

PRUNING DECIDUOUS FRUIT TREES

by Tom Del Hotal

REASONS TO PRUNE

Structural Strength:

Pruning for structural strength is especially important on fruit trees. Heavy crops of fruit can easily break branches, severely damaging main scaffold limbs or splitting trunks. Basic guidelines for structural pruning are as follows:

Train scaffold branches to be spaced along the trunk both vertically and radially when trees are young.

Prune off branches which are attached to the bottom side of attached branches. (Unless this is going to become the new terminal end of the branch.)

Increase the crotch angle of branches to greater than 30 degrees by spreading branches apart or by pruning off one of the branches.

Remove co-dominant leaders by removing or reducing one of the branches. Occasionally one of the branches can be redirected into a lateral branch by spreading the branch. This redirected branch will no longer be co-dominant. The Crotch angle should be spread to 30 degrees or larger.

Health:

Prune off the four D's: Dead, Damaged, Diseased and Dysfunctional branches.

Shape:

Prune trees to specific shapes for best fruit production. (Open vase or modified open vase for trees in the genus Prunus, central leader or modified central leader for all others.)

Many fruit trees can also be pruned or shaped for specific function in the landscape such as shade or patio trees, hedges, screens or espaliers.

Fruit or Flowers:

Prune to leave flowering and fruiting wood for specific fruit types. (Fruiting spurs, last season's growth/ one year old wood, or current season's growth.)

Thin branches and fruiting wood to allow adequate light penetration and air circulation for proper fruit development for each fruit tree type.

Size:

Fruit trees which are pruned to their maximum size will produce the greatest amount of fruit. These trees are pruned into central leader or modified open vase shapes.

To keep fruit trees smaller for ease of picking the fruit, to get more trees into an area, or because of space limitations, prune to modified central leader or open vase shapes.

Never top or head branches or trees!!! (The only exception is when you are pollarding a tree.) Topping or heading has many harmful effects on tree growth and tree health. The results include excessive, poorly attached branch growth, disease and decay, and starvation among others and never results in reducing the size of the tree long term!

Reduce the height or width of a tree or the length of a branch with thinning cuts by the pruning technique known as drop-crotching.

Direct or Redirect Growth:

Manage the growth in the tree so that one branch or side of the tree does not overgrow the other portions of the tree and so that the tree keeps a balanced shape. Prune to a terminal branch to direct growth in that direction.

As branches bend downward from the weight of fruit, foliage, or wood, they often need to be pruned back into an upright growing position. Use drop-crotching pruning techniques to a side or top branch to redirect growth.

Managing Suckers (Root Suckers):

Most deciduous fruit trees are grafted. All growth arising below the graft or from the root system should be removed to prevent the root stock from dominating and dwarfing out or killing the desired grafted tree.

Managing Water Sprouts:

Water sprouts are vigorously growing upright shoots arising from above the graft union on grafted trees. In some cases, water sprouts can be trained to form strong branches and may be beneficial. If water sprouts are excessively crowded, have narrow crotch angles, are crossing or rubbing, or are causing poor branch or tree structure, they should be removed.

Timing:

Improper timing can predispose plants to attack by insects, diseases, or damage from sunburn or sunscald. Most pruning should be done during the winter months on deciduous fruit trees when the trees are dormant and when insect populations are suppressed by the winter cold. In some cases, lighter summer pruning can be beneficial for keeping trees smaller, however many bark boring insects are promoted by summer pruning. If these insects are common in your area, keep summer pruning activities to a minimum.

PRUNING CUTS:

A pruning cut is a wound that is a possible entry point for decay, diseases or insects. Plants "heal" a wound by a process called compartmentalization. This process surrounds the wounded area both internally and externally with tissue that has greater resistance to decay. The wounded area never grows back together and this wound remains a weakened area for the life of the plant. Cutting a small branch and making a small wound is always more desirable than cutting a larger branch and making a larger wound. Larger wounds take longer to "heal" (or compartmentalize) and have greater potential for attack by decay organisms, diseases and insects.

Types of cuts:

Thinning cuts - Cuts used to remove an entire branch or stem at the point of origin, or to remove a portion of a branch or stem by cutting back to the crotch of a branch which is at least 1/3 of the diameter of the branch that is being removed, (**drop crotching**).

Drop crotch pruning is a recommended method for reducing the size of a plant in both height and width.

Heading cuts / Topping cuts: Cuts made to remove a portion of a branch, stem or trunk. Cuts are made without regard to the position of the cut or to lateral branch attachment.

Heading cuts usually result in excessive branch development below the cut. These branches are usually poorly attached and frequently break off damaging the branch or trunk they were attached to.

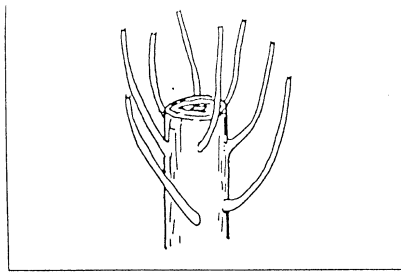


Fig. 8.11 Watersprouts develop profusely following a heading cut.

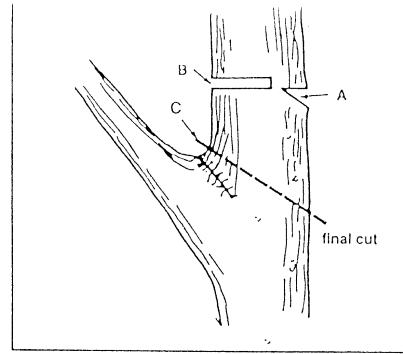


Fig. 8.10 Drop crotch pruning cuts a limb back to a major lateral.

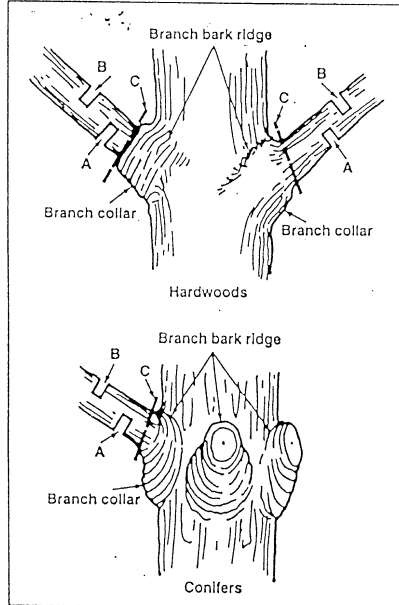


Fig. 8.2 Pruning principles. The first cut (A) undercuts the limb. The second cut (B) removes the limb. The final cut (C) should be just outside the branch collar to remove the resultant stub.

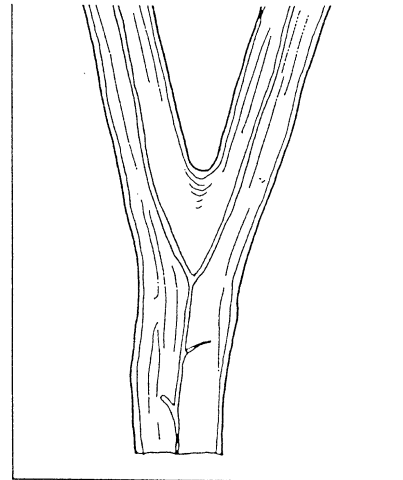


Fig. 8.4 Codominant stems. The nearly equal diameter of the two stems can make them more prone to failure.

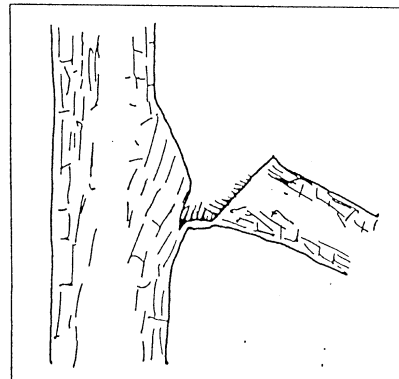


Fig. 8.3 Improper pruning cut. If a heavy limb is not undercut, it may "peel" back, tearing bark and vascular tissues of the parent limb.

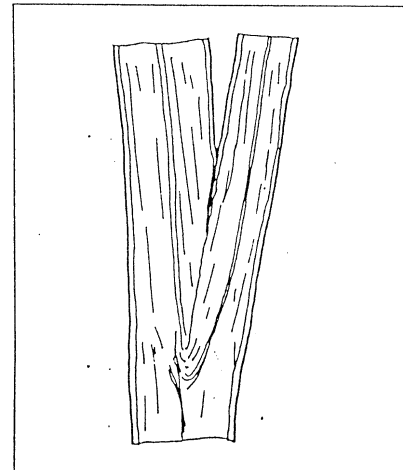


Fig. 8.5 Included bark can be a problem in tight crotches. This weakens branch attachment.

Training

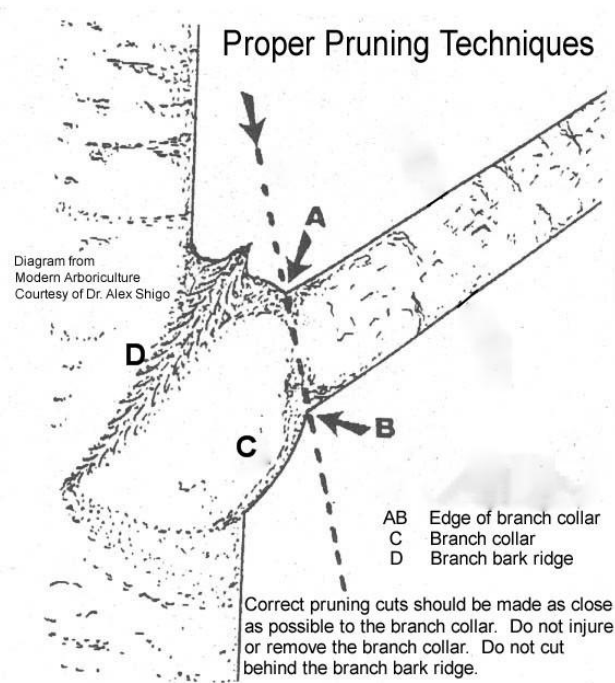
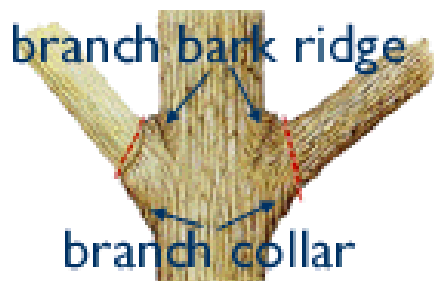
Training branches to grow in specific directions is often a viable option to pruning. This can take advantage of growth which has already developed instead of pruning off already grown branches and waiting for new branches to grow. Using training techniques can avoid the wounds made by pruning and therefore reduce the problems associated with those wounds.

Training should be done when branches are young and flexible enough to bend into shape without breaking or splitting the branch or trunk. Weights, guy wires, stakes or spreaders can be used to train branches. If ties are used, the tie material should be at least 1" wide wherever it comes into contact with the bark of the tree to prevent damage to the bark.

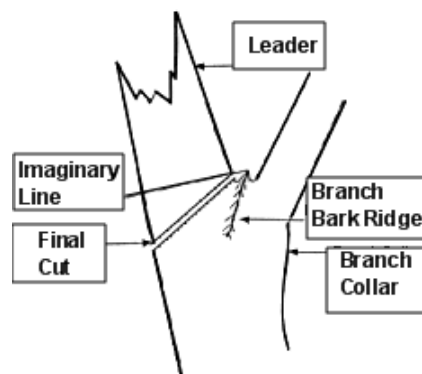
Natural Target Pruning

Natural target pruning is the way for making a proper pruning cut. Natural target pruning will allow the tree to heal the pruning wound as quickly as possible. Natural target pruning wounds heal faster because the cut is made as small as possible (as opposed to flush cutting) with the minimum amount of dead wood remaining (as opposed to leaving a stub).

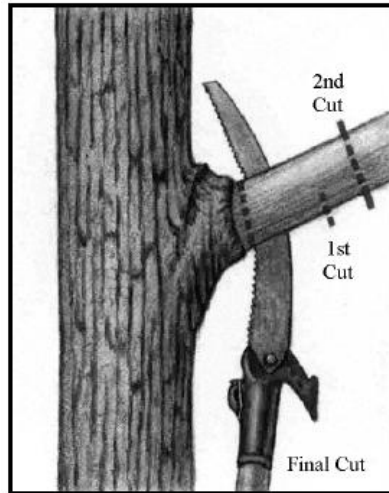
The key to natural target pruning is finding the branch collar which is the natural target for the cut. The pruning cut should always be just outside of this collar, but not far enough to leave a stub of branch. The branch collar is evident on many species of tree, some more than others. It is the base of the branch where the natural branch taper begins to flare out as it connects to the limb or trunk. **The branch collar should never be injured, cut into or compromised in any way.**



Some trees make it a little harder on us to find the target cut, but for them there is another rule of thumb generalization developed by Dr. Alex Shigo. Find the branch bark ridge, it is the area of raised bark extending down from the crotch. Find the line perpendicular to the branch to be pruned. Make your cut half way between the two.



If the branch to be pruned is larger than you can control easily it necessary to make a 3-part cut to ensure that the bark does not tear down the limb or trunk, resulting in an embarrassing scar and a larger wound. The 3-part cut is done by making an undercut about a foot from the branch collar. End this cut just as the branch is beginning to grab the saw. Directly above the undercut or slightly further our the limb, make the second cut, holding onto the branch so that it can be controlled as it falls. Finish with a natural target pruning cut at the branch collar.



Three step cut-use it when a branch is bigger than you can hold in your hand. USDA Forest Service

Natural target pruning is a way to minimize the detrimental effects caused by pruning wounds.

Remember:

- A wound on a tree is a wound forever. Trees seal or compartmentalize a wound, they do not heal a wound.
- The goal of any responsible pruner is to reduce the harmful effects of their pruning wounds. This is done by pruning in such a way as to facilitate the closure and compartmentalization of these wounds as quickly as possible by following the principles of natural target pruning.

Do not:

- * Top or make heading cuts
- * Make flush cuts behind the branch bark ridge.
- * Leave living or dead stubs.
- * Injure or remove the branch collar.
- * Paint or use 'tree seal' on cuts.

PRUNING STYLES

Open Vase and Modified Open Vase

Open vase and modified open vase pruning styles are used to maximize fruit production and fruit quality for fruit trees in the genus *Prunus* (peach, nectarine, plum, apricot and their interspecific hybrids).

The open vase style resembles a bowl. Scaffold branches and secondary scaffold branches make up the sides of the bowl. All branches that grow towards the center of the bowl are removed to allow light and air to reach the interior of the tree.

Low growing or small branches should be left as long as they do not congest this open interior of the "bowl". These branches assist in increasing branch diameter (caliper) and strength as well as help to protect the bark from sunburn. If these branches are fruiting branches, leaving these branches will help bring fruit lower and therefore fruit will be easier to harvest.

The modified open vase pruning style differs from the open vase style by having more than one level or layer. Each level or layer is made up of a smaller "bowl" above and within the larger, lower bowl. Sufficient distance must be maintained between these layers to allow for good air circulation and good light penetration to the lower layer or layers.

Large trees can have up to 3 layers, so that the overall appearance of the tree resembles candelabra. This results in a larger tree and greater fruit production than the open vase style.

Open vase shaped and modified open vase shaped trees will need to have an average of 40%=60% of growth removed on a yearly basis. Good pruning practices will help to reduce the amount of growth removed each year so that 20-40% branch removal is common.

A Systematic Method to Prune Open Vase and Modified Open Vase Trees:

Step 1: Remove all suckers.

Step 2: Look at the entire tree and determine which branches need to be removed or redirected to open the center "bowl" or vase. Use pruning or training techniques to open the center of the tree.

Step 3: After the center has been opened up, ignore the overall tree until the final steps of the pruning process.

Start pruning each scaffold limb one at a time, beginning with the lowest scaffold limb first. Start at the tree trunk and work your way towards the end of the branch. Prune for health, structural strength, and flower and fruit production and to thin out crowded branches. If branches are growing vertically and are crossing limbs which are growing above them, drop-crotch or remove the limb to prevent overcrowding and crossing branches.

After being properly pruned, the overall appearance of the scaffold branch will often be feather-like, with side branches and fruiting wood mainly attached to the top and sides of this branch. Small branches and fruiting spurs may be attached to the bottom of the scaffold, provided they are not too crowded.

As the scaffold branch matures, the ends of the branch will develop into a shape that resembles an outstretched arm and hand, with the "fingers" of the hand pointing upward and the "palm" of the hand directed towards the center of the tree. Branches should be spaced along the scaffold limb, alternating from side to side. The "fingers" and hand should form an open "cup" at the end of each limb.

Step 4: Move to the next scaffold branch and repeat the procedure outlined in step 3. Again start at the base of the branch and work outwards to the tip of the scaffold limb. Remember to focus on only the scaffold limb that you are currently pruning.

Step 5: Continue working your way around the tree, pruning one scaffold limb at a time. If there is more than one layer of branches, as in a tree pruned to a modified open vase shape, move up to the next layer and continue the procedure outlined in steps 3 and 4.

Leave sufficient distance between each layer to allow for adequate light to reach the lower layer. Actual distance between layers is variable and will depend on location, exposure, tree age and size, branch density, and species. Experience will help in determining what sufficient distance between layers is.

Step 6: When you have finished pruning each scaffold limb, one at a time, stand back and examine the tree as a whole unit. Look for excessively crowded branches, crossing branches, or branches growing towards the center of the vase. Remove or redirect these branches if necessary.

Peaches and Nectarines

These trees produce flowers and fruit on last year's growth, 1 year old wood. This fruiting wood is replaced each year. An average of 40-60% of the branches is removed each season.

Fruiting wood is easily identified. Branches have smooth, shiny, green or green and brown bark. Branches have well developed buds but no side branches. Branches are frequently pulled downward by the weight of the fruit and develop into 'hangers' which are beneficial to picking the fruit.

Plums and Apricots

These trees produce flowers and fruit on fruiting spurs. Fruiting spurs are long lived on plums (up to 10 years) but are short lived on apricots (3-5 years).

Fruiting spurs develop on branches that are 2 years old and older. These older branches have brown, rough bark and smaller side branches. The side branches may be vegetative, which will produce leaves and more branches or they may be fruiting spurs which will produce flowers and fruit. Vegetative branches will produce fruiting spurs after they become 2 years old and older.

Fruiting spurs can be identified as smaller branches with very short internode spacing between the buds (average 1/4"). Vegetative branches are usually larger and more vigorous, with more distance between the buds (usually 1/2-3/4" or more).

As fruiting spurs age and get larger they may resemble "thorns" or become club-like in appearance. Spurs should be thinned as trees age to prevent excessive fruit development which results in smaller fruit and may cause branches to break.

Apricot spurs usually die off after 3-5 years and need to be replaced. Prune to remove about 1/3 to 1/5 of the older fruiting spurs each year after the 4th-6th year.

Central Leader and Modified Central Leader

Central leader and modified central leader pruning styles are used to maximize fruit production and fruit quality for all fruit trees except those in the genus *Prunus*. This style of pruning keeps branches in the center of the tree.

Each scaffold branch and its attached branches and limbs should occupy their own space in the tree. Branches should not cross, touch, rub or be excessively crowded. Adequate spacing should be maintained between branches to allow sufficient light and air to penetrate through the tree so that fruiting wood is produced and so that insect and disease problems are reduced.

Trees should have sufficient branches remaining after pruning so that the bark of the trunk and scaffold branches is protected from strong, direct sunlight when the tree is full of leaves to prevent damage from sunburn or sunscald.

A tree pruned into a central leader shape resembles the shape of a Christmas tree. Pruned to this shape, the tree will be the tallest and will produce the greatest amount of fruit.

The modified central leader pruning style differs from the central leader by having a more rounded top. The dominant leader of the central leader tree is suppressed with drop-crotch pruning or training techniques and secondary leaders are allowed to develop. Each outer leader becomes

progressively shorter as they move outward from the center of the tree. These secondary leaders divide the growing energy or dominance between several growing points and the overall effect is a lower growing tree with a more rounded shape.

The secondary leaders must be spaced along the trunk both radially and vertically to produce a tree with strong branching structure. Trees should never be topped.

Central leader shaped and modified central leader shaped trees will need to have an average of 20%-40% of growth removed on a yearly basis. Good pruning practices will help to reduce the amount of growth removed each year so that 10-20% branch removal is common.

A Systematic Method to Prune Central Leader and Modified Central Leader Trees:

Step 1: Remove all suckers.

Step 2: Start pruning each scaffold limb one at a time, beginning with the lowest scaffold limb first. Start at the tree trunk and work your way towards the end of the branch.

Prune for health, structural strength, and flower and fruit production and to thin out crowded branches.

If branches are growing vertically and are crossing limbs which are growing above them or are crowding nearby branches, drop-crotch, train, or remove the limb to prevent overcrowding and crossing.

After being properly pruned, the overall appearance of the scaffold branch will often be feather-like where the branch is horizontal, with side branches and fruiting wood mainly attached to the top and sides of this branch. Small branches and fruiting spurs may be attached to the bottom of the scaffold, provided they are not too crowded. Where the branches are more vertical, side branches should be spaced along the branch in a spiraled arrangement with internode distance between branches. Adequate thinning of branches should be done to allow for air circulation and some light penetration.

Step 3: Move to the next scaffold branch and repeat the procedure outlined in step 2. Again start at the base of the branch and work outwards to the tip of the scaffold limb. Remember to focus on only the scaffold limb that you are currently pruning.

Continue working your way around the tree, pruning one scaffold limb at a time.

Step 4: After moving around the tree by working on the lowest scaffold branches, continue up to the next higher scaffold branches and again work your way around the tree pruning each branch one at a time.

Step 5: Repeat steps # 2-4 until you have finally reached the central leader of the tree. Branch height should descend progressively lower from the central growing point, downward as the branches move further out from the center.

Step 6: If you are pruning to a modified Central leader shape, drop-crotch the highest, central leader to a lower lateral and round out the overall tree shape by drop-crotching the taller branches.

Step 7: Stand back and examine the entire tree. Look for any crowded or crossing branches and drop-crotch, train, or remove these branches. Balance the overall tree shape by thinning, drop-crotching or training any scraggly branches.

Fruit trees may bear fruit on fruiting spurs, as in apples and pears, on last years growth, as in mulberries and some figs, or on current season growth, as in figs and pomegranates. It is extremely important to know the fruiting habits of the fruit tree you are pruning in order to be able to prune correctly and to maximize fruit production.

FRUITING HABITS OF COMMON FRUIT AND NUTS

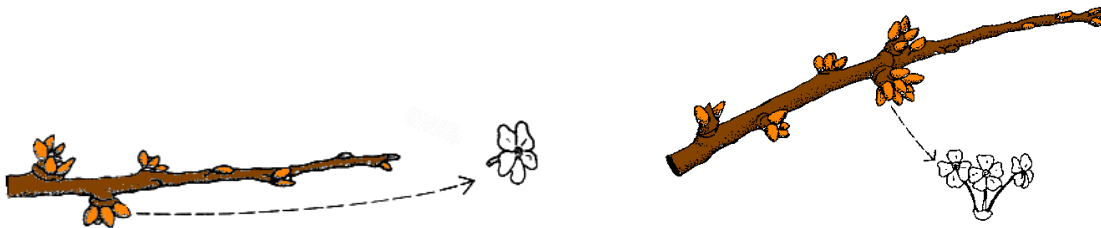
This chart shows the position on the branch where fruit will be borne and the type and age of wood that bears fruit.

Current-Season's Shoots	Previous-Season's Shoots	Fruiting Spurs
Fig — second crop Grape Lemon Orange Persimmon Quince Walnut	Apple— minor Avocado Fig — first crop Filbert Nectarine Olive Peach Pear — minor Pistachio Pomegranate Quince	Almond Apple Apricot— short-lived spurs Aprium — short-lived spurs Cherry, sour Cherry, sweet Pear Pecan Plum, European Plum, Japanese Pluot Pomegranate



Peach and Nectarine

Fruiting Spurs - 2 year old and older shoots



Plum



Apricot

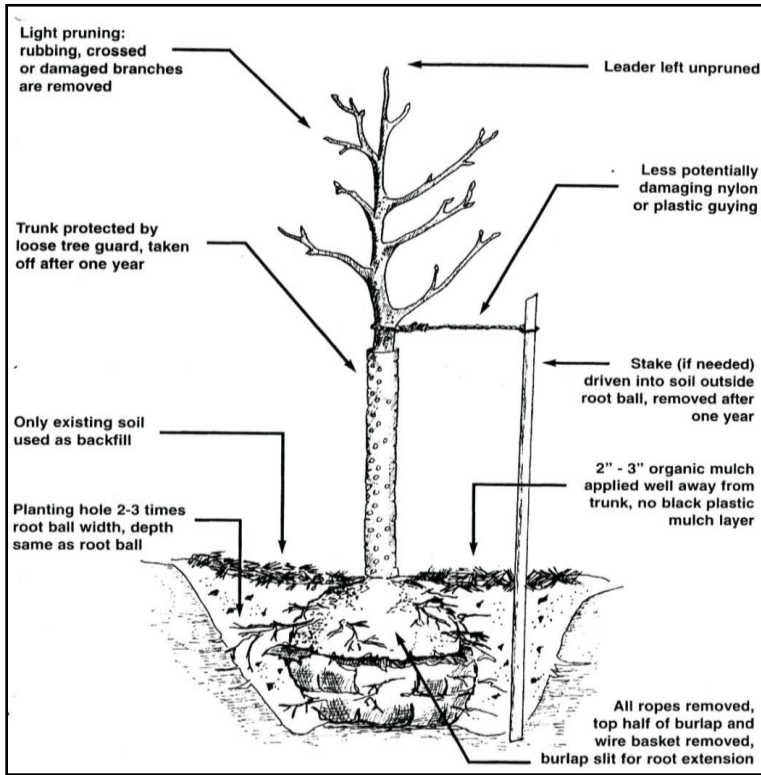


Apple



Pear

Correct Techniques for Planting Trees



Proper staking on trees is important to develop good trunk taper. Never tie a tree tightly to a rigid stake, this results in a weak tree and poor trunk taper.

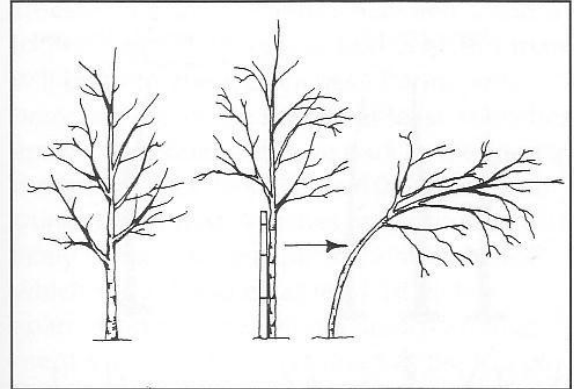
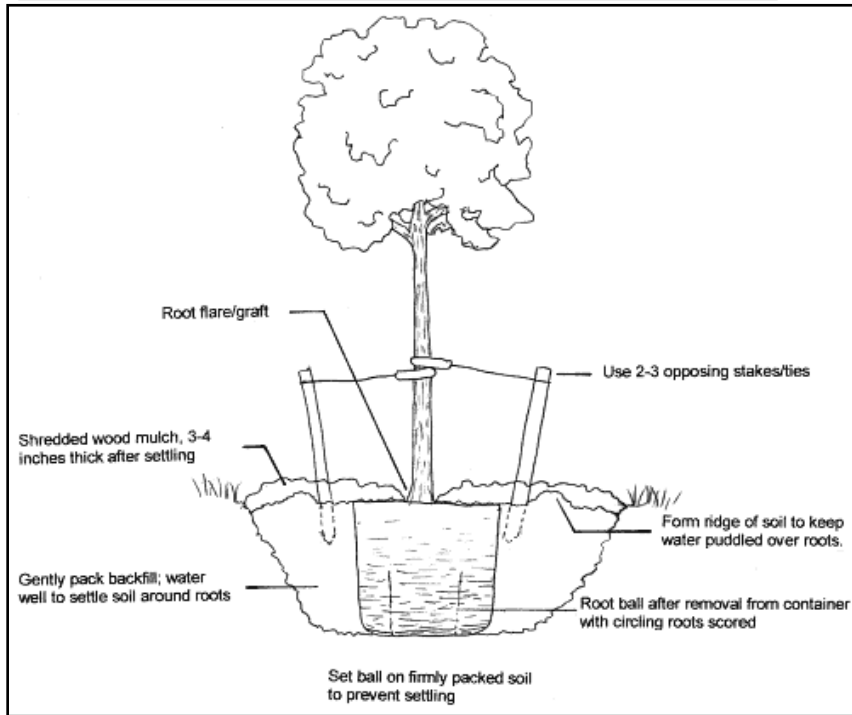
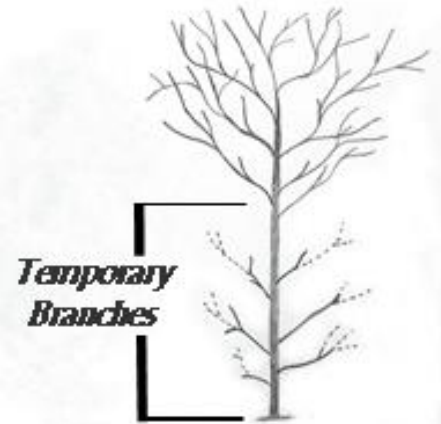


Figure 6. Good trunk taper (left) and poor trunk taper (center and right).



Temporary branches should remain on young trees. They increase trunk girth and can be removed if desired as the tree gets larger.



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