

Notes for small scale apple growers
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March 2013

A few notes from MSU Extension on the following:

1. Fertilizing your apple trees
2. Controlling insects and diseases on your apple trees
3. Sanitation, weed and animal control for apple trees
4. Pruning and training young apple trees

1. Fertilizing your apple trees

Soil testing is a simple and affordable method to take the "guesswork" out of fertilizing your trees. Get a soil test if you are planting new trees or caring for established ones. Collect the soil sample by taking small core sample about 6-8" deep from several spots around the area to be tested. Mix up these subsamples and then take a pint of the mixed soil and place it in a zip-lock bag. Your local MSU Extension office will mail the sample in to the MSU soils lab and give you recommendations based on the resulting analysis for a fee around \$15. The price may vary a little from county to county. Other labs, as well as "do-it-yourself" kits, are available. Unless there are special circumstances, soil testing is advised once every three years.

If a soil test is available, specific recommendations for your apple trees will be easy to follow. If no soil test is available, then follow these 'rules of thumb':

- Apply 1/4 to 1/2 lb. of actual nitrogen per year of tree, up to 3.5 lbs. maximum per tree. Actual nitrogen is calculated by using the percentage of nitrogen listed on fertilizer containers (ex: 27-10-15 is 27% nitrogen)
- OR... as a more general rule, apply 1 cup of 12-12-12 fertilizer per inch of tree diameter
- Granular fertilizer should be broadcast around the drip line of the tree (the outer ring where rainwater drips off foliage). If thick grass is growing under the trees, increase the amount of fertilizer by 10-15%.
- If you wish to use organic fertilizers such as compost or well-rotted manure, a heavy mulching annually will be needed for your tree to be well supplied with necessary nutrients. A 2-3 inch mulch of quality compost or rotten manure in a 5' radius around the tree should be adequate.
- Apple trees are quite tolerant of acid soils; however, there are many sites in Alger and Marquette County where soils are too acidic for apple trees to flourish. If there are jack pines and blueberries nearby, your soil may be highly acidic. If no soil test is available and your trees don't seem to be performing well, apply about 9 lbs. of agricultural lime in a 10' X 10' area around the base of the tree. This should be done no more than once every 3 years. Hardwood ashes from the woodstove can be substituted for lime. You will need about twice as much woodash to get the same result.

2. Controlling insects and diseases on your apple trees

If you want apples as blemish-free as you find them in the grocery store, you will need to initiate an aggressive spray program to control insects and disease. Detailed information is available for home fruit spraying through the MSU Extension office. Keep in mind that this sort of program is costly in material and time. It also requires you to handle pesticides and maintain reasonably good spray equipment. The cost of producing perfect fruit will likely exceed the cost of buying it at the store. Many people choose not to spray and then select the least disease and insect-damaged apples as they mature. Bad spots on the fruit are simply trimmed away.

A compromise plan is to use a minimal spray program to control much of the damage caused by the main apple pests. By applying 3 or 4 sprays over the early part of the growing season, damage caused by scab and some insect pests can be greatly reduced. Usually, a "home orchard" spray concentrate is the simplest product to use and is packaged in small, convenient amounts. There are many available. Mixing your own spray using Captan and malathion is a somewhat cheaper alternative. However, relatively large amounts of Captan and malathion must usually be purchased and used up over several years.

If you are interested in this "compromise" approach, here is a schedule:

- Spray "dormant oil" all over your tree in early spring (late March - early April). This will control scale insects.
- When leaf buds reach 1/4 inch length and are showing green color, begin to spray the tree with a home orchard spray on a 7 - 10 day interval and continue through mid-June. Follow the label instructions carefully.
- Do not spray when flowers are open! The home orchard spray contains insecticide that will kill pollinating insects.
- After petal-drop (when all flowers are gone), spray again with home orchard spray. This is the time when scab gets started. If it is controlled now, then later infection and damage can be reduced. Keep in mind that some varieties are much more susceptible to scab than others.
- 2 weeks after petal-drop, spray again with home orchard spray. This will increase the control of scab and help eliminate apple maggot (worm) damage on the developing fruit.

Some people use "red sticky ball" traps to control insects. These can be effective if enough traps are installed per tree (3 or more in small trees, 5-10 or more in larger trees). The round red ball tricks the adult apple maggot flies into landing on them, where they are trapped by a sticky substance, such as 'Tanglefoot', applied for this purpose. This technique has been effective in at least one local hobby orchard. These types of traps are widely used in commercial orchards to monitor the appearance of damaging insects. For example, when the first apple maggot flies appear on the red sticky ball trap, its time to start spraying for apple maggot. This concept will work well in the home orchard.

A kaolin clay-based non-toxic insect control product is called Surround WP (wetable powder). This powder is mixed with water at a rate of ½ lb per gallon and sprayed on developing fruit at one week – 10 day intervals throughout the growing season. It provides a physical barrier to all insects which may damage fruit, including apple maggot, codling moth and tarnished plant bugs. The product has been tried in our area with excellent results. In combination with scab resistant varieties, or judicious use of fungicides early in the growing season, high quality apples can be produced by hobbyists. Surround WP can be mail ordered through several garden supply companies and costs about \$40 for 25 lbs (plus shipping). Available from several sources, including Johnny's Select Seeds.

Additional information on organic apple pest control and fireblight control is included at the end of this handout.

If you are planting new trees, take disease resistance into consideration when selecting varieties.

Sanitation, weed and animal control for apple trees

Sanitation

For the home orchard, sanitation includes disposal of wood removed by pruning and raking up of leaves and fruit that fall throughout the season, as well as in the fall. These leaves and fruit should be placed in an active compost pile. In the fall, it's also very important to harvest all fruits from the trees to eliminate the possibility of diseases or insects over-wintering in that fruit. Again, all this harvested fruit can be placed in an active compost pile. The final aspect of sanitation is continually to prune out dead twigs and branches during the growing season. This material should be removed from the orchard to prevent disease organisms and insects from re-infesting healthy trees.

Weed Control

Do not allow grass or other vegetation to grow within 18 inches of the tree. A vegetation-free area of 2-3 feet radius around the tree trunk is even better. Vegetation competes with trees for water and nutrients. Grass growing up to tree trunks also makes it difficult to mow without damaging the tree trunk. Many apples and other trees have been damaged or killed by 'lawn mower blight'.

Prevent weed growth around tree trunks by mulching, cultivating, or applying herbicides. Cultivate shallowly (no deeper than 1-2 inches) to avoid damaging tree roots. Organic and inorganic mulches will prevent weed growth. Mulch is ideal because it prevents weed growth and conserves soil moisture. Apply 3-4 inches of organic mulch such as shredded bark, bark chips, or wood chips. Spread the mulch in a donut shape around tree trunks. Avoid heaping mulch around tree trunks. This can lead to fungal rots on the trunk and can attract rodents that gnaw on the bark.

Glyphosate (Roundup, Kleenup, or similar products) is the easiest herbicide to use to prevent weed or grass growth around tree trunks. For young trees, wrap the trunk with aluminum foil or plastic wrap before applying herbicide, then remove it when the spray is dry. Apply glyphosate according to label directions and avoid getting spray on the trunk or leaves (glyphosate on leaves will kill your tree). Spray only on calm days. At least one local, small hobby orchard has been ruined by misapplication of Roundup by the owner.

Animal Control

Most animal problems affecting apple trees are caused by deer and rodents such as mice, voles and rabbits. A cylinder of one quarter inch hardware cloth installed from the base of the trunk to above the normal snow line will discourage bark gnawing by rodents. Deer are a tougher problem. For young trees in areas with deer problems, install 3 or 4 fence posts around the tree. Construct a 'cage' of woven wire, chicken wire, or other appropriate fencing material around the tree using the posts for support. Keep in mind that you will need to open up this structure annually for pruning and training the young tree. Be sure to make enough room inside the cage for limb development. A diameter of 6-8 feet is desirable. Any twigs poking through will be vulnerable to nipping by deer. Once the tree structure is established and the central leader is beyond deer reach, the cage becomes less important for tree survival. However, twig pruning by deer can severely damage fruit production and quality. In some cases, an 8 foot woven wire or multi-strand electrified fence around the perimeter of the orchard is the best solution. Repellents (such as "Hinder") are also effective in discouraging deer. They are much less effective in cold weather and must be reapplied every 10-14 days or after it rains during the growing season.

3. Pruning and training young apple trees

The first step in growing apple trees successfully is selecting a good variety. As mentioned before, take disease resistance into consideration. A few varieties to check out are:

- Lodi (an improved yellow transparent type, great for sauce)
- Pristine (scab immune) – yellow transparent type
- William's Pride (scab immune) – medium quality
- Redfree (scab immune) – early
- Zestar (scab immune) – early, mid-summer, excellent for small home orchard
- Gala
- Lindamac – red with Macintosh flavor
- Cortland – huge, good baker
- Honeycrisp – excellent quality, need to thin to 50% crop to avoid cyclical bearing
- Liberty (scab immune) – top quality, early fall, firm flesh
- Wolf River – nice antique variety, large fruit
- Jonathan – very red
- Ginger Gold – big Golden Delicious type
- Empire – good Macintosh type
- Idared – great baker
- Goldrush (scab immune) – makes good deer apple tree on larger rootstocks
- Enterprise (scab immune) – makes good deer apple tree on larger rootstocks
- Candy Crisp (scab immune) – Very late, makes good deer apple tree

Many people select good trees, fertilize and plant them properly, but fail to follow through with proper pruning and training. Sometimes, people are reluctant to prune trees due to a mistaken notion that they will "hurt" the tree. Pruning is an age-old and very necessary part of establishing strong, healthy and productive fruit trees. The hardest cut of all seems to be the one needed right after planting a tree, called "whipping" the tree. This procedure is done on newly planted, bare-root apple trees (usually with 1/2 - 5/8 inch trunk diameter) with only a few limbs. All limbs are completely removed and the main trunk is "whipped" down to 30-45 inch height. This will accomplish two things. It reduces the leaf area available the first year to match the minimal roots available and gives the new tree a good chance to establish the root system with minimal stress. It also encourages new and better branch development. If there are some very good branches on the tree when you plant it, these may be kept (if you just can't bring yourself to cut them). It is not advisable to "whip" larger, potted or ball-and-burlap apple trees.

A few of the many internet sources of apple tree information follow:

- MSU Extension Fruit and Nut website – <http://msue.anr.msu.edu/topic/info/fruit>
- MSU Extension Apple website – <http://www.apples.msu.edu/index.htm>
- A Growers Guide to Organic Apples, Cornell University Extension http://nysipm.cornell.edu/organic_guide/apples.pdf
- MSU Extension Fruit 'Integrated Pest Management' information <http://www.ipm.msu.edu/agriculture/fruit>
- MSU Fruit Publications (MSU Extension Bookstore) – <http://web2.msue.msu.edu/bulletins2/index.cfm?killnav=1>
- Wisconsin Extension Tree Fruit publications – <http://learningstore.uwex.edu/Care-C288.aspx> and <http://learningstore.uwex.edu/Problems-C289.aspx>
- Gene's Backyard Orchard (a virtual tour of Chicago-area hobby orchardist's mini-dwarf apple orchard) – http://www.midfex.org/App_Pages/Yale/intro.aspx
- Hilltop Fruit Trees (larger volume sales, excellent reference material) – <http://www.hilltopfruittrees.com>
- Fedco Seeds, Waterville, Maine (heirloom varieties) <http://www.fedcoseeds.com/>
- National Sustainable Agriculture Information Service (ATTRA) – publications for sale only <https://attra.ncat.org/index.php>

A good publication from University of Wisconsin - Extension follows to give more detail on training and pruning new trees.

If you have questions or would like more information on these topics, contact:

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Training and pruning apple trees

T.R. Roper

Apples are the most common fruit tree planted in Wisconsin. In addition to providing fruit, apple trees can be a pleasing addition to the home landscape. However, unlike most shade trees, apple trees require annual training and pruning from the time of planting to produce an attractive and productive tree.

Proper training and pruning are also a valuable part of an effective

pest management program. Pruning to open up the canopy improves air flow, reducing some disease problems. An open canopy also allows better access for managing insect pests.

Training and pruning cannot compensate entirely for poor horticultural factors such as poorly matched scions (the above-ground portion of the tree) and rootstocks. For exam-

ple, if a strong spur-type scion, which produces little vegetative growth, is grafted to a dwarfing rootstock, the resulting tree will "runt out." That is, it will produce little new growth and small fruit, regardless of how it is pruned. On the other hand, a vigorous scion on a standard or semi-dwarf rootstock planted in a fertile soil will become a large, unmanageable tree that cannot be pruned into submission.

Pruning or training

Many people rely on pruning only to shape apple trees. While pruning offers many benefits, it limits the grower's options to removing branches only. Often, the remaining branches aren't in an ideal position for maximum fruit production. Training, by contrast, allows the grower to shape the tree through branch positioning and pruning. Well-trained trees produce more fruit of higher quality than those that have not been trained.

Training begins when a tree is planted and continues throughout the life of the tree. Training a tree properly during its first few years can save many hours of difficult, corrective pruning as the tree ages. Limb positioning is important because it determines whether the branch will produce primarily fruit or vegetation (figure 1). When branches grow straight up, they produce mostly vegetative growth and very little fruit. By contrast, branches that grow straight out from the tree are very fruitful, but produce little new vegetative growth. The ideal limb position is about 30° above horizontal, creating

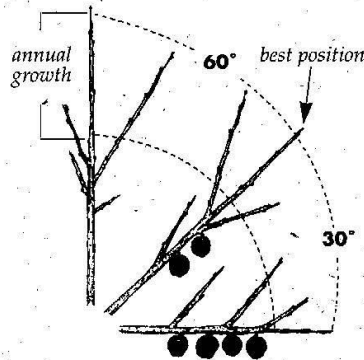


Figure 1: The effect of limb position on vegetative growth and fruit production.

Adapted from Oberhofer, H. 1990. *Pruning the Slender Spindle*. BC Ministry of Agriculture and Fisheries, Victoria, BC Canada

a 60° crotch angle. This allows maximum fruit production while still promoting growth of new wood for future fruiting. In addition, branches having a wide angle between the limb and the trunk, the crotch angle, are stronger than upright branches with narrow crotches (figure 2). Branches are most easily positioned when they are only 3-6 inches long with very soft wood.

Pruning should be used to open "windows" to allow light to penetrate throughout the tree. When all of the leaves are exposed to more light, the tree is able to produce higher quality fruit. However, be careful not to remove too many branches, as pruning can cause excess regrowth. When a portion of a branch is removed, the tree responds by producing new growth. Often three or four branches will grow where only one grew before, resulting in a "grow and cut" cycle. While excess regrowth can be minimized through proper cuts and by cutting into older wood where possible, it cannot be entirely avoided.

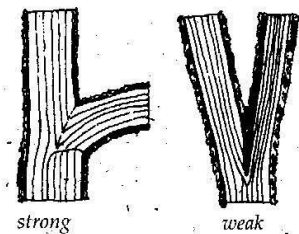


Figure 2: Branches with wide crotch angles are stronger than those with narrow angles.

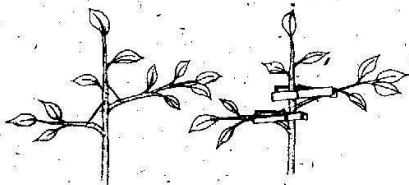


Figure 3: Toothpick and clothespin spreaders.

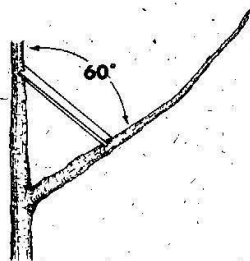


Figure 4: Wooden spreader.

Spreading This technique uses objects such as toothpicks, clothespins, or short sticks to push branches towards a horizontal position. For very young trees or for young succulent growth in older trees round wooden toothpicks or spring-type clothespins work well (figure 3). Insert spreaders in mid- to late June, when young branches are 3–6 inches long. If using toothpicks, gently push them into the soft bark of the limb and trunk to hold them in place. For clothespins, place the gripping end on the trunk and push the open side against the small limb to force it towards horizontal.

For older trees and branches, you can use wooden, metal, or plastic spreaders to push branches into position. Wooden spreaders (figure 4) can be made or purchased in any length needed. To make a wooden spreader, notch the ends or, for larger stock, drive small nails into each end of the spreader then cut off the heads of the nails using heavy pliers to create a sharp surface that will hold in the tender bark.

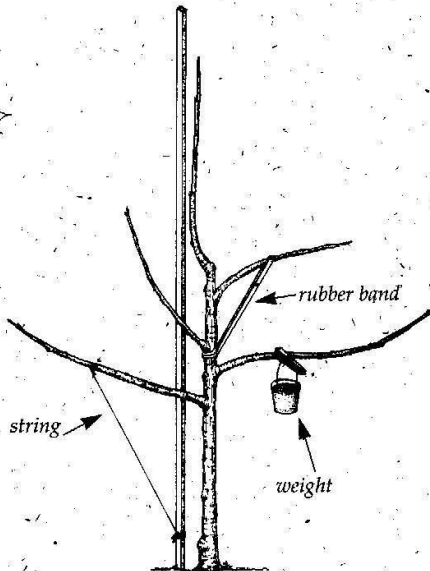


Figure 5: Various methods of tying and weighting.

Tying Many techniques and numerous materials can be used to tie branches. Tie the branch in place using twine, string, vinyl tape, fiberglass tape, long rubber bands, or other material (figure 5). Take care to not tie material tightly around branches. Tying can also be used to support weak branches that are unable to support the weight of developing fruit. Black electrical tape or fiberglass tape can be wrapped a couple of times around a branch and then pulled up or down and fastened to the trunk or stake to the correct position. Long rubber bands can be used for training fruit trees. Rubber bands rot away after a few weeks so it is not necessary to remove them. The best time to use rubber bands is in late June when young branches are at least 8 inches long. If used before this period, they may damage the branches or rot before enough wood has formed to hold the branch in place.

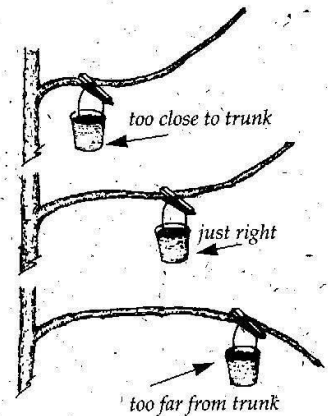


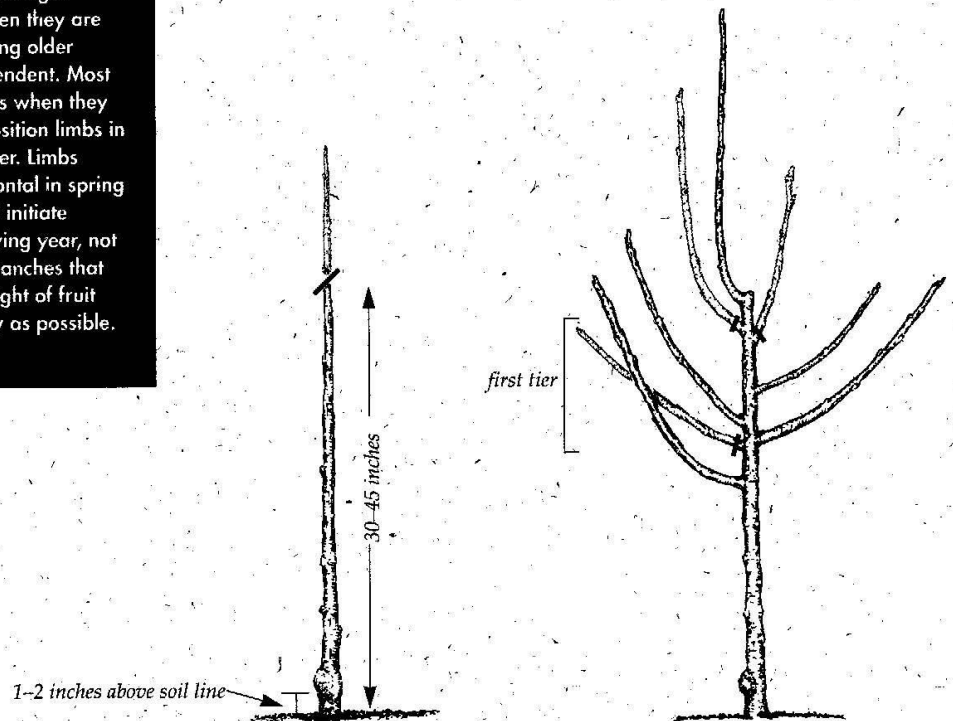
Figure 6: Positioning weight on branch.

Weighting Weights can be used to pull limbs into place (figure 6). Any heavy material can serve as a weight. You can make your own weights by filling paper cups with concrete and placing a hoop of wire into the wet cement. Then use a clothespin to clip the weight to the branch. You can vary the weights by using larger or smaller cups or by filling the cups with different amounts of cement. An alternative is to attach stones to clothespins using construction adhesive.

The position of the limb is adjusted by the location of the weight on the limb. You may need to experiment with placement to position the limb correctly. Placing the weight farther away from the trunk pulls the limb down more, but it also creates more arc. Avoid placing the weight so far from the trunk that the branch bends down in an arc; too much bend may mean the crotch angle is narrower than you'd intended. Weights provide a constant pull, so be sure to examine them periodically and adjust them when needed to maintain the correct position.

Timing for limb positioning

The best time to position younger branches is in June or when they are 3–6 inches long. Positioning older branches is less time dependent. Most growers position branches when they dormant prune, others position limbs in late spring to early summer. Limbs positioned towards horizontal in spring to very early summer will initiate flower buds for the following year, not the current year. Weak branches that are hanging from the weight of fruit should be tied up as early as possible.

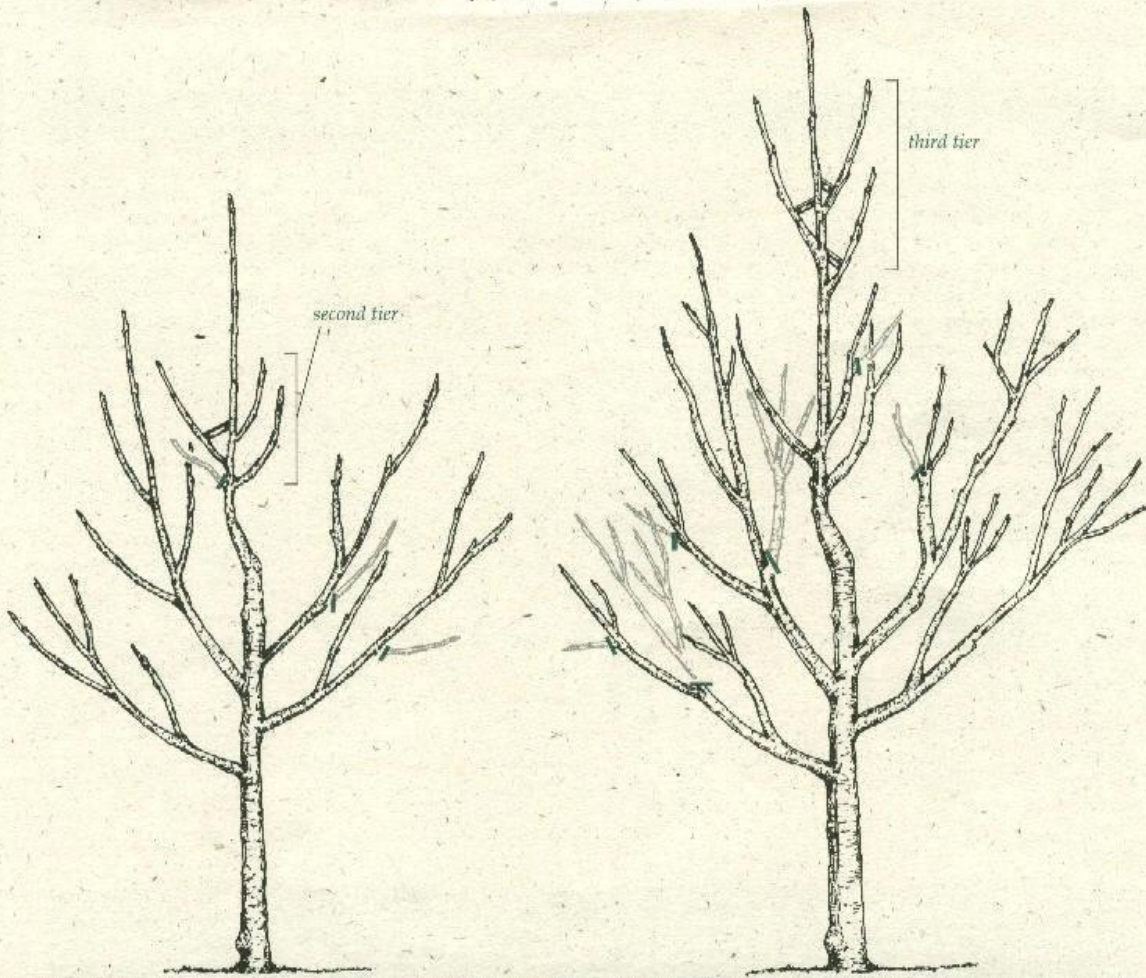


The objective in training a young tree is to develop a structure that will provide a strong framework to support fruit production. The top of the tree should be smaller and narrower than the bottom of the tree. This shape prevents the top of the tree from shading the bottom of the tree. The central leader system (illustrated above) produces a vertical central leader or main stem and strong, properly spaced scaffold limbs. This system is easy to prune and provides optimum production potential.

Over the years, you will train two to three tiers of scaffold branches. These branches will form the central framework of the tree and should grow at a wide angle from the leader.

At planting If you plant an unbranched whip tree, cut off the top leaving the tree 30–45 inches tall. Side branches will grow from the whip the first year. New branches will grow just below this cut. You control the location (height) of the new limbs by the height of the cut. If you've purchased branched trees, remove only broken, damaged, or poorly positioned limbs.

Year 1 During the first summer, choose four or five good branches for the lowest tier of scaffolds. The lowest scaffold limb should be at least 24 inches above ground and can be as high as 36 inches in a landscape where flowers or bushes under the trees are desired. Limbs growing closer to the ground make it difficult to work around the tree. Select well-spaced branches growing within about 18 inches of the lowest branch that are growing neither exactly opposite nor directly above one another. For the first dormant pruning in late spring, remove weak or poorly positioned limbs that will not become scaffolds.



Years 2-3 After two or three years, select a second tier of scaffold limbs. Again, choose or create branches with wide crotch angles. The lowest branch of the second tier should be at least 24 inches above the top branch of the lower tier. This 24-inch gap allows light to penetrate into the canopy and to strike the lower tier of branches. The upper branches must be kept shorter than the lower branches to keep them from being shaded. This will create a "Christmas tree" shape. For dwarf trees, two tiers will be sufficient; for semi-dwarf trees, repeat the process to create a third set of scaffolds near the top of the tree.

Yearly maintenance The central leader must remain the tallest part of the tree. The highest point in the tree is dominant and most vigorous. If a side branch is becoming nearly as tall as the leader, bend it lower (see limb positioning) or prune it back into 2-year-old or older wood.

Once the central leader reaches the height you want (usually 8-10 feet high for dwarf or 12-16 feet high for semi-dwarf) you can adjust the vigor in one of two ways. Take the top, supple part of the leader, bend it in an arc and tie it to the support post or the stronger part of the tree. As new



branches begin to grow on the arc, remove the ties and allow the leader to return to the vertical position.

Alternatively, cut off the leader just above a weak side branch. Both techniques reduce the vigor of the top of the central leader. To maintain the tree height, follow one of these techniques every year for the life of the tree.

Remove all dead and broken branches annually, as well as suckers, water sprouts, and branches forming narrow angles. By the fifth year, trees should be well established with two tiers of scaffolds. Spurs should be developing throughout the tree to provide annual fruiting.



Pruning bearing trees

The objective of pruning bearing trees is to maintain maximum production of high quality fruit on a continuing basis. Properly trained trees require little pruning but must still be pruned annually. Limit pruning of bearing apple trees to removal of weak, unproductive branches to improve light penetration and distribution, reduce tree height, and improve spray coverage.

As trees grow older, you may need to make more thinning cuts. Don't let the upper branches grow longer than the lower branches. Long upper branches shade lower branches and reduce productivity. If necessary, prune upper branches into 2-year-old or older wood to keep them shorter than lower branches. Thin out weak, unproductive branches, and keep the tree "open" for good light penetration. In the top of the tree, branches

can be cut back to the trunk leaving a short stub (about 1 inch long) on the bottom of the cut (figure 7). A new branch will often grow from the base of the stub.

If an older tree is too tall for convenient spraying and harvesting, more drastic steps must be taken. To lower the height of a tree, completely remove one or two of the tallest

growing limbs. Make the cut where the limb joins the trunk. When you prune drastically, you must greatly reduce other pruning in the tree that year. Over-pruning will stimulate too much growth and lower fruit production. Spread out extensive renovation pruning over 2-3 years.

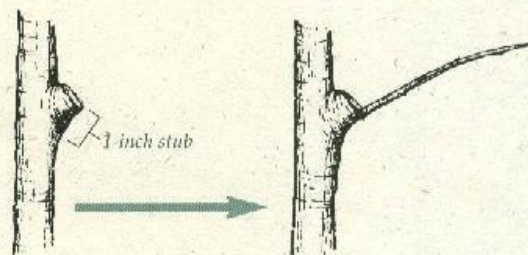


Figure 7: Pruning to promote new growth.

Pruning procedure

To prune efficiently, follow these steps:

Cut off water sprouts growing on the trunk and scaffold limbs. Occasionally, a water sprout may be left to fill in an open area.

Remove broken and diseased branches.

Remove the weakest of crossing or closely growing parallel limbs.

Remove all limbs or spurs growing downwards.

If the tree needs more branch thinning, remove weak, spindly branches first. Remove dense or long growth from the upper portions of the tree which shade lower limbs. Limbs growing within arm's reach are easier to harvest and spray.

Remember these tips when pruning:

Light is required for quality fruit.

Prune during the dormant period, late winter or early spring. March and April are best.

Use tools made specifically for pruning and keep them sharp and clean.

Make all cuts smooth and close. Leave the collar but not a stub (except for branch renewal).

On cultivars that bear heaviest on alternate years, do heavy pruning just before the bearing season.

Related publications

For more information on apple trees, contact your county Extension office for the following publications.

Growing Apples in Wisconsin (A3565)

Apple Cultivars for Wisconsin (A2105)

Apple Pest Management for Home Gardeners (A2179)

Rootstocks for Fruit Trees in Wisconsin (A3561)



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A1959 Training and Pruning Apple Trees

R-04-97-5M-100