on shoot growth; maximum, 10 pounds per tree.

Peaches and nectarines need $1/2$ to 1 pound of mixed fertilizer (such as 10-10-10) per year of age of tree, depending on shoot growth; maximum, 10 pounds per tree.

Pears frequently do best without fertilizer because of the danger of fire-blight disease. Fertilization should be limited to $1/5$ pound of mixed fertilizer (such as 10-10-10) per year of age of tree with a maximum of 4 pounds per tree.

Lawn fertilizer (such as 10-6-4 or 10-8-6) is satisfactory. Use half as much of a 21-7-7 or similar lawn fertilizer. If the soil has adequate levels of phosphate and potash, ammonium nitrate (33-0-0) can be substituted for mixed fertilizer. Use $1/8$ of the amount suggested for 10-10-10.

Fertilize in early spring as the buds begin to swell. Broadcast the fertilizer in a circular band starting about 1 foot from the trunk and extending out to the spread of the branches.

Heavy pruning during the dormant (winter) season produces the same effect on fruit trees as applying nitrogen. When a tree is pruned heavily, reduce or omit fertilization.

**Orchard Soil Management**

A grass cover in the home orchard is convenient and satisfactory for bearing trees. A mulch under bearing trees (see page 17 for more details on mulches) in combination with grass reduces the area to be mowed.

Keep the grass mowed as closely as a lawn. Native or wild grasses are satisfactory, or bluegrass or a bluegrass-white clover mixture may be used.
Fruit Thinning

Fruit trees sometimes set more fruits than they can mature to a desirable size. In addition to reducing fruit size at harvest, excessive fruit-set retards the development of fruit buds for the next year's crop and increases branch breakage. Alternate-year bearing may result.

Excess fruits may be hand-picked during late May and in June. Thin apples, peaches, pears, and nectarines to about 6 to 8 inches apart. Thin plums and apricots to about 2 to 3 inches apart. Delay plum thinning until the latter part of June.

Fruit thinning by hand enables one to remove and discard misshaped, damaged, and diseased fruits. The matter of fruit thinning is always a difficult decision even for experienced commercial growers. Most people tend to underthin because once a fruit is removed, it cannot be replaced. Home gardeners who are hesitant to thin fruits are encouraged to thin selected branches for comparison with the unthinned remainder of the tree.

Harvesting and Storage

Tree fruits (except pears) develop maximum flavor and quality when allowed to mature on the tree. All of the fruits on a tree do not mature simultaneously. To obtain maximum quality, therefore, several pickings are frequently necessary.

Pears develop maximum flavor and quality when ripened off the tree. When a few pears on a tree start to mature, harvest all of the fruits and place them in a cool, dark place such as a cellar, in the crawl space under a house, or in an unheated corner of a basement, preferably walled off from the heated area. Look over the pears each week and select out the ripe ones.

Fall and winter apples for storage should be harvested just before they mature to extend the storage life. When the first apples on a tree are mature (ready to eat), most of the remaining apples are usually in a good stage to harvest for storage.

Ideal storage conditions for fresh fruits are 31° to 33° F, temperature, 90 percent humidity, and subdued light or darkness. Most home gardeners cannot provide these ideal storage conditions. However, the closer one can approach these conditions the longer one can store fresh fruits. Probably the best storage conditions available to the home gardener are to keep the fruits in a plastic bag in a refrigerator. Close the bag loosely or punch one or two small holes in it for slow air exchange. The plastic bag will prevent dehydration of the fruits.
Cherries, peaches, nectarines, apricots, plums, and summer apples have short storage lives even under ideal conditions. Fall apples and pears have somewhat longer storage lives. Winter apples such as Winesap and Turley have the longest storage lives.

**Winter Injury**

Cold temperatures may have harmful effects on fruit trees throughout Illinois. Cold injuries may be mild or severe, depending on the time and severity of the low temperatures and on the type, variety, and condition of the tree. For example, peaches are more susceptible to cold injury than apples and Japanese-type plums are more susceptible than European-type plums. Red Delicious apple blossoms are more susceptible to spring frost injury than Golden Delicious blossoms.

Cold injuries may be due to (1) very cold winter temperatures, (2) immaturity of tissues (cold occurring before the tree has developed cold hardiness), (3) fluctuating winter temperatures (cold immediately following a warm period), (4) widely fluctuating day and night temperatures, and (5) spring frosts.

Very cold winter temperatures may kill buds (especially of some stone-fruit trees), stem tissues, and even the roots of fruit trees. Little can be done to protect trees from this type of injury. Select types and varieties of fruits that are known to be cold hardy in a given area.

Injuries due to immaturity of tissues usually result from conditions causing trees to continue vigorous growth into the fall, or by conditions that affect normal physiological processes in the plant. Too much water, abnormally warm fall temperatures, and excessive amounts of nitrogen, alone or in combination, may cause excessive fall growth and predispose the tissue to cold injury. To avoid immature tissues, keep trees moderately vigorous before winter arrives, avoiding practices such as late cultivation, excessive irrigation, and heavy or late applications of nitrogen fertilizers that tend to stimulate fall growth. Fall drought also may reduce the development of cold hardiness by hindering normal physiological processes in the plant.

Injuries from fluctuating winter temperatures usually occur when unseasonably warm weather in late winter and early spring is followed by cold weather. The warm period causes trees to lose some of their cold hardiness, thus making them more susceptible to cold injury. Bark tissues and flower buds both may be damaged.

On sunny days in the winter the sun may warm the bark on the southwest side of the trunk and crotches to temperatures much above air temperatures. As the sun goes down, the bark quickly cools to air temperature. These fluctuating day-night bark temperatures may cause injury to the bark. Shading the trunks and vulnerable limbs with burlap
Pest Control

Spraying Equipment

Three-gallon compressed air sprayers are inexpensive and are satisfactory for spraying two or three dwarf trees or 10 to 20 young trees (Fig. 14). After trees are 5 years old, power equipment should be considered if more than five trees are to be sprayed.

Several manufacturers make power sprayers with a 10- to 30-gallon tank capacity. The pumps are driven by small gasoline engines or by
A compressed-air sprayer with a 2-gallon capacity. Such sprayers are inexpensive and are satisfactory for spraying a few small trees. (Fig. 14)

electric motors. Pump capacity should be at least 2 gallons per minute and pressure should be at least 100 pounds per square inch. Local dealers can furnish specifications for their merchandise (Fig. 15).

Garden hose attachment-type sprayers are also satisfactory. These siphon a concentrated mixture into the water stream. Prepare the concentrated mixture so the final spray has the same concentration as given in spray schedules. Keep the concentrated mixture agitated by shaking while spraying.

Spray schedules for tree fruits are given in Circular 1001, Home Orchard Pest Control. This circular also discusses the prevention of mouse, rabbit, and bird damage.

**Major Insect and Disease Pests**

Scale insects may attack all types of fruit trees. General feeding insects such as grasshoppers, caterpillars, aphids, and leafhoppers also may damage fruit trees. Other major pests of each type of fruit are listed in Table 3.
A small power sprayer. Such units represent a considerable investment but they enable the home gardener to do an excellent job of spraying with a minimum of effort. (Fig. 15)

<table>
<thead>
<tr>
<th>Pest</th>
<th>Apple</th>
<th>Pear</th>
<th>Peach and nectarine</th>
<th>Apricot</th>
<th>Plum</th>
<th>Sour and sweet cherry</th>
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<tr>
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</table>
**Descriptions of Insect Pests**

**San Jose scales** overwinter as nymphs and begin feeding again when sap begins to flow in the tree. Female scales continue to grow and give birth to young crawlers about 3 weeks after petal fall. There are two to three generations in northern Illinois and four to five in southern Illinois. The young crawlers feed on branches, leaves, and fruits, causing red, spotted areas. Infested leaves usually drop and branches lose vigor and die. Fruits will have an undesirable finish because of the red, spotted appearance caused by scale feeding and the presence of the scale (Fig. 16).

![Scale insects on an apple. They also damage branches and, if numerous, may kill branches or entire trees.](Fig. 16)

**Apple maggot** mainly infests apples but may also attack plums, blueberries, and crabapples. It passes winter as a pupa and adults emerge from June to September. Adult flies that have dark bands on their wings and white bands around the abdomen puncture the skin of an apple and insert an egg into it. Egg laying can occur from mid-June to mid-September. Tiny legless maggots hatch from the eggs and feed by tunneling throughout the apple flesh, leaving tiny brown trails. Egg punctures and larval feeding cause fruits to be dimpled. If the fruit is soft, it will soon rot. Apple maggots are common in northern Illinois but are not found in the southern part of the state (Fig. 17).

**Peach tree borers** and lesser peach tree borers attack the trunk and branches of trees of stone fruits, especially peach trees. Peach tree borer injury occurs on the trunk a few inches above or below ground. Lesser peach tree borer injury may occur anywhere on the trunk or branches where larvae can get under dead bark. Both species winter as larvae under damaged bark. Adults emerge from these wounds from
An apple infested with apple maggots. Note the dimpling of the surface and the tunneling in the flesh. (Fig. 17)

A branch infested with lesser peach tree borers. The material on the surface is a mixture of wood parts and worm droppings pushed out of the worm holes, as well as gum from the bleeding of the tree in the wounded area. (Fig. 18)

about mid-May through September. The moths lay eggs on rough areas of bark and young, hatching larvae must be able to get under loose bark for protection. There is usually one generation a year in Illinois for the peach tree borer and about one and a half for the lesser peach tree borer (Fig. 18).
Codling moth is a serious pest of apples. It overwinters as a larva behind loose bark on the trunk of an apple tree. The moths emerge in late spring and lay eggs on leaves and fruits soon after petal fall. There are two and sometimes a partial third generation in Illinois. Larvae damage apples by chewing their way into the center of apples. "Frass," or fecal material, is pushed out through the opening in the apple skin. The tunnel through the apple is an avenue for disease to attack the fruit, causing it to drop (Fig. 19).

Two-spotted spider mites, as well as European red mites and four-spotted spider mites, are severe pests in orchards, especially on apples. Mites are small, eight-legged animals about half the size of a pinhead. Use a magnifying glass to look for them on the undersides of the leaves. Usually they can first be found on leaves near the trunk, later moving to leaves on other parts of the tree. They suck juices from leaves, causing yellowing and finally bronzing of foliage. Hot, dry weather favors their development. Special miticide chemicals are usually necessary for mite control (Fig. 20).

Oriental fruit moth larvae are a common pest on peaches and nectarines. First-generation larvae tunnel into the ends of new shoots, causing dieback or flagging. If fruits are available, succeeding genera-
tions enter and feed in them. Larvae feeding in fruit cause the fruit to drop. The wounds also serve as avenues for rots to enter the fruit. There are four generations in the central part of Illinois with a partial fifth generation in the southern part (Fig. 21).

Oriental fruit moth damage to the tip of a young peach shoot. The larvae bore into the tender stem tip causing the tip to die. Larvae also tunnel into fruits. (Fig. 21)

Plum curculio attacks a number of fruit species, including apple, peach, plum, cherry, pear, and apricot. It winters as a dark-brown snout beetle in wooded areas near orchards and becomes active at blossom time, feeding on newly forming fruits. Eggs are laid on crescent-shaped flaps cut in the skin of young fruits. Hatching larvae will tunnel through fruits of peaches or plums, causing the fruits to drop or rot. Such cuts on apples give an undesirable finish to mature fruits but curculio larvae seldom live in apples.

Descriptions of Diseases

Apple scab is a widespread and serious disease of apple and crabapple. Dull, smoky spots appear on the young leaves and leaf petioles. The spots soon become velvety and olive-green and finally turn black. Scabby leaves curl, wither, and drop early, greatly weaken-
ing the tree. Infected fruits develop black scaly spots. Early infection causes fruit to be deformed, knotty, cracked, and often to drop early. (For additional information see Report on Plant Diseases No. 803.) (Fig. 22.)

**Blotch** infects the leaves, twigs, and fruits of apples. Leaf spots are small, round, and light gray with a black dot in the center, or elongated, sunken, and light-colored with several black dots. Severely infected leaves drop early. Rough, swollen, light-colored, perennial cankers may girdle fruit spurs, twigs, and branches. Shiny black blotches that are slightly sunken and irregularly lobed form on the fruits. Several blotches may coalesce to cover a large part of the fruit surface. Such fruits may crack. (Fig. 23.)

**Brown rot** is the most common and destructive rot of ripening peach, nectarine, plum, cherry, and apricot fruits. The rapidly enlarging rotted areas are soft and brown. Tufts of brownish-gray mold, often in rings, cover the brown rotted areas. Infected fruits shrivel, gradually turning into hard, wrinkled, black "mummies." Some may hang in the tree all winter. Other symptoms include a browning, wilting, and blighting of the blossoms and new shoot growth.
Blotch lesions on apple fruits and blotch cankers on apple twigs. Blotch infection may occur throughout the summer months. (Fig. 23)

Brown-rot-infected peaches. Brown rot grows rapidly on ripening peaches, nectarines, plums, cherries, and apricots. (Fig. 24)

Twigs may wither and die back from sunken, brown, girdling cankers. (For additional information see Report on Plant Diseases No. 804.) (Fig. 24.)

**Cedar-apple rust** is a common destructive disease of apple and crabapple. Small, pale-yellow spots form on the upper leaf surface in May or June. The spots soon enlarge, become orange, and black specks (pycnia) later form in the center. A mat of orange-yellow “cluster cups” (aecia) appear on the corresponding underleaf surface. Similar rust spots, up to ¾ inch in diameter, may form on the fruits near the calyx end. Early-infected fruits may be distorted and drop prematurely. (For more information see Report on Plant Diseases No. 802.) (Fig. 25.)

The closely related quince rust produces dark green, crater-like spots on apple fruits. The flesh becomes brown and spongy. The leaves are not infected.

Upright junipers and red cedars are the alternate host of these rust fungi. Light- to reddish-brown galls up to 2 inches in diameter (cedar-
Cedar-apple rust lesions on apple leaves. These lesions are orange in color with a small black center. (Fig. 25)

apple rust), or elongated, rough, dark-colored swollen cankers (quince rust) form on the cedar and on some junipers.

**Fire blight** is a common and serious disease of apple, crabapple, and pear. Also attacked are many ornamentals including quince, hawthorn, mountain ash, firethorn (*Pyracantha*), spirea, serviceberry (*Amelanchier*), and rose. Blossoms and fruit spurs are withered. During June and July new shoot growth suddenly looks as if scorched by fire with dark brown or blackened leaves clinging to the blighted twigs. The causal bacteria mostly overwinter in slightly sunken, discolored cankers, with a sharp margin, in the branches and trunk. Twigs and branches die back. The disease not only cuts production, but may eventually kill the tree. Fire blight is often followed by other diseases including black rot. (For additional information see Report on Plant Diseases No. 801.) (Fig. 26.)

**Powdery mildew** is becoming a more important disease on apple and crabapple each year in the Midwest. Look for whitish-gray, pow-
A fire-blight-infected apple shoot. The tip is turning brown and curling back. The leaves near the tip are also turning brown. A tip like this will shortly be dead. (Fig. 26)

dery mold or felt-like patches on the buds, young leaves, blossoms, and green twigs. Leaves may be crinkled or cupped upward, dwarfed, narrow, and erect. New shoots appear stunted and rosette-like, and may die back. Fruits on certain varieties show a brown net-like russetting and may crack. (Fig. 27.)

**Peach leaf curl** is a common and serious disease on unsprayed trees. Unfolding leaves are severely curled, blistered, swollen, and curved inward. The distorted leaves soon turn reddish-purple and usually drop in 2 to 3 weeks. A second crop of leaves forms later. Severe attacks weaken peach trees and greatly reduce fruiting. (For additional information see Report on Plant Diseases No. 805.) (Fig. 28.)

A closely related fungus causes plum pockets (bladder plum). Infected plum fruits are extremely large, pale, hollow, wrinkled, and drop early.

**Peach scab** causes small, round, dark olive-green to black spots to form on nearly full-grown peach fruits. When severe, the spots
Mildew infection on apple shoots. The leaves near the tips are distorted and have a whitish appearance. (Fig. 27)

Peach leaves distorted by peach leaf curler disease. The distorted parts usually turn reddish-purple in color. Badly infected leaves drop in early summer. (Fig. 28)
A peach infected with peach scab. Wettable sulfur must be included in the spray program up to 40 days before harvest to control scab. (Fig. 29)

A cherry leaf infected with cherry leaf spot disease. Leaves turn yellow and purple spots become conspicuous. Yellowed leaves soon drop. (Fig. 30)

merge to form irregular, velvety blotches. Fruits may be misshapen and cracked if spots are numerous. (Fig. 29.)

**Cherry leaf spot or yellow leaf** causes numerous small purple spots to form in the leaves from mid-May to mid-June. The spots enlarge somewhat and by mid-summer the centers of older spots turn brown and fall out. Such leaves appear shot-holed and often turn a golden yellow and drop in large numbers. Fruit on early-defoliated trees is often dwarfed, ripens unevenly, and falls prematurely. Severely infected trees are low in vigor and may eventually die. (For more information see Report on Plant Diseases No. 800.) (Fig. 30.)
SUGGESTIONS FOR PRUNING FRUIT TREES

Pruning is the judicious removal of parts of plants to increase their usefulness. It is not a mere haphazard cutting of wood, but a skill acquired through knowledge of the plant to be pruned, practice, and observation of the results of pruning. The primary purposes of pruning are to:

1. Improve the quality and size of the fruits.
2. Develop a strong tree that will carry a load of fruits.
3. Facilitate cultural and harvesting operations.
4. Adjust or partially control size and shape of trees.

Fruit trees, if unpruned, become tall, dense, and unmanageable. Fruit production tends to be limited to the outer edges and the top where there is more sunlight. The interior of the tree becomes a tangled mass of branches with very little productive fruiting wood. An unpruned tree is also difficult to spray and harvest. Though total yield produced by unpruned trees may be adequate, the size, color, and quality of the fruits usually are not.

All of the pruning discussion in this circular pertains to the pruning of the portions of the tree above the ground, except for the suggestions on root pruning at planting time.

You may be hesitant to prune because of the fear of "ruining the tree." Trees, like most plants, have the ability to replace removed parts. Thus, if an unwise cut is made, the tree will eventually succeed in replacing the removed part. The greatest mistake usually is to do no pruning. Nevertheless, since the replacement of a removed branch may take years, the pruner should have a good reason for making a particular cut.

There is no "right" or "wrong" system of pruning. Using basic pruning principles and an understanding of plant growth, fruit growers develop pruning systems adapted to their own operations. Home gardeners also may modify pruning systems to fit their own needs.

A major consideration in pruning is that each tree is an individual and no two trees grow and develop exactly alike. This can be especially frustrating in trying to develop a desirable framework in young trees. Probably the best solution is a compromise — know the ideal and modify it enough to suit the individual tree, but still develop the general shape of the system selected.

The Modified-Leader System and the Open-Center System

Pruning suggestions in this circular deal with the two most commonly used tree training systems, the modified-leader and the open-
Suggestions for Pruning Fruit Trees — 39

center. The modified-leader system is suggested for apples, pears, European-type plums, and sweet cherries. The open-center system is suggested for peaches, nectarines, and Japanese-type plums. Apricots and sour cherries may be trained to either of these systems, but the open-center system is easier to develop and maintain for both fruits.

Basically, an ideal semidwarf or spur-type apple tree trained and pruned to the modified-leader system has the following characteristics:

1. One main stem (trunk) 5 to 8 feet high with an open center above.
2. Lowest branch (scaffold) 18 to 22 inches from the ground and not on the southwest side of the tree.
3. Five to nine higher scaffold branches spaced 4 to 8 inches apart vertically on the trunk and each spaced at least 90 degrees around the trunk from the one next below.
4. The crotches of the scaffold branches forming a 40 to 90 degree angle with the trunk.

These characteristics are shown in Figure 31.

The number and spacing of scaffold branches and the height of the modified leader varies with the type of tree (dwarf, semidwarf, or
Suggestions for Pruning Fruit Trees

standard) with the type of fruit (apple, cherry, pear, or plum), and with the number and spacing of scaffolds. Properly shaped, a modified-leader tree has low and well-spaced branches, well-distributed fruiting wood, and is close enough to the ground to facilitate the various orchard operations. The modified leader system is more fully discussed and illustrated on pages 49-56.

Basically, an ideal standard peach tree (Fig. 32) trained and pruned to the open-center system has the following characteristics:

1. A single trunk 18 to 30 inches high.
2. Two, three, or four scaffold branches, all located close together vertically near the top of the trunk and kept about equal in size by pruning.

A peach tree trained to the open-center system. The four scaffolds arise from the trunk about 24 inches from the ground. Note the open center. (Fig. 32)
3. All scaffold branches forming a crotch angle of 40 to 90 degrees with the trunk and spaced as uniformly as possible from each other, none pointing directly southwest.

Properly shaped, an open-center (or vase) tree develops into a low-headed tree to facilitate orchard operations. The open center allows good light penetration for fruiting of inner branches and coloring of fruits. The open-center system is more fully discussed on pages 56-60.

**Pruning Terms**

"Heading back" or "tipping" refers to cuts into the current season's growth during the growing season and into the previous season's growth during the dormant season. Such cuts are made to encourage the growth of lateral (side) branches. A general rule to remember regarding heading-back cuts is that when 1-year-old branches are headed back during the dormant season, shoots will grow from lateral buds from the cut to about 10 inches below the cut. The general effect of heading-back pruning is a more dense, compact type of growth (Fig. 33).

The vast majority of pruning cuts are classified as thinning-out cuts. They are used to shorten a branch or the trunk, remove a branch entirely, and reduce the number of laterals growing from a branch or the trunk. The general effect of thinning-out pruning is a more open, rangy type of growth (Fig. 34).

**Pruning Tools**

Proper equipment is essential for successful pruning. For the home gardener these tools are hand pruning shears for small cuts up to...
Suggestions for Pruning Fruit Trees

Thinning-out cuts used to remove laterals from a branch (A), to shorten a branch (B), to shorten a tree (C), and to remove laterals (D). The dotted lines indicate growth that can be expected after pruning. (Fig. 34)

½ inch in diameter, lopping shears with 24- to 30-inch handles for cuts between ½ and 1 inch in diameter, and a pruning saw for cuts over 1 inch (Fig. 35). Pruning saws have teeth with a wide set to prevent binding by the living wood and fresh sawdust. Carpenters' hand saws are designed for dry lumber and bind in fresh wood. Another useful tool, especially for taller trees, is the pole pruner, essentially a cutting head mounted on a long pole. Some pole pruners can cut through 1½-inch branches located 12 to 16 feet above the operator.

All pruning tools should be kept oiled and sharp to make clean, nonjagged cuts. A clean wound heals more rapidly and smoothly.
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Basic pruning tools shown on the left are (1) push and pull cut pruning saw, (2) pull cut pruning saw, (3) lopping shears, and (4) and (5) hand pruning shears. On the right, a branch 12 feet above the ground is being cut with a pole pruner.

(Fig. 35)

Structural Strength

The frequently heavy weight of fruits at harvest time requires a strong tree framework to prevent breakage. Branches with wide-angle crotches are stronger than those with narrow crotch angles. Main scaffold branches with strong crotches should be selected while the tree is small, especially with apple, peach, and nectarine trees. Strong crotches are desirable but not as critical with pear, cherry, plum, and apricot trees (Fig. 36). (See the discussion of branch spreaders on page 49.)

Careful vertical and radial spacing of branches also contributes to a strong framework. On trees trained to the modified-leader system, avoid close spacing of branches along the trunk and locating consecutive branches directly above one another.

For peaches and other fruit trees trained to the open-center system, close vertical spacing of scaffolds is desirable.
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Narrow-angle crotchtes on the left and wide-angle crotchtes on the right. The wide-angle crotchtes are stronger. (Fig. 36)

Fruiting Habits

The various fruit trees differ in the manner in which they produce fruits. In order to intelligently prune these, as well as any other fruiting plants, these fruiting habits should be known, since they affect the type and extent of pruning.

Fruits may be borne laterally (along the branch) or terminally (at the tip) on 1-year-old twigs or on fruit spurs produced on older wood. Fruit spurs are short, modified branches that grow very slowly (usually less than 1 inch per year) and usually bear fruits every other year. The amount and type of pruning are largely determined by the portion of the crops borne on buds in the various positions on the tree (Fig. 37). Although exceptions occur, the following descriptions of fruiting habits are a reliable guide.

Apples and pears produce most of their fruits terminally on spurs that are found on wood 2 years old and older. Individual spurs frequently live 15 or 20 years but their productive life is not over 8 to 10 years. In general, apple and pear trees need moderate pruning once they are trained and come into bearing.

Apricots, cherries, and plums produce most of their fruits laterally on spurs on wood 2 years old and older. Apricot spurs are usually not productive for more than 3 years so the pruning treatment should be designed to cause continual renewal of the fruit-spur system. Sweet cherries bear entirely on spurs that carry numerous fruit buds. The spurs are productive for 10 to 12 years so the sweet cherry needs less
Suggestions for Pruning Fruit Trees

A branch with a terminal bud and lateral buds on the 1-year-old part (from the annual rings to the tip) and fruit spurs on the 2-year-old part (the lower part of the branch up to the annual rings). Also shown is an enlarged fruit spur with a terminal bud and lateral buds.

(Fig. 37)

renewal wood than almost any other deciduous fruit tree. Sour cherries bear largely on spurs, but also on lateral buds on short 1-year twigs. Moderate renewal pruning to maintain an abundant spur system is desirable. European-type plums bear primarily on long, slender spurs that are frequently branched while Japanese-type plums bear, as a rule, on short thick spurs with a minor portion of the crop borne laterally on 1-year-old twigs. The European-type plums do not tend to over-produce and light pruning favors fruit-bud production. Japanese- and hybrid-type plums tend to set too many fruits. Therefore, moderate to severe annual pruning is needed to reduce the number of fruit buds.

Peaches and nectarines have identical fruiting habits, bearing their fruits almost entirely from lateral buds on 1-year-old twigs. Thus new fruiting wood must be produced each year. Probably no other fruit trees respond more to proper pruning and decline with neglect more than peaches and nectarines. Since new growth must be continually stimulated to maintain enough fruiting wood each year, peaches and nectarines should be pruned more heavily than most other fruit trees.
Annual Pruning Is Important

Annual pruning is important throughout the life of the tree. While the tree is young, annual pruning is needed to develop the desired tree structure. As the tree grows older, annual pruning is necessary to keep the tree productive and to prevent it from becoming too large and too dense. Pruning stimulates the growth of the above-ground portion of the tree that is left after pruning, but this portion of the tree will be less than that of an unpruned tree. Furthermore, severe pruning of young trees tends to keep them from being productive and may delay the start of bearing. Thus the pruning of young trees should be moderate, the objective being to develop a well-shaped, structurally strong tree.

As indicated in the discussion on bearing habits, the severity of annual pruning suggested for trees in heavy bearing varies among the various types of fruits. The following guide gives a general rating as to the severity of pruning needed.

<table>
<thead>
<tr>
<th>Amount of annual pruning needed</th>
<th>Peaches, nectarines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most severe</td>
<td>Japanese-type plums</td>
</tr>
<tr>
<td></td>
<td>Apples</td>
</tr>
<tr>
<td></td>
<td>Sour cherries</td>
</tr>
<tr>
<td></td>
<td>European-type plums</td>
</tr>
<tr>
<td>Least severe</td>
<td>Pears</td>
</tr>
<tr>
<td></td>
<td>Sweet cherries</td>
</tr>
</tbody>
</table>

When to Prune

Light pruning may be done any time of the year, but heavy pruning usually should be limited to the latter part of the dormant season, preferably from January 1 to March 15 in the southern half of Illinois and from February 1 to April 1 in the northern half. Pruning before January 1 in southern Illinois and February 1 in northern Illinois may increase the danger of cold injury to the tree. If pruning must be started before the dates suggested here, start on older apple trees requiring light to moderate pruning. Wait until late winter or early spring to prune young trees.

Summer pruning of apple trees is becoming more popular because of the increasing interest in small-sized apple trees. Pruning during the dormant season stimulates new top growth because more food is available to the remaining parts of the tree. Pruning in July or August, in contrast, has a dwarfing effect on growth of apple trees bearing a
crop of fruits because the number of leaves is reduced with a resulting decrease in food production. Apple growers have found summer pruning to be especially helpful in keeping dwarf and semidwarf apple trees at a desired size. Summer pruning should be used in conjunction with dormant pruning rather than as a substitute for it. Essentially, moderate to heavy dormant pruning is replaced by light summer pruning and light dormant pruning.

Removal of watersprouts and suckers during the summer is preferred over cutting them out during the dormant season (see page 48). Watersprouts invite insect and mite pests and make trees harder to spray. Though all types of fruit trees may be pruned lightly during the summer, summer pruning is most useful on apples.

**Making Pruning Cuts**

Make pruning cuts flush with the trunk or branch and do not leave stubs. If latent (nongrowing) buds are present on the stub, they may start growing and fill up the open area. If no latent buds are present, the bark on the stub usually dies leaving the wood to rot before healing can begin (Fig. 38).

The major exceptions to these recommendations on making flush cuts are certain cuts on young spur-type apple trees. If more than half of the bark area of the branch or trunk will be removed by a flush pruning cut, growth may be severely retarded. In this case, a stub can be left for 1 year. However, remove any shoots starting to grow from it. After 1 year, remove the stub with a flush cut.

Treating pruning wounds less than 2 inches in diameter usually is not necessary. For larger wounds, an asphalt paint especially prepared for trees, ordinary white lead-linseed oil paint, or outdoor-type latex
paint is satisfactory. Don’t use any paints with turpentine or similar thinners. *Do not use creosote or creosote paint.* Creosote is toxic to living bark and may even kill the entire branch or tree if the wound is large and application is liberal. There are a number of commercial tree paints with asphaltum as the base that are readily available and reasonably priced. These are the safest and most satisfactory materials.

In treating pruning wounds, cover only the wounded area, not the surrounding bark.

**General Pruning Rules**

The following general pruning rules are applicable to all fruit trees.

1. Remove dead and broken branches.
2. Remove diseased branches, or the diseased parts of branches.
3. Remove watersprouts. These are rapidly growing young shoots arising from the trunk or scaffold branches. They grow straight upward, frequently without branching.
4. Remove suckers. These are shoots arising from the roots or from the trunk at or below the ground line.
5. Eliminate competition between branches. If one branch grows into another branch or rubs another branch, remove the least desirable branch.
6. Eliminate V-branching. If two branches of about equal size form a narrow V, eliminate one (Fig. 39).
7. Remove weak, slow-growing, drooping, nonproductive branches.
8. Remove branches or parts of branches that touch the ground.
9. Avoid selecting main branches growing toward the direction of prevailing summer winds. Illinois frequently has high summer winds. The prevailing direction of these winds is from the southwest. When trees are in full leaf, winds may distort the tree shape because branches growing toward the prevailing wind tend to be blown back into the center of the tree (Fig. 40).
10. The first 5 years the tree is in the orchard, prune only enough to properly train the tree. Remember that pruning is in reality a dwarfing process, although some parts of the plant may be selectively increased. Severe pruning can delay the development of bearing wood and thus retard the onset of bearing. The main object of training young trees is to develop the desired framework and bring the trees into profitable production as quickly as possible.

**Branch Spreaders**

Branch spreaders are helpful in training young trees to the modified-leader system. Stiff wire sharpened at each end and boards notched at each end make satisfactory branch spreaders.

Apple and pear branches tend to curve and grow straight upward even though the crotch forms a satisfactory angle. Spreaders help to keep the branches growing at the desired angle.

Length of the branch spreaders depends on the size of the tree. For 2-year-old trees, spreaders 6 to 12 inches long are most convenient. Longer spreaders (18 to 36 inches) are needed for 3-, 4-, and 5-year-old trees. See Figure 43, page 52, for spreaders in a 2-year-old tree and Figure 11, page 19, for spreaders in a 4-year-old tree.

**PRUNING APPLES**

The modified-leader system is suggested for apple trees growing on all types of rootstocks. The system is modified somewhat for various rootstocks, spur-types, and different varieties.

**Training Young Apple Trees**

Dwarf trees. The suggested structure for dwarf apple trees is a 4- to 6-foot-tall trunk with 6 to 10 scaffold branches spaced around
the trunk (except towards the southwest). The scaffolds should be spaced from 2 to 6 inches apart vertically (center to center) along the trunk. The lowest scaffold should be about 18 to 22 inches above the ground. A short trunk with close branch spacing results in a smaller, more compact tree.

Dwarf trees may not have strong anchorage and may need support to prevent them from blowing over. See page 11. They may start bearing when 2 or 3 years old. Early bearing may distort the shape of the tree because of the weight of the fruits. It is especially important in young trees to prevent the main leader from being bent over. See page 18.

Pruning at planting time. If unbranched trees are planted, cut off the shoot about 30 inches above the ground (Fig. 41).

If branched trees are planted, one or two branches may be saved if desirable branches are present. Select branches with wide crotch angles. The lowest branch should arise from the tree 18 to 22 inches from the ground. A second branch 2 to 6 inches up the trunk from the first branch and going out in a different direction sometimes may be saved. Cut off all other branches flush with the trunk. The top and the selected branches should be cut back one-third to one-half. Leave the top (trunk) longer than the upper branch and leave the lower branch longer than the upper branch (Fig. 42).

Pruning after 1 year. After one growing season, from two to four scaffolds usually can be selected. Remove the other branches and cut back the main leader about 15 to 18 inches above the crotch of the highest scaffold. Cutting back the main leader stiffens the trunk and
At planting time one or two scaffold branches may be selected if desirable branches are available. The spacings given are for dwarf apple trees. For other types of trees modify the spacings as suggested in the text for each type of tree. (Fig. 42)

forces new branches to develop above the highest scaffold. Shorten any excessively long scaffolds. Branch spreaders help to prevent branches from growing straight upward. See page 49.

Pruning after 2, 3, 4, and 5 years. Continue the selection of scaffold branches. One, two, or three may be selected each year depending on the growth of the tree and the location and crotch angle of the branches available. Prune out other branches and shorten any excessively vigorous scaffolds. Cut off the main leader each year about 15 to 18 inches above the crotch of the highest scaffold. Use branch spreaders where needed. Follow the general pruning rules given on page 48. (Figs. 43 and 44.)

Most of the permanent framework of the tree should be selected by the end of the 4th year. Trees should be bearing fruits.

Semidwarf and spur-type trees. The suggested structure for semidwarf and spur-type trees is a 5- to 8-foot-tall trunk with 6 to 10 scaffold branches spaced around the trunk (except growing towards the southwest). Vertically the scaffolds should be spaced from 4 to 8 inches apart (center to center) along the trunk. The lowest scaffold should arise from the trunk about 18 to 22 inches above the ground.

The taller trunk with greater spacing between scaffolds (as compared with dwarf trees) provides more space for these somewhat more vigorous trees and enables them to develop a strong framework. Varieties on EM VII tend to be poorly anchored until they are about 10 years old. They frequently need support from their 4th through their 10th year in the orchard. See page 11.
Training from planting time through the 5th year. Pruning at planting time and during the first 5 years in the orchard is the same as for dwarf trees except for the increased spacing between the scaffolds along the trunk and the taller trunk.

Jonathan and Golden Delicious trees should be starting to bear fruits in their 4th or 5th year. Red Delicious trees may be slower in starting to bear and may need special treatments to induce bearing. See page 18.

Standard apple trees. Standard apple trees will be larger than dwarfs and semidwarfs. The trunk should be 6 to 10 feet tall and the scaffolds spaced 8 to 15 inches apart. The number of scaffolds selected may vary from three to 10. The height of the trunk will vary with the

Before (left) and after (right) pruning a young semidwarf apple tree 2 years after planting. Several well-spaced scaffolds have been selected. Note the branch spreaders in the pruned tree. (Fig. 43)
Before (left) and after (right) pruning a 5-year-old dwarf apple tree.
(Fig. 44)

number of scaffolds, the more scaffolds selected the taller the trunk required. Some growers prefer a three- or four-scaffold standard tree allowing these few scaffolds to become large. Others prefer more scaffolds of smaller size.

*Training at planting time and through the first 5 years.* The system of pruning standard apple trees at planting time and after 2, 3, 4, and 5 years is similar to that described for dwarf trees except for the differences in number of scaffolds and the vertical spacing along the trunk. Standard trees may grow more vigorously and usually are slower coming into bearing than those on dwarfing rootstocks. They may require more severe pruning and may need special treatments to bring them into bearing. See page 18.

**Pruning after 6 to 10 years.** During this period make any selections needed to complete the framework. The main leader may be removed back to the top scaffold (suggested for standard trees) or it may be allowed to bear fruits. On dwarf and semidwarf trees, allowing the top of the main leader to bear fruit usually bends it over and the top of the main leader then becomes the highest scaffold. Follow the general pruning rules given on page 48.

Also, some thinning-out cuts will be necessary to prevent the trees from becoming too dense. Dwarf trees can be left denser than semidwarf trees and both can be left denser than standard trees because there is less shading of the lower limbs. Dwarf, semidwarf, and spur-type trees should be bearing regular and moderately heavy crops during this time. Standard trees should start bearing after their 6th year and by the 10th year should be bearing regular and moderately heavy crops. Pruning should be light to moderate to encourage bearing (Fig. 45).
Before (left) and after (right) pruning an 8-year-old semidwarf apple tree. Tall branches have been shortened and numerous small cuts have been made to thin out the tree. (Fig. 45)

A 15-year-old semidwarf apple tree after pruning. (Fig. 46)
Before (top) and after (bottom) thinning out an individual branch on a standard apple tree.

(Fig. 47)
Pruning after 10 years. Pruning now should be heavier. Trees should be in their prime bearing years. Bearing surfaces must be renewed by cutting out older wood and encouraging new growth. Trees will be growing tall and broad unless branches are shortened. Annual thinning-out pruning is needed to keep the trees open and prevent them from becoming too dense. Summer pruning may be helpful in maintaining the desired tree size (see page 46). Also follow the general pruning rules given on page 48. See Figures 46 and 47.

As trees grow older they lose some of their vigor. To overcome this loss of vigor the amount of annual pruning should be increased.

Pruning neglected apple trees. Trees not properly trained when young, and trained trees that have not been pruned for several years usually develop the following conditions: 1. They have too many branches. 2. The trees are tall. 3. Lateral branches are long. 4. The tree is too dense and sunlight does not penetrate the interior of the tree.

The first step in pruning is to select six to ten of the better branches for scaffolds. These will usually be the larger branches with wide-angle crotches. The other branches arising from the trunk should be removed over a 3-year period, cutting out about one-third each year. Spreading this branch removal over a 3-year period reduces the shock to the tree. Excessive pruning at one time may upset normal bearing for several years.

Long or tall scaffolds should be shortened. Some thinning out of these selected scaffolds probably will be needed.

Do not fertilize trees during this corrective pruning period. The corrective pruning will provide enough stimulation of growth.

PRUNING PEACHES AND NECTARINES

The open-center system is suggested for peaches and nectarines. This system consists of a short trunk about 2½ to 3½ feet tall with two, three, or four scaffolds arising from the trunk (Fig. 48). The trunk is cut off at the level of the top scaffold. The bottom scaffold should arise from the trunk at least 15 inches above the ground and the highest scaffold should arise no more than 30 inches from the ground (Fig. 49). Vertical spacing of scaffolds along the trunk is not important. All scaffolds may arise at the same level or may be spaced apart. They should be spaced as evenly as possible around the trunk.

The center of the tree is kept open by removing any large branches growing into the center. This open center allows sunlight to penetrate the interior of the tree and favors fruit production in this area.
Pruning at planting time. If unbranched trees are planted, head them back to 27 inches above the ground. If branched trees are planted, the permanent-scaffold system may be selected if desirable branches are present. Scaffold branches should arise from the trunk at least 15 inches, but no more than 30 inches, above the ground. They should be evenly spaced around the trunk. The branch structure of some trees is most easily adapted to two-scaffold trees, some to three-scaffold trees, and some to four-scaffold trees. Look over the branch structure on each tree and decide whether it should be trained as a two-, three-, or four-scaffold tree.

If scaffolds can be selected, remove all other branches flush with the trunk and cut out the top at the level of the highest scaffold. If the scaffolds are about equal in size, shorten them to 10 to 15 inches long (Fig. 49). If they are unequal in size, cut each back to 3 to 5 inches long and leave two buds.

If desirable branches for scaffolds are not present, top the tree at 27 to 30 inches and cut back the branches leaving them 3 to 5 inches long. Scaffolds will then be selected after 1 year’s growth.

Pruning after 1 year. Usually all of the scaffolds can be selected at this time if this was not done at planting. Cut off all other branches flush with the trunk. The trunk can be cut off at the level of the highest scaffold or a 2- to 3-inch stub can be left for 1 year and then cut off. Do not allow any branches to grow from the stub.

Cut out any lateral branches arising on the scaffolds within 18 inches of the trunk (Fig. 50). If branched trees were planted and scaffolds were selected at planting time prune these trees as suggested for 2-, 3-, and 4-year-old trees.
Pruning Peaches and Nectarines

Before (left) and after (right) pruning a branched peach tree at planting time when desirable scaffold branches are available.

(Fig. 49)

Remove all lateral branches arising from the scaffolds within 18 inches of the trunk. Upright-growing branches arising near the trunk will tend to fill up the open center.

(Fig. 50)

If the scaffolds are about equal in size, no cutting back is needed. If they are not about equal in size, cut back and thin out the larger ones to allow the less vigorous ones to catch up.

Pruning after 2, 3, and 4 years. Complete scaffold selection if needed. Prune as little as possible. However, the scaffolds must be kept nearly equal in size and the center must be kept open. Prune out branches arising on the scaffolds within 18 inches of the trunk (Fig. 50). Branches arising from the trunk that are not selected as scaffolds should be pruned out. Peaches and nectarines should start bearing during their 3rd year in the orchard. See Figures 51 and 52.
A 2-year-old peach tree after pruning. Because scaffolds were not selected previously, more severe pruning was required to develop a desirable framework. The scaffolds are about equal in size and were not pruned. The center and several lateral branches were removed.

(Fig. 51)

**Pruning after 5 years.** After 5 years, peach and nectarine trees should be in heavy production. These trees grow rapidly and branch profusely. Thus, moderate to heavy pruning each year is needed to produce healthy bearing wood and to prevent trees from becoming too dense, too tall, and too spreading. In general, the older the tree becomes, the heavier the pruning required to maintain production and vigor.

Scaffolds must be thinned out and shortened and the center must be kept open. If the limbs are allowed to grow too large or too long, they may break under a load of fruits. Also, follow the general pruning rules given on page 48. See Figures 53 and 54.
A 4-year-old peach tree after pruning. Only a few branches were removed. This tree is ready to produce a good crop of fruits. (Fig. 52)

Severe pruning frequently will revitalize old peach and nectarine trees, though a year’s crop will be lost. This may be done all at one time, preferably during a noncrop year when the fruit buds have been killed by winter cold, or one scaffold a year may be cut back. This staggered severe pruning reduces but does not eliminate the crop (Figs. 55 and 56).

Pruning neglected peach and nectarine trees. Neglected trees will be too dense, may be too tall, will have dead wood, and will be lacking in vigor. They need heavy pruning to invigorate them and produce new fruiting wood. They can tolerate heavy pruning.

First, select scaffolds to keep, then remove the other ones. Remove all dead, diseased, and injured branches. Then shorten and thin out the selected scaffolds.

Sometimes the most practical method of revitalizing neglected trees is severe pruning.

PRUNING APRICOTS

Apricots may be trained to either the modified-leader system or the open-center system. For the modified-leader system, use the specifications and training suggestions given for standard apple trees on page 52.
Before (above) and after (below) pruning a 6-year-old peach tree. Peach trees more than 5 years old need moderate to heavy annual pruning to keep them productive. Most of the cuts were made on small branches.

(Fig. 53)
As peach trees grow older, they need more pruning to keep them productive. (Fig. 54)

For the open-center system, train and prune apricots in the manner suggested for peaches on page 56.

Bearing apricot trees, whether trained to the modified-leader system or the open-center system, require a little more annual pruning than standard apple trees, but less than peaches require. Most of the fruits are borne on short spurs that are productive for up to 3 years. Considerable thinning-out pruning should be done to induce annual production of new fruiting spurs.

**PRUNING SOUR CHERRIES**

Sour cherries may be trained to either the modified-leader system or to the open-center system. For the open-center system, use the training methods described for peach and nectarine trees on page 56. See Figure 57. This system may be used for standard trees and also
An older peach tree after severe pruning. (Fig. 55)

A peach tree 1 year after severe pruning. Note the great amount of 1-year-old growth. Considerable thinning out of this growth is needed. (Fig. 56)
A 3-year-old sour cherry tree trained to the open-center system. After scaffolds are selected, pruning for the following 2 or 3 years should be limited to maintaining the scaffold structure. (Fig. 57)

for Meteor and North Star natural dwarf trees, but the modified-leader system is preferred for Meteor and North Star.

For the modified-leader system, use the training methods described for semidwarf apple trees on page 51. For Meteor and North Star natural dwarfs, use the specifications given for dwarf apple trees on page 49. See Figure 58.

Sour cherries will get too dense if not pruned. Standard trees need about the same amount of pruning as semidwarf apple trees. Meteor and North Star are similar to dwarf apples in quantity of pruning required.

Sour cherries trained to the open-center system will need about one-third to one-half of the amount of pruning suggested for peach trees because they grow less vigorously than peaches and produce fruits from spurs on older wood as well as on 1-year-old twigs.
A standard 5-year-old sour cherry tree before being trained is shown on the left. It has too many scaffold branches and is too dense. On the right, the same tree is shown after being pruned to the modified-leader system. Several scaffolds were removed and some thinning out of the remaining scaffolds was done. The tree still has too many scaffolds that must be gradually removed during the next several years. (Fig. 58)

**PRUNING SWEET CHERRIES**

Sweet cherry trees are best trained to the modified-leader system described on page 38. For standard trees, a system of five to eight scaffolds spaced 8 to 16 inches apart vertically along the trunk with a trunk height of 10 to 15 feet is suggested. For dwarf trees, select five to eight scaffolds spaced 5 to 10 inches apart vertically along the trunk. Trunk height should be 5 to 7 feet.

In pruning at planting time, if unbranched whips are planted, do not tip them. If branched trees are planted, one or two scaffolds may be selected as described on page 51, but do not tip the scaffolds.

During the early years after planting, tipping or shortening of scaffolds is not suggested, except for overly vigorous ones.

Pruning should be light to reduce the danger of winter injury and keep the trees productive. Heavy pruning of sweet cherries disrupts production and subjects trees to winter injury. Sweet cherry trees are naturally large trees and there is no practical way to keep them small. Since they naturally tend to grow upright, give them as much spread as possible by retaining the outward-growing branches and removing the upright ones (Fig. 59).

As trees grow older, some thinning out will be necessary, but branch shortening should be limited. In general, sweet cherry trees need less pruning than other types of fruit trees.
A sweet cherry tree trained to the modified-leader system. Sweet cherries do not require as much pruning as other fruit trees. (Fig. 59)

**PRUNING PEARS**

The modified-leader system is desirable for both standard and dwarf pear trees. This system is described in detail on page 38. The suggestions for training apple trees can also be used for training pear trees.

Wide-angle crotches are desirable but are not as essential for pears as for apples because they have less tendency for crotch splitting and branch breakage under a load of fruits. Two or three branches arising at the same level on the trunk can be tolerated in pears.

Prune pear trees less severely than apples because of the danger of fire-blight disease. Heavy pruning stimulates vigorous growth which is more susceptible to fire-blight infection.
For dwarf pear trees, select six to 10 scaffolds spaced about 4 to 6 inches apart along the trunk and distributed around the tree. The lowest scaffold should arise 18 to 24 inches above the ground and the main leader should be 5 to 7 feet tall.

For standard pear trees, select five to eight scaffolds spaced 6 to 12 inches apart vertically along the trunk and distributed around the trunk. The lowest scaffold should be 20 to 26 inches from the ground and the main leader should be 7 to 10 feet tall. A few temporary scaffolds may be left in younger trees to increase fruit production. Gradually remove these temporary scaffolds as the main scaffolds develop more bearing wood.

**Pruning at planting and during the first 5 years.** Select scaffolds as suggested on page 49, but prune as lightly as possible. Follow the general pruning rules given on page 48. Pear branches tend to grow straight upward until they start to bear. Then the fruit load usually will spread them out. It usually is not necessary to shorten the scaffolds on young trees.

**Pruning bearing pear trees.** Continue scaffold selection if needed. Light *annual* pruning consisting of shortening and thinning out scaffolds when needed will help keep the trees productive. Also follow the general pruning rules on page 48. Standard trees, because of more growth, may need somewhat more pruning than dwarfs but the growth rate of all bearing pear trees should be kept low to reduce fire-blight disease.

**Pruning neglected trees.** These trees will have too many branches arising from the trunk. Gradually reduce the number to eight to 10 over a 3-year period by cutting them off at the trunk. Thin out and shorten the remaining scaffolds if needed. Follow the general pruning rules on page 48.

**PRUNING EUROPEAN-TYPE PLUMS**

The modified-leader system is suggested for European-type plums such as Stanley, Damson, Bluefre, and Green Gage. For standard trees, the lowest scaffold should be 20 to 25 inches from the ground and vertical spacing of scaffolds along the trunk should be 5 to 10 inches apart. Select seven to 10 scaffolds distributed around the trunk. The trunk should be 6 to 8 feet tall when the structure is complete.

For dwarf trees shorten the vertical distance between scaffolds to 3 to 6 inches and shorten the trunk to 4 to 6 feet. The number of scaffolds should be about the same as for standard trees.
Training young European-type plum trees. See the section on pruning semidwarf apples (page 51) for detailed directions on pruning at planting time and during the first 5 years after planting. Modify the trunk height, number of scaffolds, and vertical spacing of the scaffolds along the trunk as suggested above.

Pruning bearing European-type plum trees. In early bearing years, the European-type plums usually do not require much pruning. They are spur-type trees without a great deal of lateral branching. While young, they are not as likely to become too dense.

As they get older, moderate pruning is needed to maintain vigor and keep the bearing wood productive. Both shortening and thinning-out cuts will be needed. Avoid heavy pruning. European-type plums have difficulty overcoming the shock of heavy pruning.

PRUNING JAPANESE-TYPE AND HYBRID PLUMS

Japanese-type plums and Japanese-hybrid-type plums such as Methley, Santa Rosa, Redheart, and Ozark Premier grow in a somewhat spreading fashion and are best trained to the open-center system. The specifications and training methods given for young peach trees on page 56 are suggested for this type of plum.

As Japanese- and hybrid-type plums come into heavy bearing, they usually are somewhat less vigorous than peaches, and pruning should be lighter than that required for peaches. On bearing trees, moderate annual pruning is needed to keep the trees open, productive, and within the desired size.