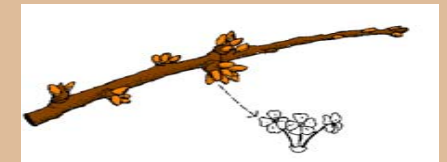




FRUIT TREE PRUNING Basics

Better Ways to Prune for Tree Health & Long Tree Life



- Natural Target Pruning
- Terminology and Tools
- Reasons for Pruning Fruit Trees
- Identifying & Managing Fruit Bearing Wood

Pruning for structural strength, tree health, fruit production and size

Traditional pruning methods have frequently emphasized fruit production while sacrificing tree health and long tree life. Skills needed to prune trees properly take time to learn and training to develop.

Instead of following pruning principles that promote tree health and long tree life, it is a standard practice and is often considered easier and more “cost effective” to replace the trees after a relatively short period of time (10 – 20 years).

Recent research on pruning by Richard Harris and Alex Shigo (among others) has taught new principles and given new insights on how plants respond to pruning and how pruning affects tree health.

This research has been adopted by the International Society of Arboriculture to establish new and better pruning standards for the way we should prune trees.

Using these principles to prune fruit trees can increase tree longevity and fruit production while reducing maintenance costs as well as help to reduce pest and disease problems on our fruit trees!

PRUNING:

- 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.



PRUNING:

- 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.



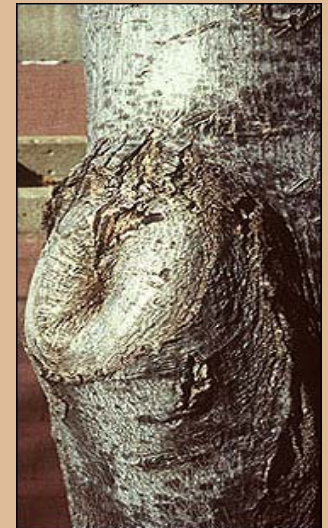
Pruning Sealers

- Although pruning sealers have commonly been recommended to use on pruning wounds, studies have shown that **these products are not beneficial and should not be used!**
- At best, they are purely cosmetic and do no good.
- At worst, they trap disease organisms against the wounded area and encourage disease and decay as well as impair the ability of the tree to grow over the wounded area and compartmentalize the wound!
- **Do not use these products when pruning your trees!**





Natural Target Pruning



Making Proper Pruning Cuts

Natural Target Pruning

- In this lesson we will learn:
 - What is Natural Target Pruning
 - Where to make Natural Target Pruning Cuts
 - How to make Natural Target Pruning Cuts
 - Why is it important to make Natural Target Pruning Cuts
 - When is it necessary to make Natural Target Pruning Cuts

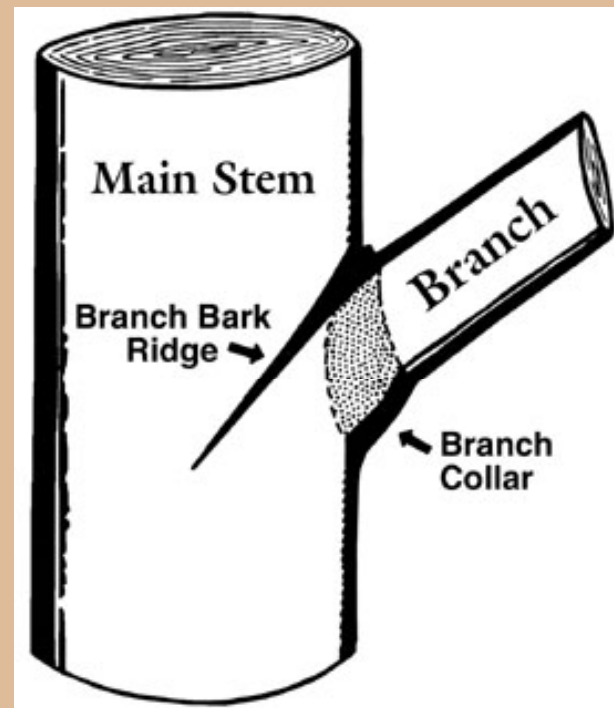
Natural Target Pruning - Definition

- Natural target pruning, as defined and described by Alex Shigo is a radical change from the conventional method used by arborists since the advent of the chain saw to remove branches from hardwood and coniferous trees.
- In natural target pruning the objective is to leave the branch collar on the primary stem or tree trunk while removing the remainder of the branch.



Where to Cut: Natural Target Pruning

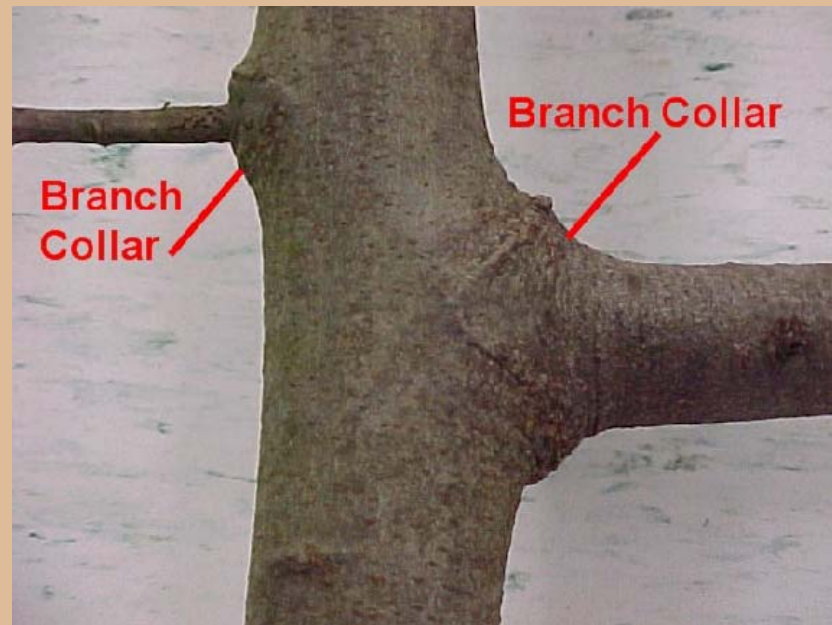
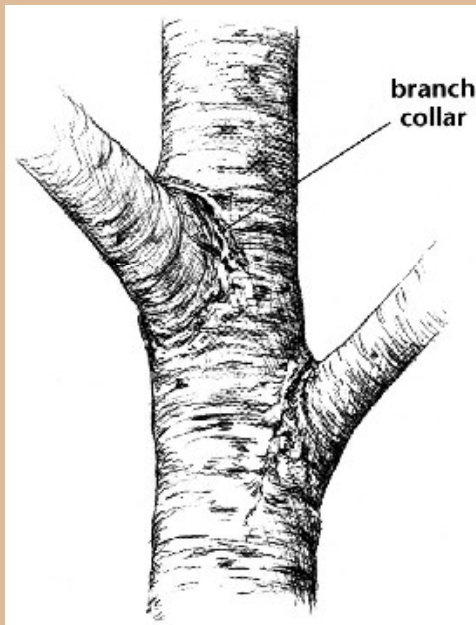
- Good pruning cuts are called *natural target cuts* by arborists, who use two targets on the tree to show them where to make the cut.
- These targets are the *branch collar* and the *branch bark ridge*.



The Branch Collar



- 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 is (typically) a swollen, wrinkled area at the branch base where branch and trunk (or branch and branch) tissues come together.



The Branch Bark Ridge

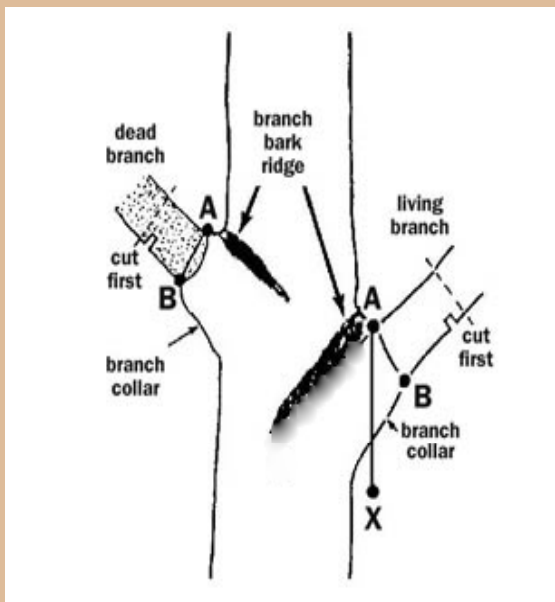
- Every branch has internal tissues that separate it from the trunk. These tissues are instrumental in the process of wound closure and self-defense and must be protected and maintained during pruning.
- As this internal branch tissue forms, the bark is forced upward to form a raised ridge on the trunk that separates the branch from the trunk. It extends down the branch or trunk on either side of the branch crotch.
- This raised area is the branch bark ridge.



A Natural Target Cut



- A natural target cut leaves the branch bark ridge and branch collar on the tree without leaving a stub.
- The cut passes just outside the branch bark ridge on top and usually slants out and down, leaving a bump but no stub (from A to B on the diagram). The cut is made on the outside of the branch collar.



- **The branch collar should never be injured, cut into or compromised in any way.**

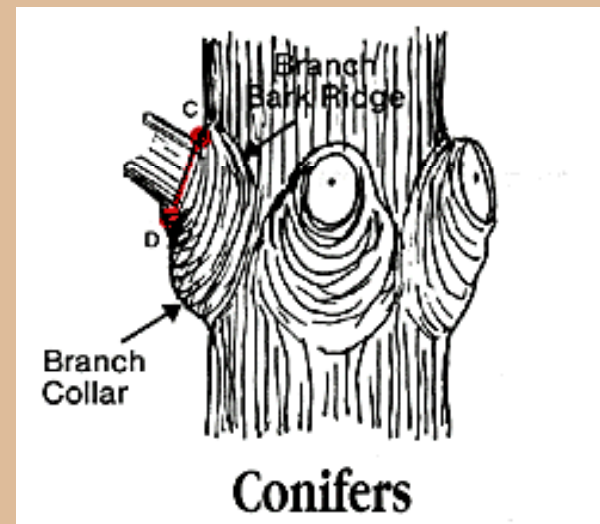
A Natural Target Cut

- Though the “targets” usually are easy to see on most broadleaved trees, some trees like sycamore constantly lose bark and don’t accumulate a branch bark ridge.



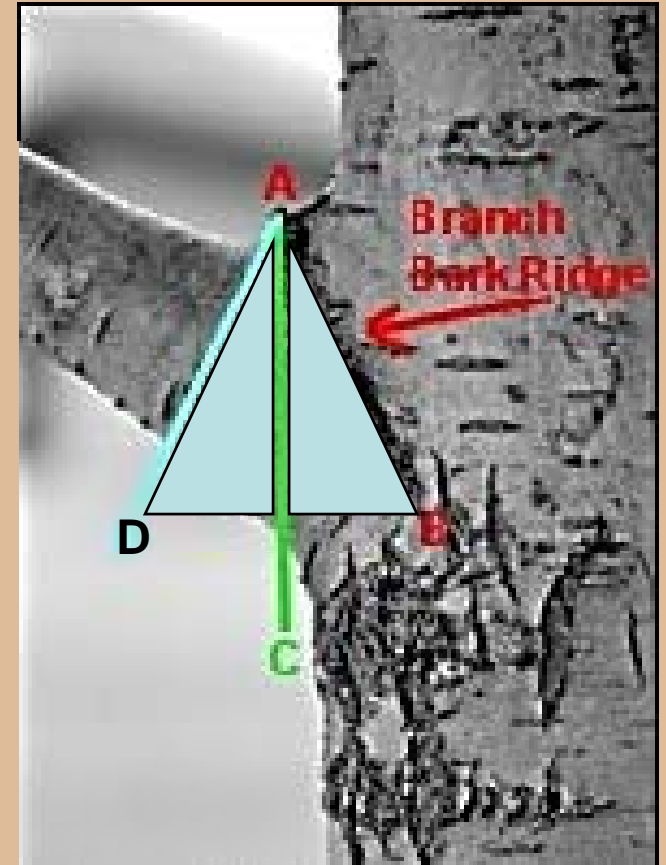
Do not injure the branch collar when pruning

- Conifers also may not accumulate a typical branch bark ridge. In both cases, cut outside any swollen or wrinkled branch collar.



A Natural Target Cut

- Some trees make it a little harder on us to find the branch collar and the target cut, but for them there is another rule of thumb generalization developed by Dr. Alex Shigo.
- Find the top of the branch bark ridge (A). The top of the cut is made at the top of the branch bark ridge.
- Make an imaginary vertical line from the top of the branch bark ridge straight down to the ground (line A-C). Now determine the angle between this vertical line and the bottom of the branch bark ridge (angle C-A-B).
- Reverse this angle on the opposite side of the vertical line A-C (angle C-A-D). The natural target cut is made along the line of this reversed angle (line A-D).



Making a Natural Target Cut

- Proper pruning means removing the branch so that the branch collar is not injured or removed. No cuts should start behind the branch bark ridge.
- When removing dead branches, never cut into the callus tissue which has formed at the base of the branch. Remove the branch beyond the callus ridge so that no living material is severed or detached.
- Three things contribute to the desired result of making a natural target cut:
 - 1. The Branch Bark Ridge is retained.
 - 2. The Branch Collar is intact.
 - 3. The final cut line correctly aligned.
- **There are no set pruning angles applicable to every tree - only targets - the branch bark ridge and branch collar. Correctly using the targets as guides should ensure the right final cut every time!**

Natural Target Pruning

Making Proper Pruning Cuts

- Good pruning involves removing as much of the branch as possible without leaving a stub or flush cutting.



Stub Cut

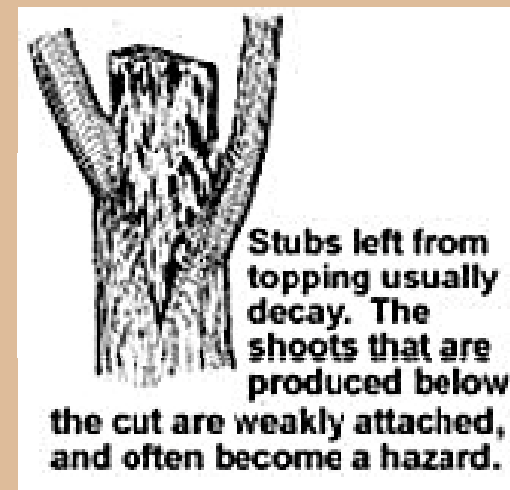
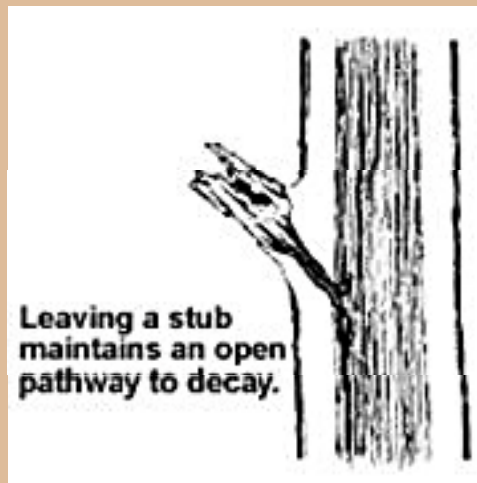


Flush Cut



Stub Cuts

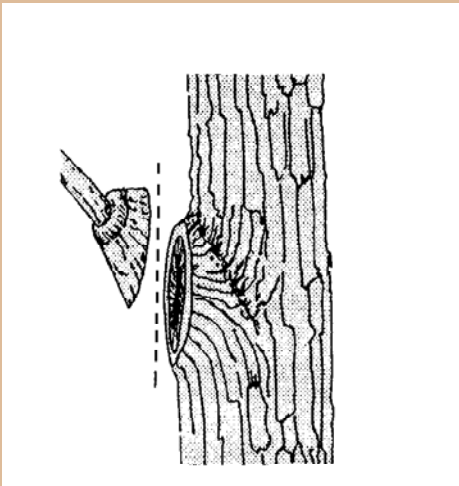
- Stub Cuts are pruning cuts that are made too far outside the branch bark ridge or branch collar. These cuts leave branch tissue attached to the stem.
- Disease organisms “incubate” on the dying stub that remains. Eventually the stub becomes a pathway for decay organisms to enter the tree trunk and cause serious wood decay.
- Heading cuts are pruning cuts that shorten a branch or stem so far back that a large stub is created. In this case, the stub decays, creating health problems for the tree.



Flush Cuts

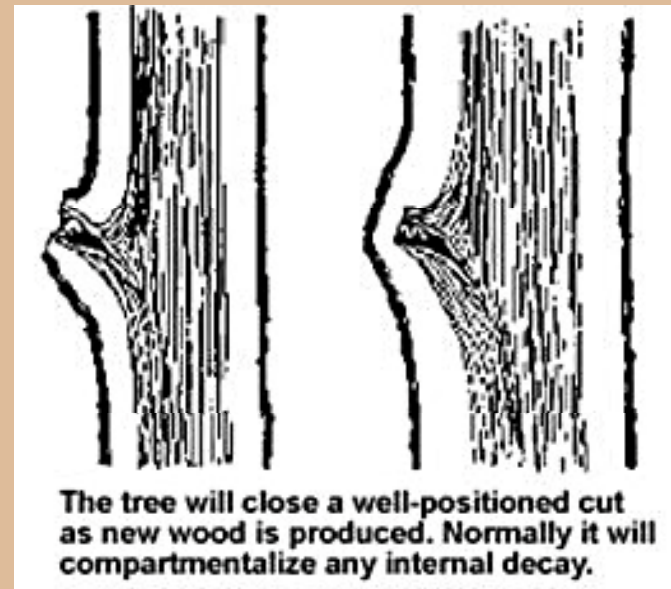
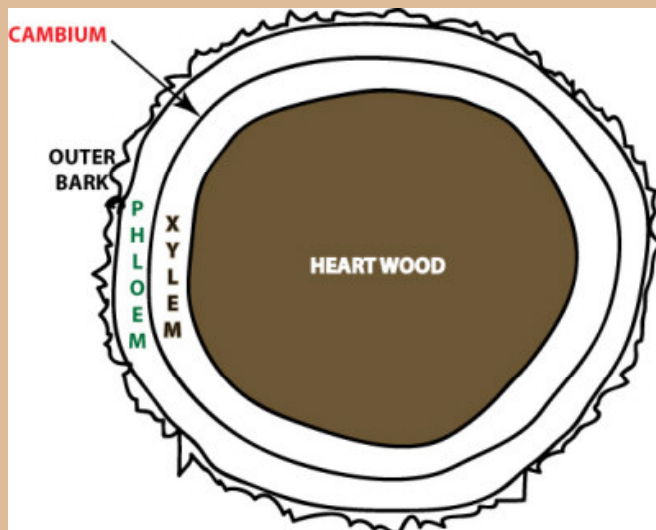


- Flush Cuts are pruning cuts that originate inside the branch bark ridge or the branch collar, causing unnecessary injury to stem tissues.
- Flush cuts can, and usually do, lead to a myriad of defects, including radial cracks, circumferential cracks, discolored wood and wood decay.
- Flush cuts are improper and may break the protective chemical barrier and allow decay organisms to colonize stem tissue. The spread of this decay will eventually end in the demise of the tree.



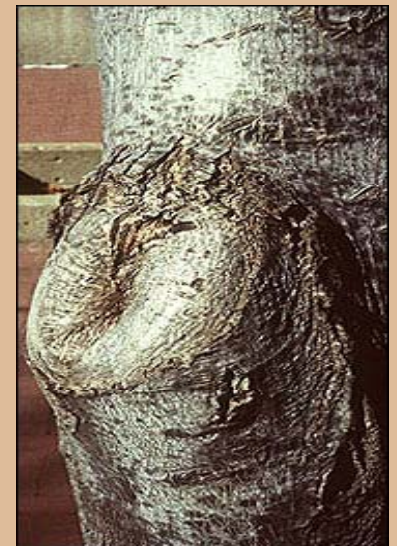
Healing Response to Pruning

- Healing naturally follows pruning or wounding. It starts in the cambium, a thin layer of cells between the wood and bark.
- Two areas of the cambium, the *bark ridge* at the junction of two limbs, and the *branch collar* function to close off the wound between the plant and the pruning cut.
- For fastest healing, prune close to the main branch without injuring the bark ridge or branch collar areas.



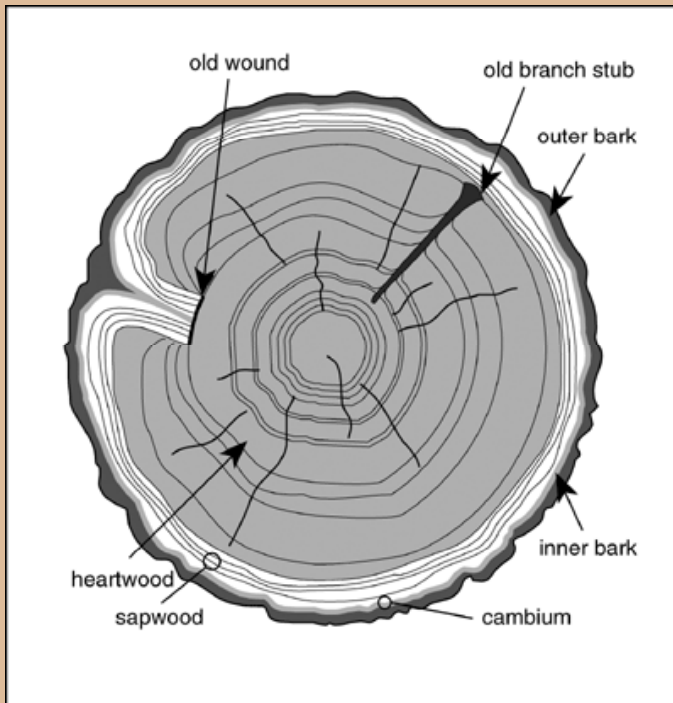
Healing Response to Pruning

- Natural target cuts start to seal over quickly as *woundwood*, sometimes called *callus*, forms at the wound edges (callus forms first and becomes woundwood as it matures and becomes woody).
- Woundwood usually forms in a continuous ring around a natural target cut, eventually sealing over the wound as it grows together.



Healing Response to Pruning

- The term “seal,” rather than “heal,” is used to describe tree wound closure, since the wound still exists inside the tree even after it no longer shows on the outside.



Compartmentalization of Wounds

- Trees have a natural defense response to wounds and pruning cuts. They form four types of walls to compartmentalize the area thus preventing the spread of decay organisms.
- The decay or injury remains but is sealed off and does not increase in size if the walls are stronger than the decay organisms.
- Natural target pruning initiates the wound response and promotes the compartmentalization of the wounded area as quickly as possible.



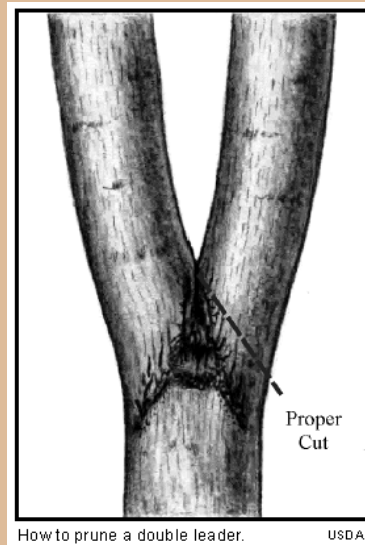
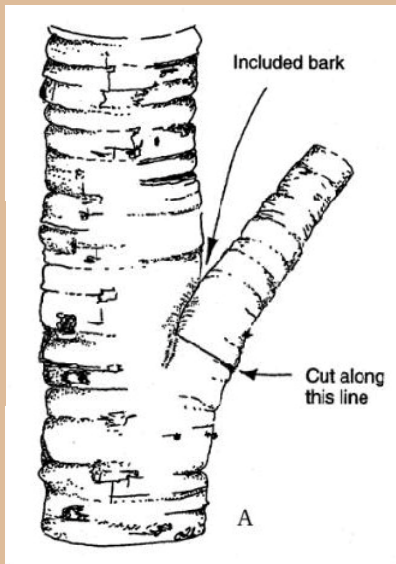
Included Bark

- Sometimes the bark where two branches meet turns in instead of out, forming a seam of *included bark* inside the tree instead of a branch bark ridge. Areas of included bark often die and become decayed.
- These areas are naturally weaker than branch attachments with normal branch bark ridges.
- Included bark can be found on any tree. It is more common where branches attach to one another at a very narrow angle, but it can occur with wide attachment angles as well.



Included Bark

- Included bark prevents strong attachment of branches, often causing a crack at the point below where the branches meet.
- Codominant stems that are approximately the same size and arise from the same position often form included bark.
- Remove a branch that has included bark by cutting from the open crotch down and out (or cut up to the crotch).
- This actually leaves a small stub on or in the tree, but cutting farther down may cause serious trunk wounds.

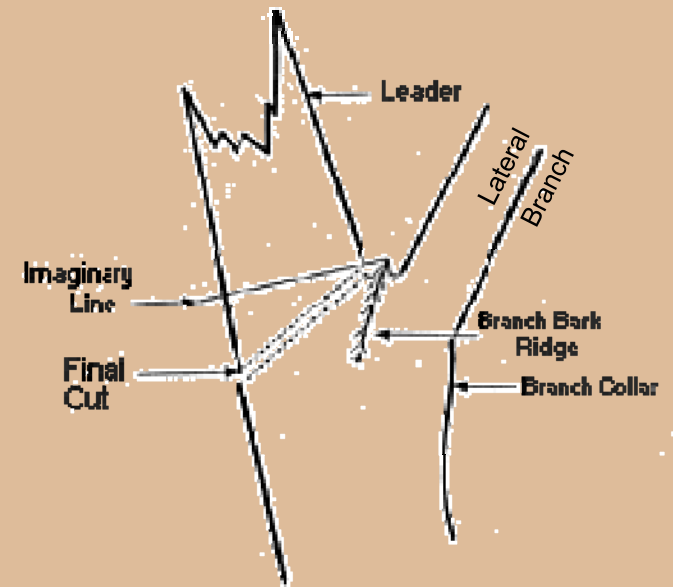


How to prune a double leader. USDA



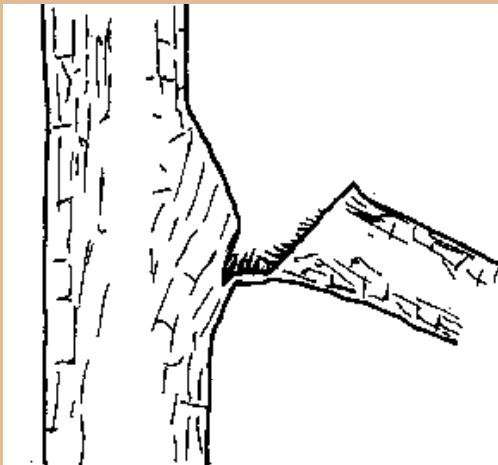
Pruning Leaders or Co-dominant Stems

- When cutting back to a lateral branch, a natural target pruning cut is made by bisecting the angle between the branch bark ridge and an imaginary line made perpendicular to the leader or the branch being removed.
- The cut should slope out and down away from the branch bark ridge, with the bottom of the cut straight across from the bottom of the branch bark ridge.
- A leader can be pruned off where another branch is attached if the remaining branch is healthy and vigorous and at least $\frac{1}{3}$ the diameter of the leader to be removed (so a 6" leader could be removed at a 2" branch).
- No more than about one-quarter of the foliage should be removed from the branch that is being shortened.
- Co-dominant stems are pruned similarly. Removing some of the lateral branches from a co-dominant stem can reduce its growth enough to allow the other stem to become dominant.



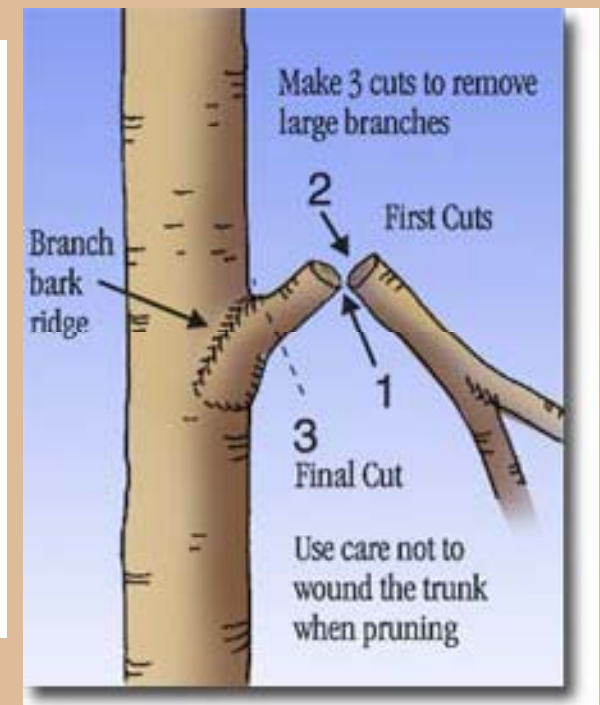
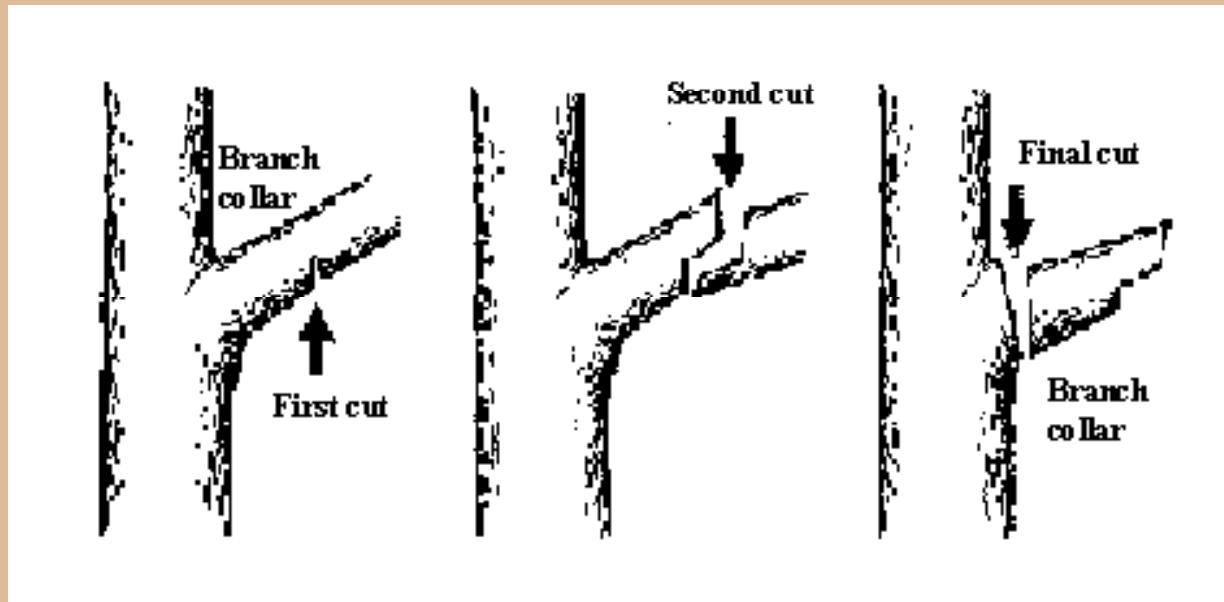
Pruning Large Branches

- To remove large branches (over one inch in diameter) use the three-step cutting method.
- This removes the weight of the limb before the final cut and eliminates the possibility of stripping the bark down the side of the main trunk.



The three-step cutting method:

- 1. Undercut one-third of the way up through the branch one or two feet out from the trunk to prevent bark stripping.
- 2. Cut down and remove limb. A top cut directly into or slightly outside of the undercut will remove most of the branch weight.
- 3. Trim branch stub at branch collar. Make a final natural target cut that removes the stub. Final cuts can be made from the bottom up to the crotch if the branch angle is tight and tools won't fit in the crotch.



Natural Target Pruning

- Natural target pruning is a way to minimize the detrimental effects caused by pruning wounds.
- Remember, that 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:**
 - make flush cuts behind the branch bark ridge.
 - leave living or dead stubs.
 - injure or remove the branch collar.
 - paint cuts.

Pruning Tools

Hand Pruners and Loppers

- Both hand pruners and Loppers are available as anvil or bypass style cutting blades.
- Anvil style has a tendency to crush living tissue, and is generally not recommended.
- Bypass style cuts like a pair of scissors and makes a clean cut which minimizes damage to the live tissue.



- Hand pruners are useful for cutting branches up to $\frac{3}{4}$ " in diameter.
- Loppers will cut branches 2" to 3" in diameter. Larger if the lopper has a compound action cutting mechanism.

Sharpening Hand Pruners and Loppers

- Sharpen bypass pruners and loppers only on the beveled edge of the blade.



- Carbide sharpening tools are frequently the easiest to use. Carbide sharpeners are available that will sharpen one side of a blade, as for scissors, and bypass pruners, or both sides of a blade, as for knives.



Pruning Tools - Saws

- Pruning saws are available as folding saws or as fixed blade saws.
- Folding saws are smaller and conveniently fit in your pocket.
- Fixed blade saws are larger to cut bigger branches.
- Razor-toothed saws cut much easier and faster than conventional saws and are preferred whenever they are available.

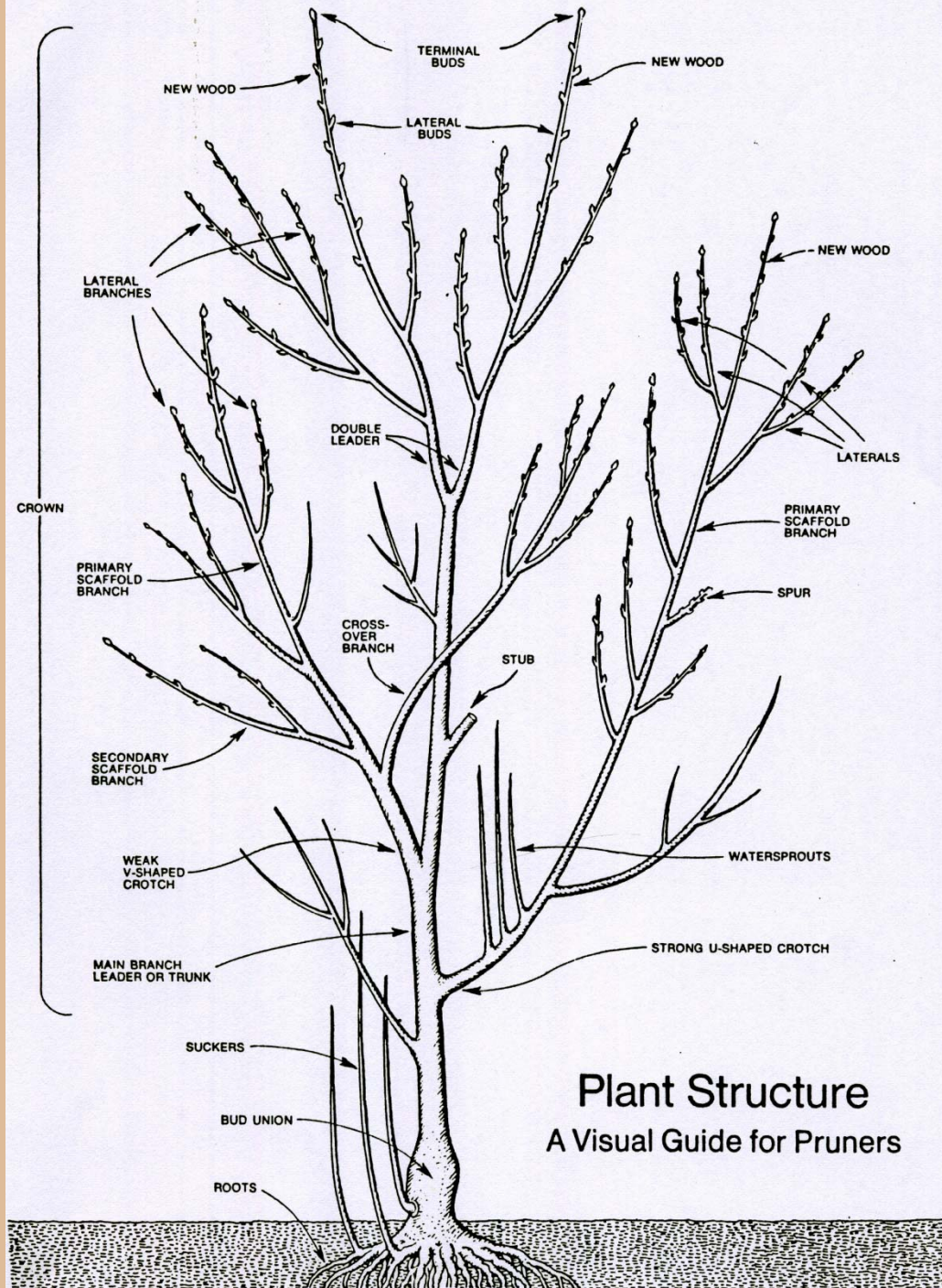


Pruning Tools

Ladders

- Three-legged ladders or orchard ladders are much more stable on slopes or irregular ground than are standard ladders.
- Orchard ladders are available in a variety of heights. They are extremely maneuverable and are usually made of light weight materials such as aluminum or fiberglass.





Plant Structure
 A Visual Guide for Pruners

Types of cuts:

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.

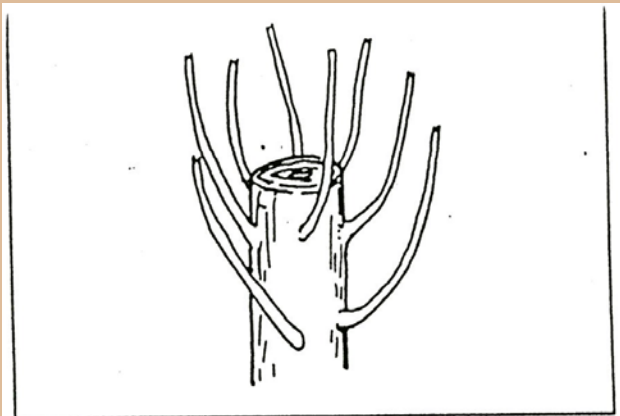
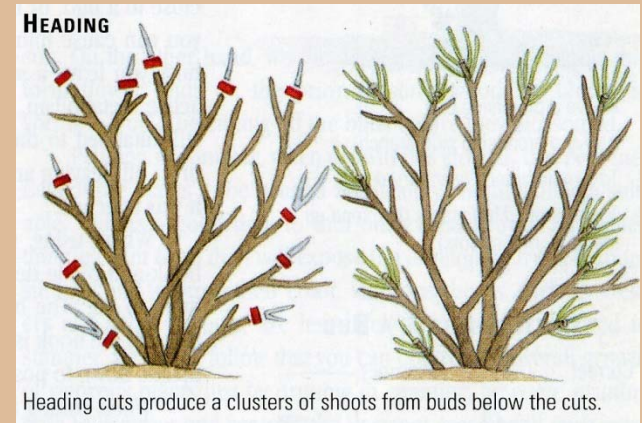


Fig. 8.11 Watersprouts develop profusely following a heading cut.



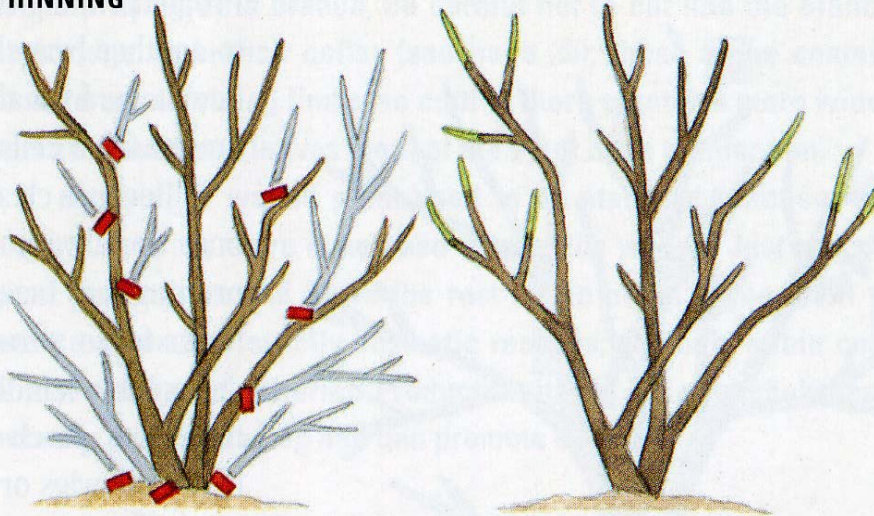
Heading cuts produce a clusters of shoots from buds below the cuts.

Types of cuts:

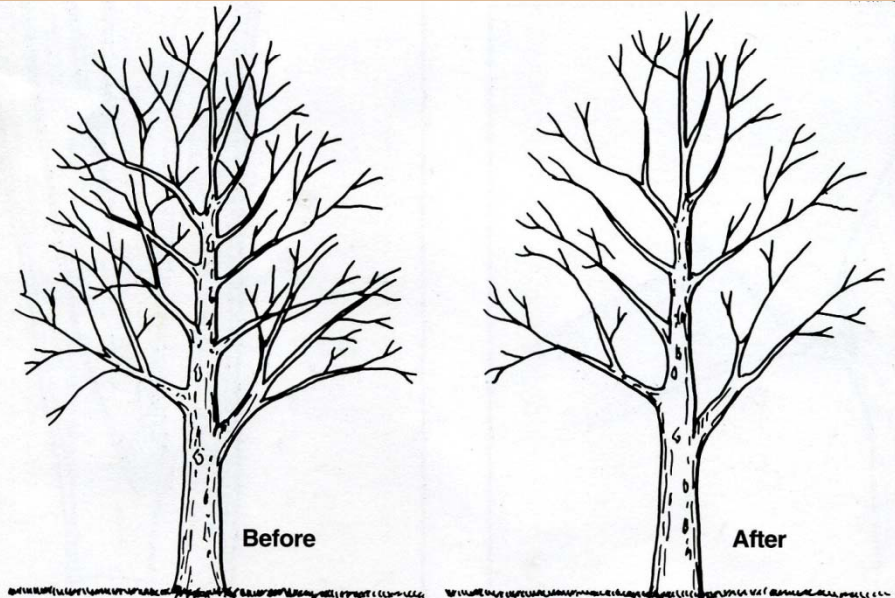
Thinning cuts

- 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).

THINNING

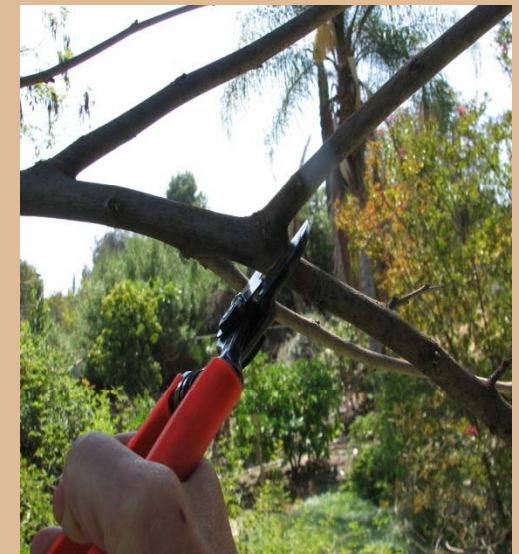
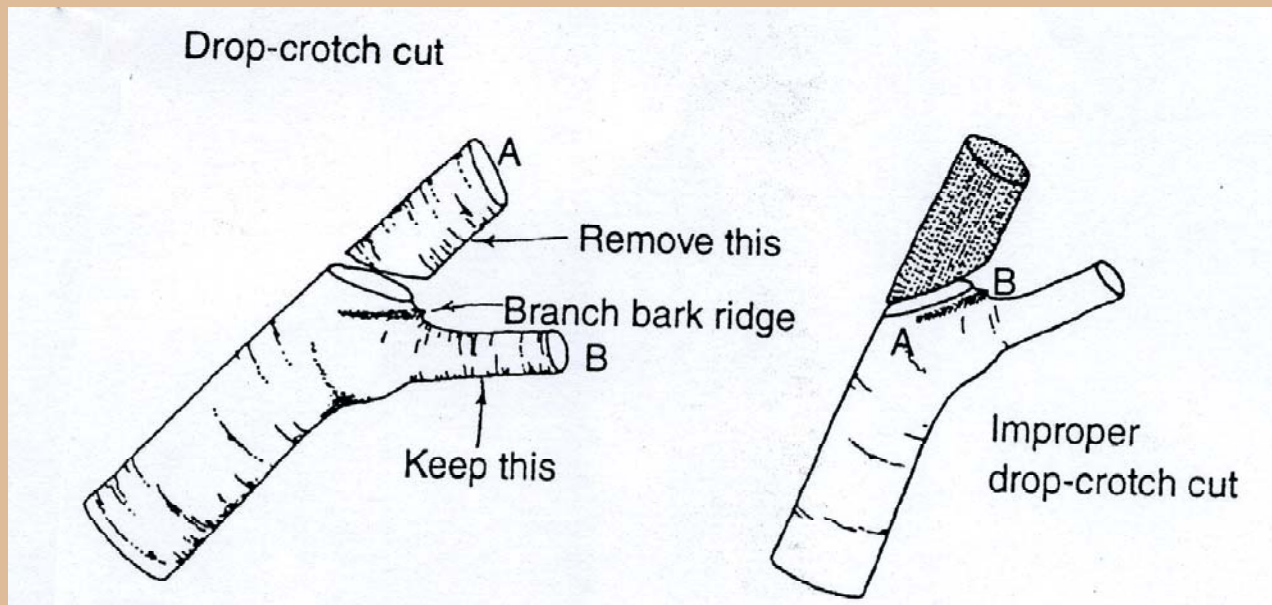
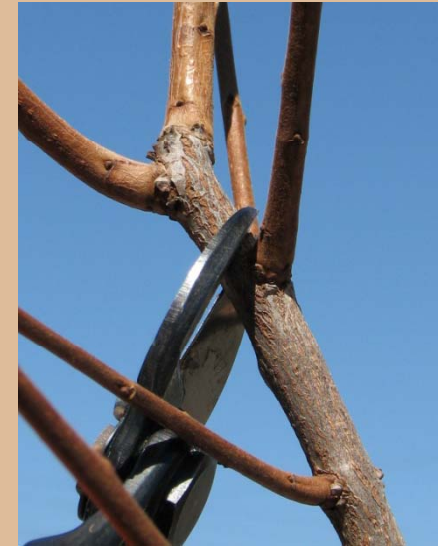


Thinning cuts open up a plant and cause the least amount of regrowth.



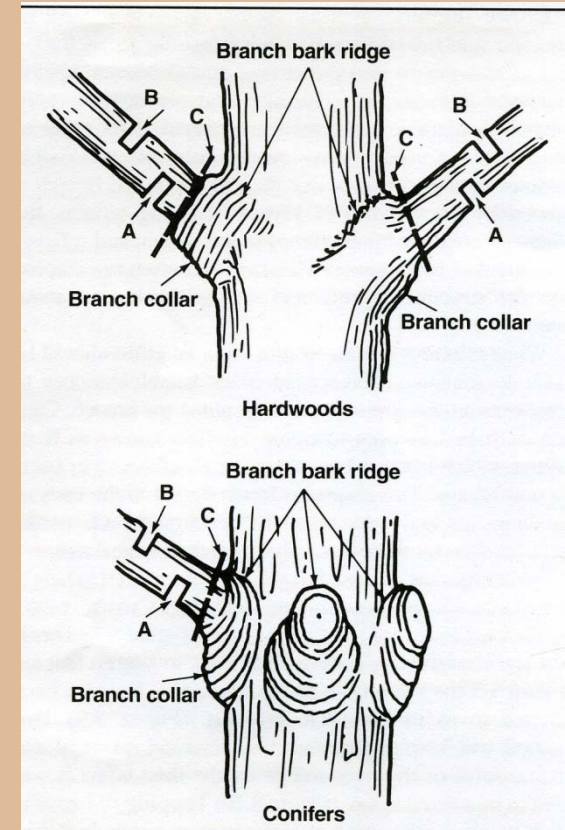
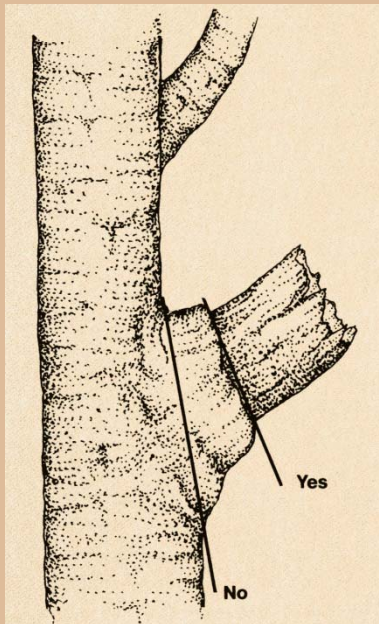
Types of cuts: Drop Crotch cuts

- ◆ Drop crotch pruning is a type of thinning cut and is a recommended method for reducing the size of a plant in both height and width.



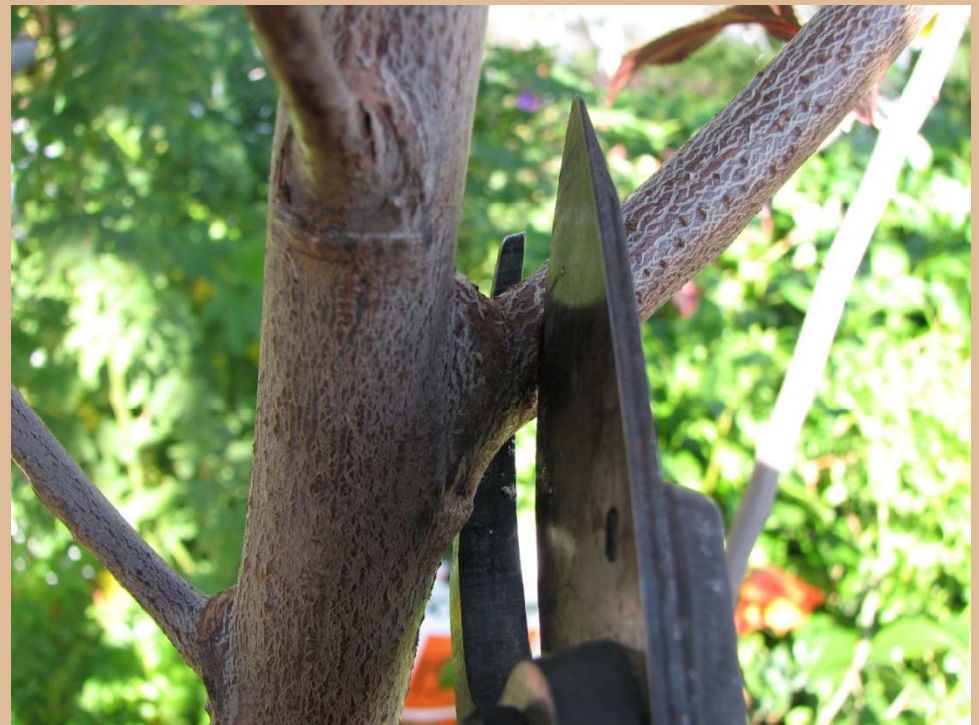
Making proper cuts:

- When making thinning cuts, remove the branch at the top of the collar or shoulder of the remaining branch.
- This will trigger a "wound response" which initiates compartmentalization and callus tissue formation at the wound site.



Making Cuts with Bypass Hand Pruners and Loppers

- Place the cutting blade at the top of the collar to make a correct cut.
- Placing the cutting blade on the outside of the cut will leave a stub above the remaining branch collar.



Making proper cuts:

- Never leave stubs...
The cut will not compartmentalize, and decay and disease will enter the wound.
- Never make flush cuts.
This makes a larger wound which takes longer to compartmentalize and also removes the collar or shoulder which is helpful in triggering the wound response.
- Never make ripped or torn cuts.
- When removing a larger branch, follow the three cut process to prevent damage to the bark.

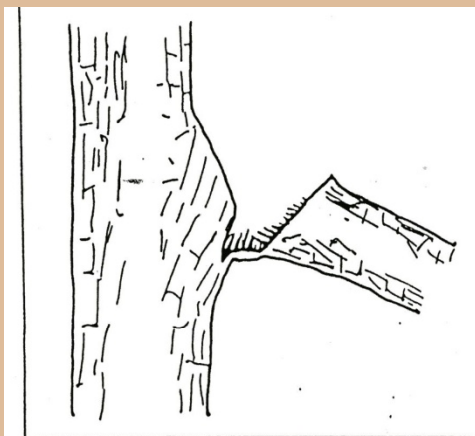
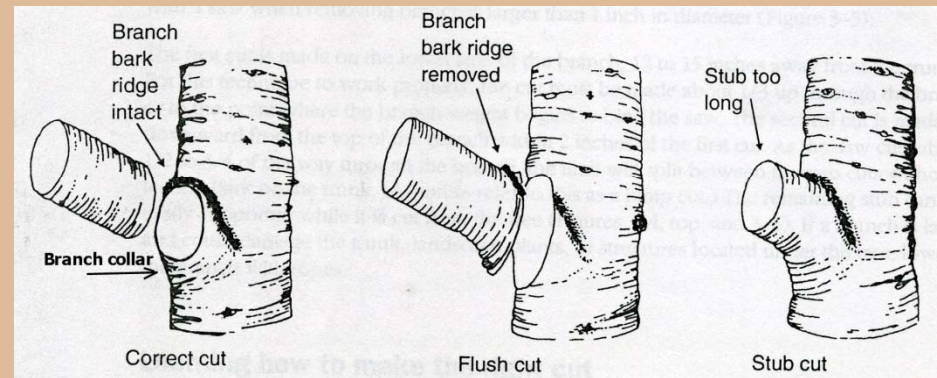
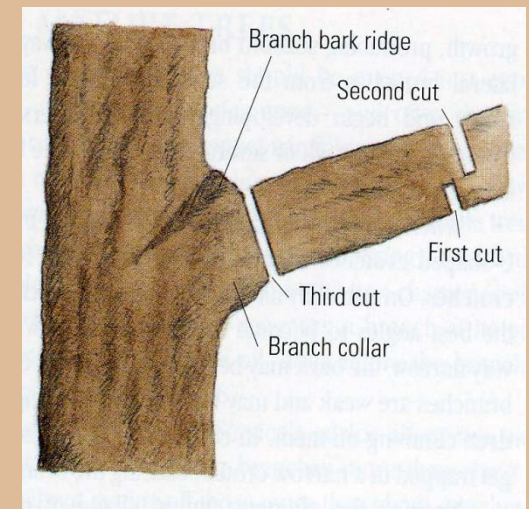
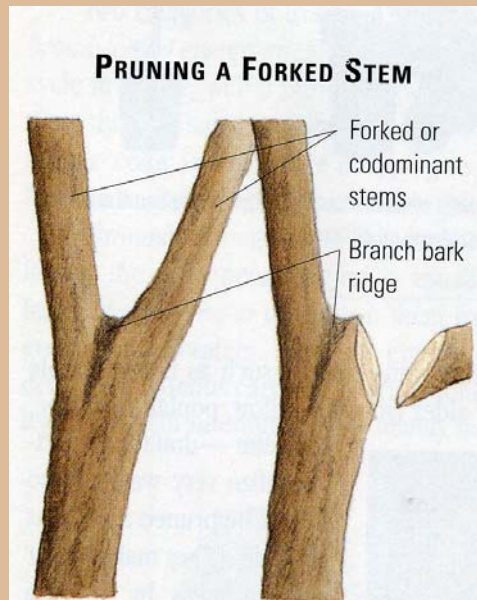
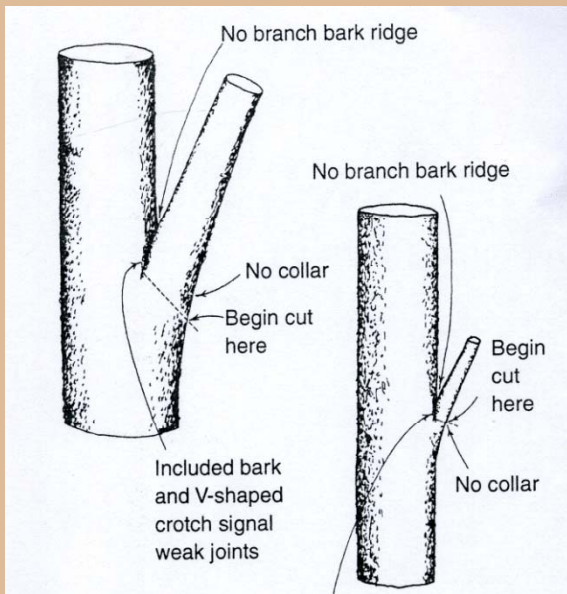
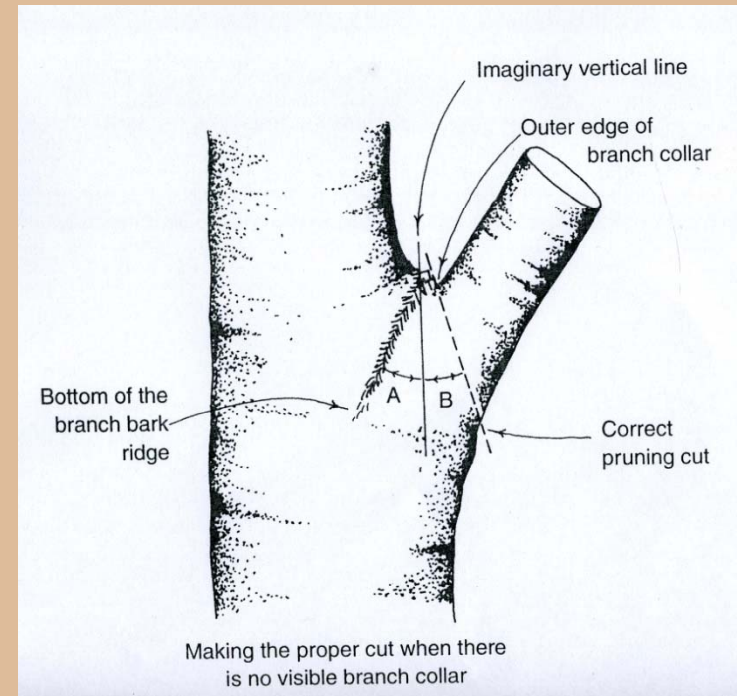


Fig. 8.3 Improper pruning cut. If a heavy limb is not undercut, it may "peel" back, tearing bark and vascular tissues of the parent limb.



Making proper cuts:

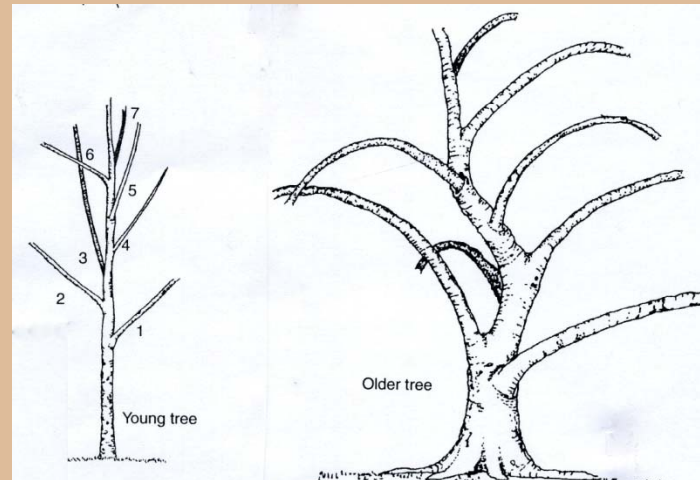
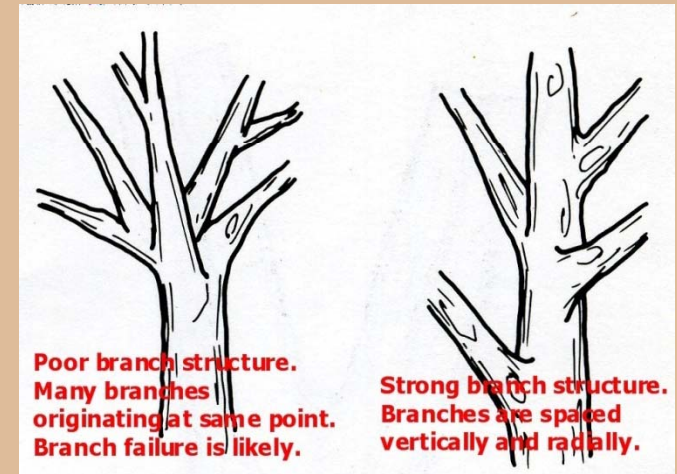
- If no visible collar or shoulder is present, or visible, prune at a mirrored angle to the branch bark ridge.



REASONS TO PRUNE

Structural Strength:

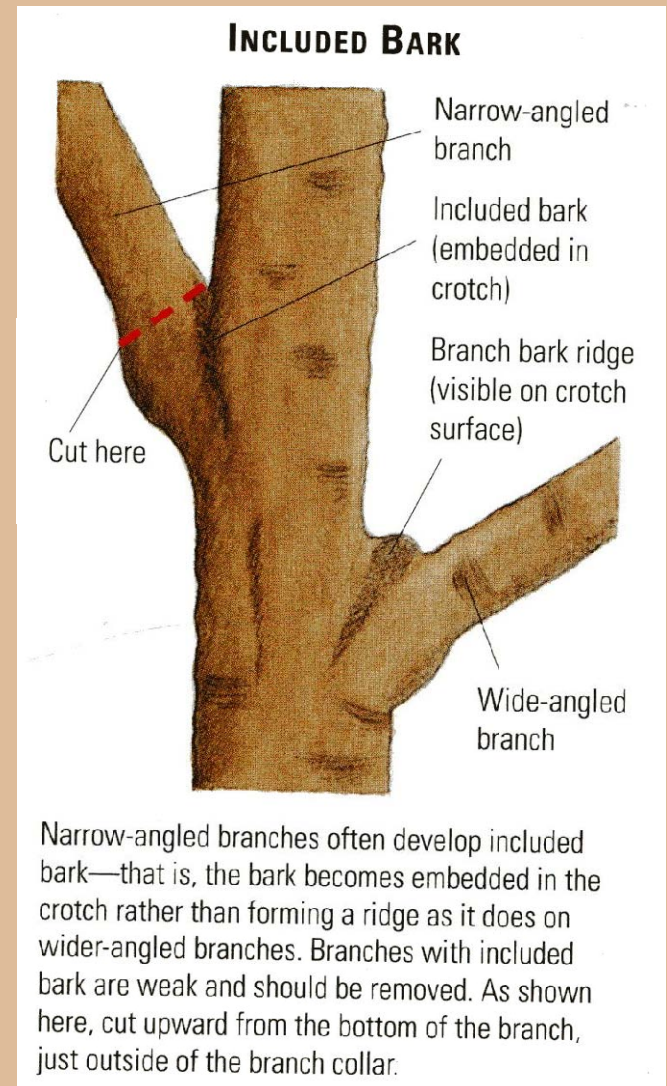
- Pruning for structural strength is especially important on fruit trees. Heavy crops of fruit can easily break branches, severely damaging main scaffold limbs or splitting trunks. Basic guidelines for structural pruning are as follows:
- Train scaffold branches to be spaced along the trunk both vertically and radially when trees are young.



REASONS TO PRUNE

Structural Strength:

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



REASONS TO PRUNE

Structural Strength:

- Remove co-dominant leaders by removing or reducing one of the branches.

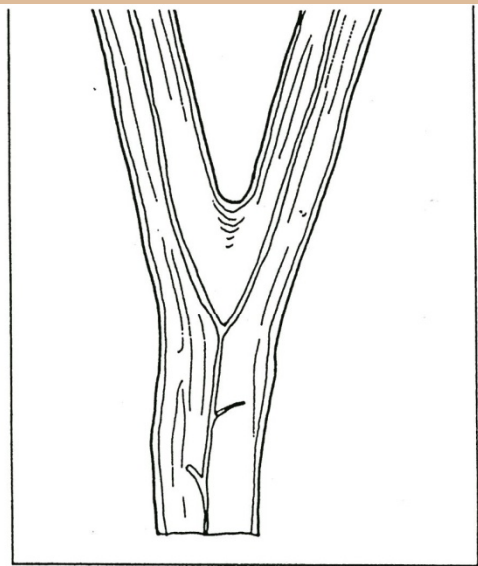
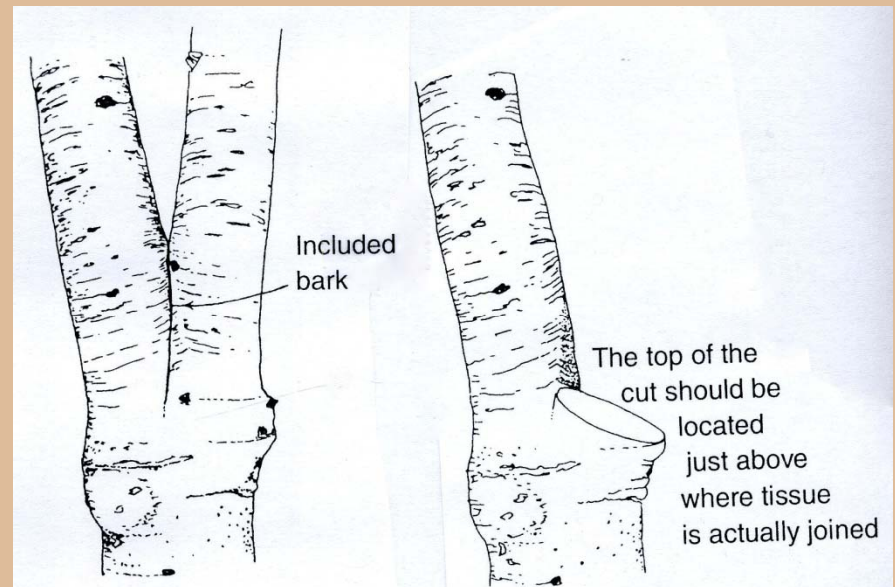
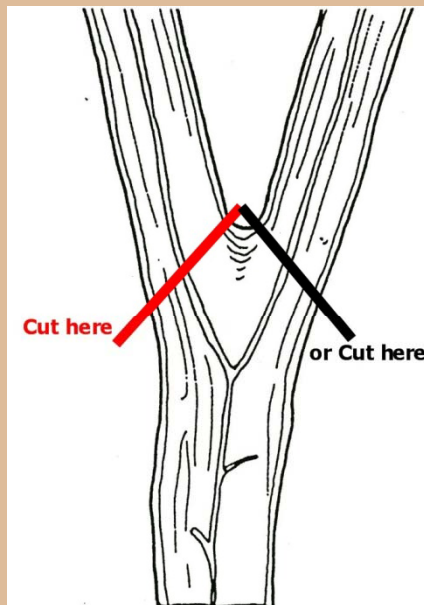


Fig. 8.4 Codominant stems. The nearly equal diameter of the two stems can make them more prone to failure.

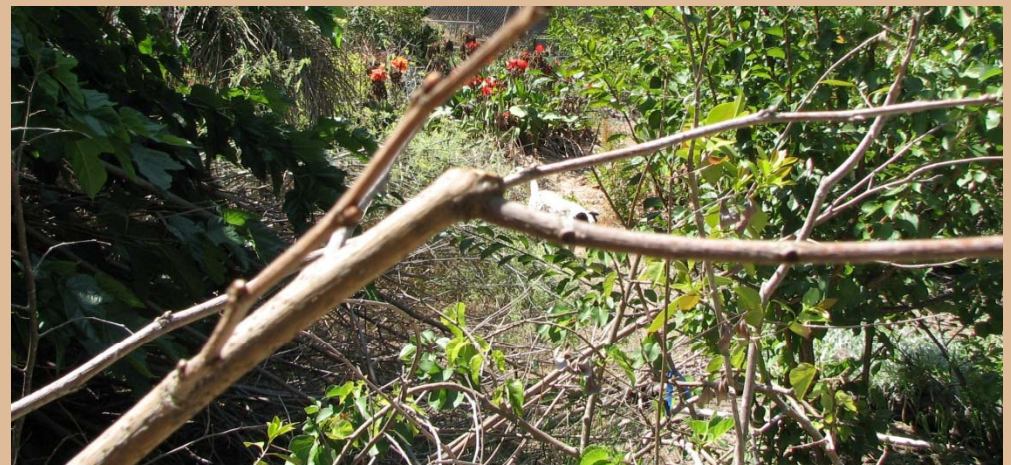
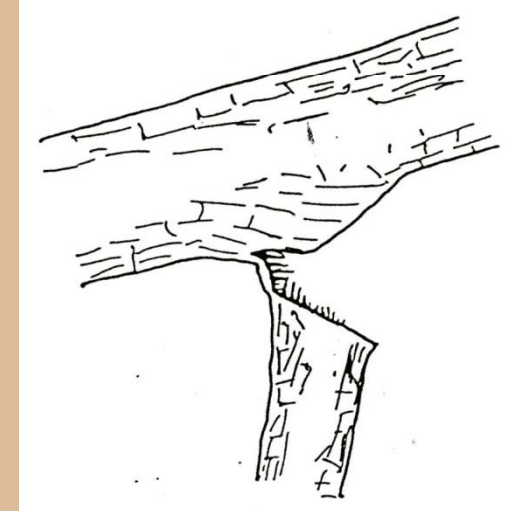


- Occasionally one of the branches can be redirected into a lateral branch by spreading the branch. This redirected branch will no longer be co-dominant. The crotch angle should be spread to 30 degrees or larger.

REASONS TO PRUNE

Structural Strength:

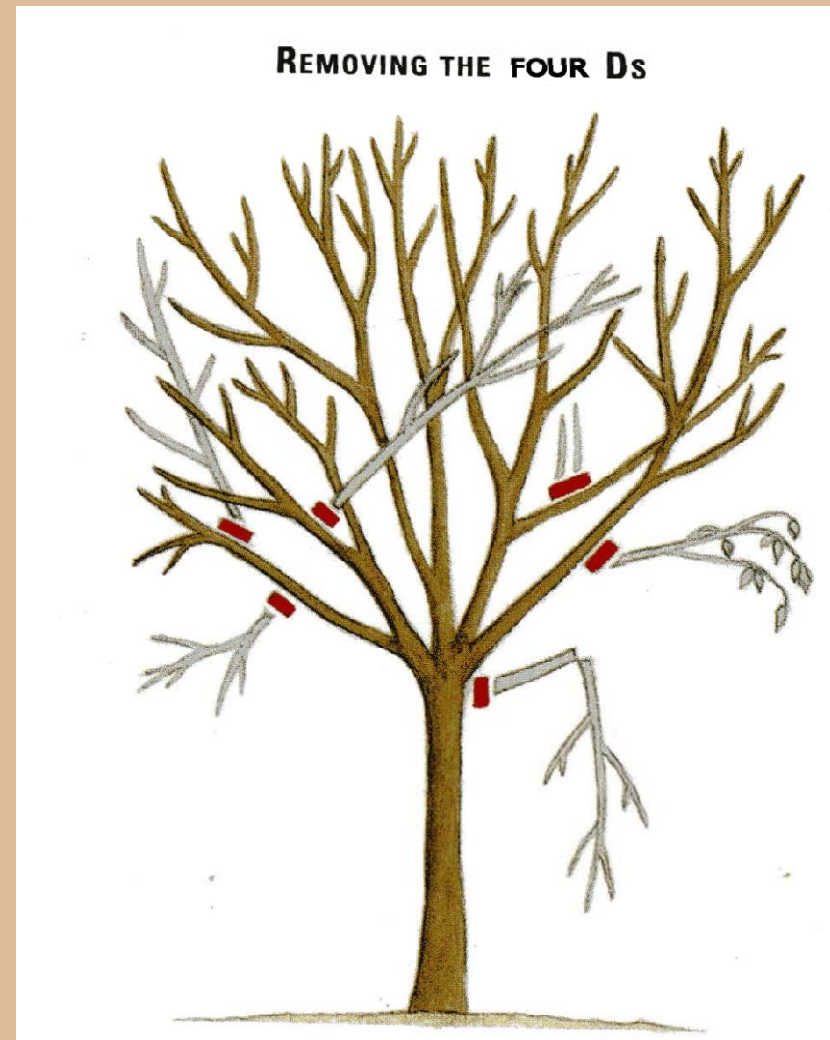
- Prune off branches which are attached to the bottom side of attached branches. (Unless this is going to become the new terminal end of the branch.)
- If these branches break, ripping or tearing of the bark of the supporting branch often results.



REASONS TO PRUNE

Health:

- Prune off the four D's: Dead, Damaged, Diseased and Dysfunctional branches.
- Dysfunctional branches are branches which are pointing towards the ground or are crossing or rubbing other branches.



REASONS TO PRUNE

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.



REASONS TO PRUNE

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.



REASONS TO PRUNE

Shape:

- 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.



REASONS TO PRUNE

Direct or redirect growth

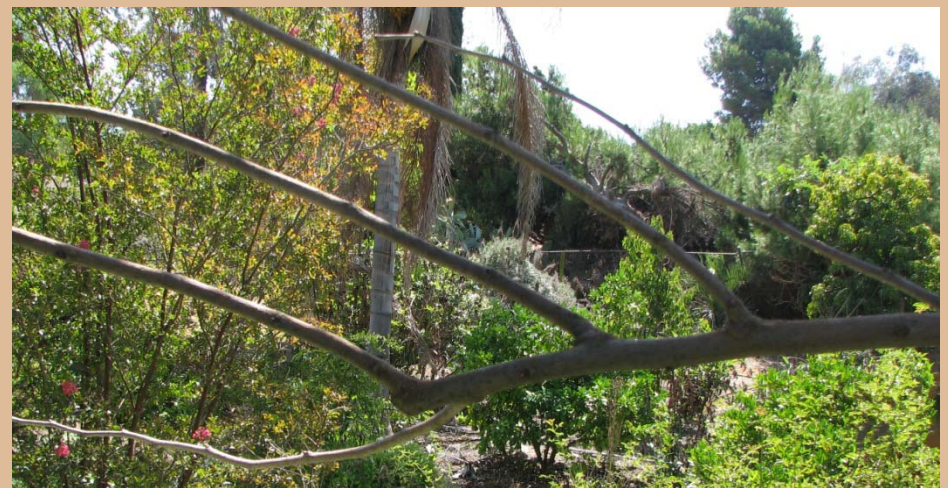
- Manage the growth in the tree so that one branch or side of the tree does not overgrow the other portions of the tree and so that the tree keeps a balanced shape.
- Prune to a terminal branch to direct growth in that direction.
- As branches bend downward from the weight of fruit, foliage, or wood, 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.



REASONS TO PRUNE

Direct or redirect growth

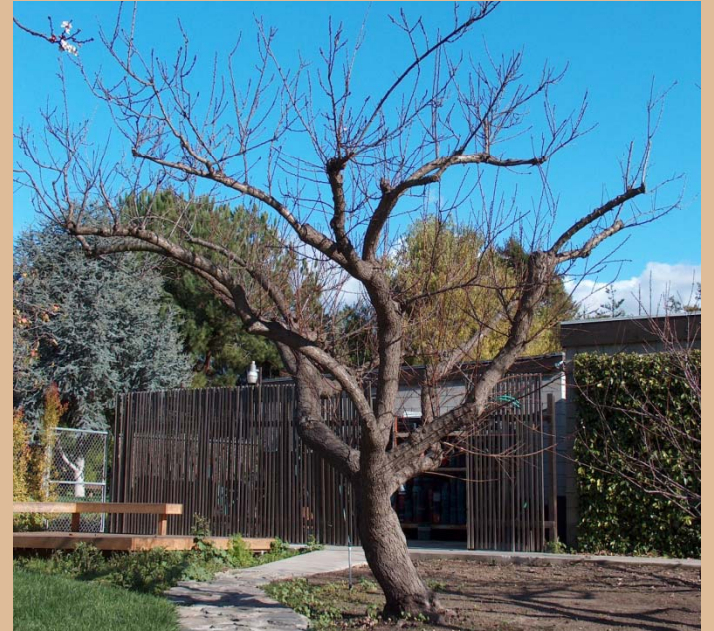
- As branches bend downward, redirect growth using drop-crotch pruning techniques to a side or top branch to redirect growth upwards.



REASONS TO PRUNE

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!!!

- 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!

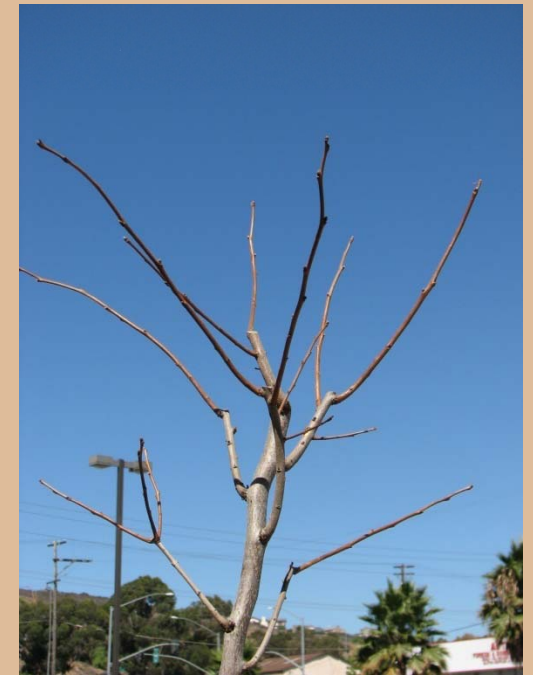
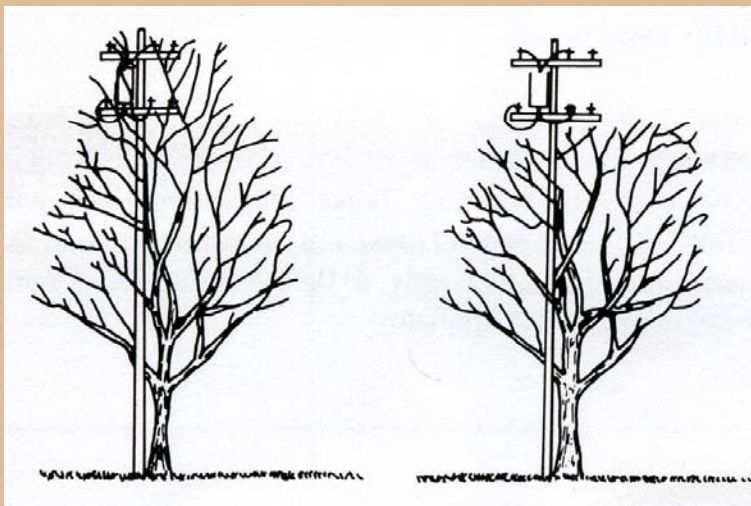


- The only exception is when you are pollarding a tree or creating a hedge.



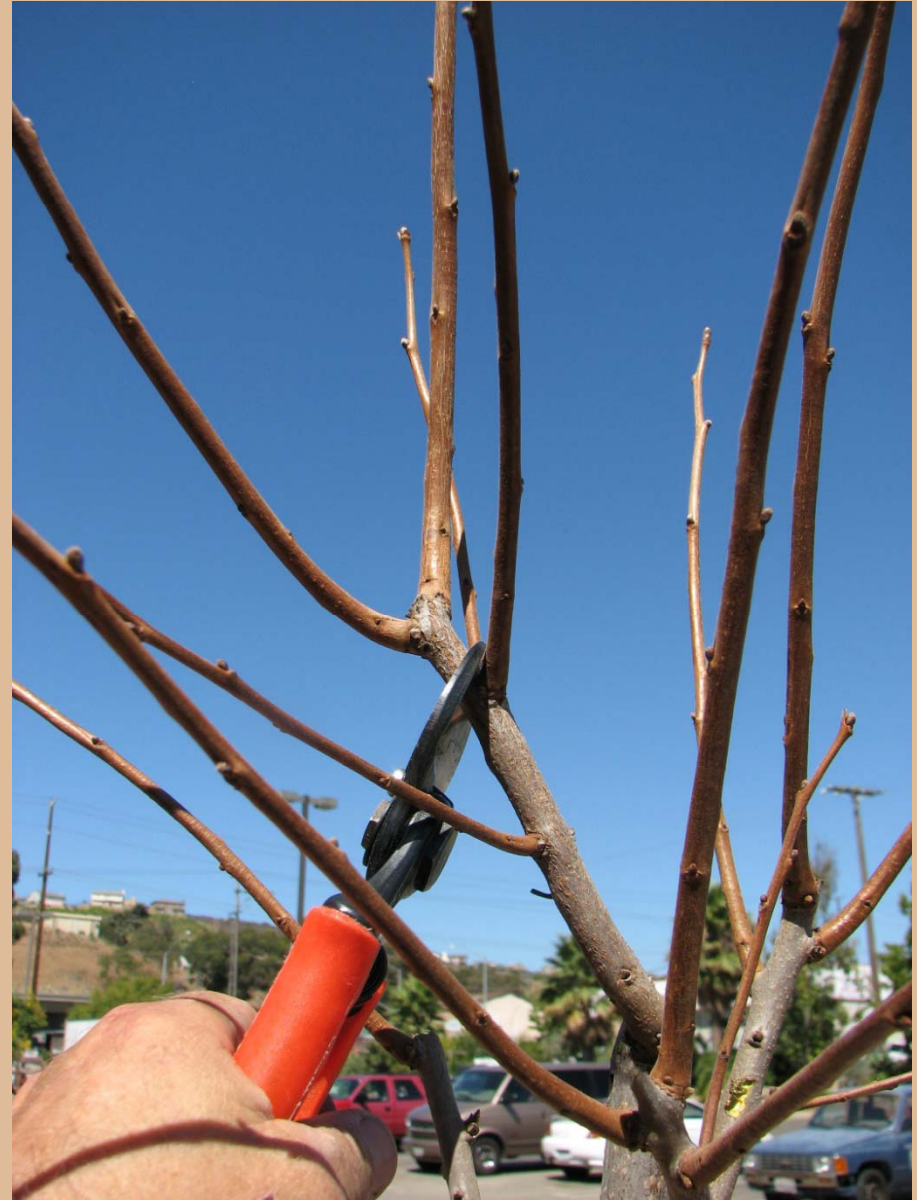
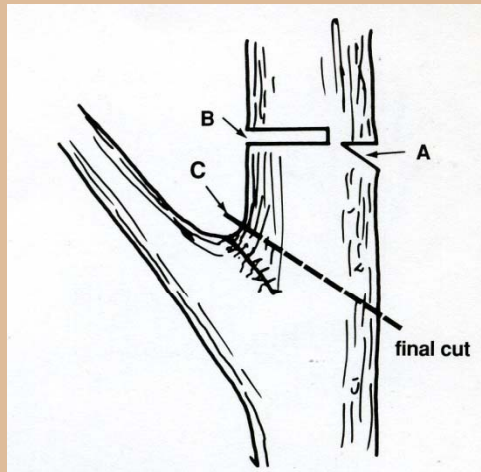
Never top or head branches or trees!!!

- 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.



Drop Crotch Pruning

- Drop crotch pruning is to prune a branch by dropping back from the apical tip to a lower lateral branch. This lateral branch should be at least $\frac{1}{3}$ the diameter of the branch which is being removed.
- A pruning cut is then made at the top of the collar of the lateral branch.



Drop Crotch Pruning

- Each branch is pruned individually, reducing the height or width of the entire tree.



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.

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

- 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.



Identifying Fruit-bearing wood

- Fruit trees may bear fruit on short-lived (3-5 years) or long-lived (5-10 years or more) fruiting spurs, on last years growth, or on current season growth.
- 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.
- Each type of fruiting plants bears fruit on wood of a specific age.
- Fruit wood should be managed to keep trees productive as well as to prevent over production and to help prevent limbs from breaking.

FRUITING HABITS OF COMMON DECIDUOUS FRUIT AND NUTS

Current-Season's Shoots

- Che
- Fig — second crop
- Mulberry
- Persimmon
- Quince
- Walnut

Previous-Season's Shoots

- Fig — first crop
- Filbert
- Nectarine
- Peach
- Pistachio
- Quince

Previous-Season's Spurs and Shoots

- Apple — minor
- Cherry, sour
- Pear — minor
- Pomegranate

Long-lived Spurs

- Almond
- Apple
- Apricot and Aprium— short-lived spur
- Cherry, sour
- Cherry, sweet
- Pear
- Pecan
- Plum,
- Plumcot
- Pluot
- Pomegranate

Current-Season's Shoots



Fig



Avocado



Citrus



Surinam Cherry

Previous-Season's Shoots



Peach and
Nectarine



Pomegranate



Fig



Mulberry



Loquat

Fruiting Spurs - Apricot



Fruiting Spurs - Plum



Fruiting Spurs -Apple



Fruiting Spurs - Pear



Managing Fruiting Spurs



- As time progresses, fruiting spurs and fruiting wood becomes excessively crowded. This often results in small, poor quality fruit and broken limbs.



- Thin out spurs and fruiting branches to improve light penetration and air circulation, reduce overcrowded fruit, reduce the risk of broken branches and to improve the quality of the remaining fruit.





FRUIT TREE PRUNING BASICS

Better Ways to Prune for Tree Health & Long Tree Life

By Tom Del Hotal



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