



# Colorado MASTER GARDENER

## Pruning Cuts

no. 7.821

*by D. Whiting, J. Bousselot, R. Cox, and C. O'Meara'*

### Outline. . .

Size of Branch to Remove,  
page 1

Thinning Cuts, page 1

Reduction Cuts, page 3

Heading Cuts, page 4

Three Cut Method, page 5

Wound Dressing, page 5

Time of Year to Prune, page 5

Amount of Wood to Remove,  
page 6

Hiring a Qualified Tree Pruning  
Professional, page 6

Additional Information, page 6

As forest scientists observed how trees respond to wounds, pruning techniques changed and pruning objectives were clarified. Plants don't heal. Instead tissues in the injured area, called the **reaction zone**, undergo chemical changes to **compartmentalize** or seal-off the damaged area from the surrounding tissues in an attempt to suppress the spread of decay. For details on tree growth and decay, refer to fact sheet 7.820, *Tree Growth and Decay*.

A pruning cut may or may not predispose the tree to internal decay and stress depending on the type of cut used, technical precision of the cut, size of the branch removed and general health of the tree.

In pruning, there are three primary types of pruning cuts, **thinning cuts** (natural target pruning cuts), **reduction cuts**, and **heading cuts**, each giving different results in growth and appearance.

### Size of Branch to Remove

Ideally, all pruning cuts are made on branches less than 2 inches in diameter. **Woundwood** (the callus tissue that grows over pruning cuts or wounds) quickly grows over these small pruning cuts.

Any cut on a branch larger than 4-inch diameter should be justified, taking into account the potential for decay.

### Thinning Cuts

**Thinning cuts** remove a branch back to the larger parent branch or trunk. Thinning cuts have the advantage that they preserve the **branch defense zone**, giving a strong defense against internal decay.

Thinning cuts reduce the canopy density but generally have little impact on height. Thinning allows better light penetration into the canopy, which encourages desired growth of interior branches and reduces foliar disease problems. This improves trunk taper and increases the general vigor of primary branches and trunk. Thinning cuts reduce the weight on large branches, giving the tree resilience to snow loads. The primary use of thinning cuts is on middle-aged and older trees and on shrubs.

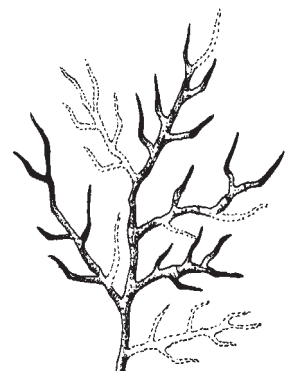


Figure 1. Thinning cuts remove a branch back to the trunk or parent branch. This opens the plant's interior to light and air circulation, promoting a tree's health and vigor. Thinning cuts give a strong defense against internal decay.

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Two features on the branch, the branch collar and the branch bark ridge, help identify the proper cut angle. The **branch collar** is the area where the annual growth rings of the trunk fold in between the annual growth rings of the branch, in a manner similar to shuffling a deck of cards. On some species, the branch collar is readily noticed while on other species the branch collar is less obvious.

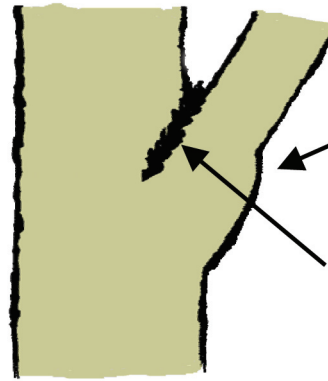


Figure 2.  
**Branch Collar**  
Trunk tissues overlap with branch tissues.  
**Branch Bark Ridge**  
is where trunk bark meets branch bark.

The **branch bark ridge** is where the bark from the trunk/parent branch joins the bark from the side branch. It looks like a dark line or small mountain range extending out from the **branch union** (crotch) down both sides of the trunk/branch. It is the mirror angle of attachment for the side branch.

Within the branch collar is a narrow cone of cells called the **branch defense zone**. These cells activate the growth of **woundwood**, the callus tissue that grows over the pruning cut. The branch defense zone also plays an important role in activating a strong reaction zone inhibiting the spread of decay organisms into the trunk.

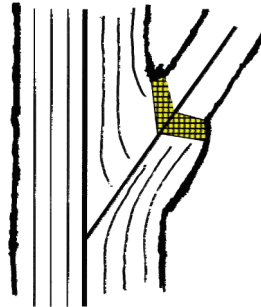


Figure 3. Within the branch collar is the branch defense zone, a narrow ring of cells that effectively initiate chemical changes that protects the trunk/branch from decay. If the branch collar is cut or nicked in the pruning, the defense zone may fail, predisposing the wound to decay.

If the branch collar is injured or removed during pruning, the branch defense zone fails, limiting the growth of woundwood and predisposing the cut to decay. Thus, a primary objective in a correct thinning cut is to preserve the branch collar intact.

With a **thinning cut**, the final pruning cut should be just beyond the branch collar. Since the woundwood that grows over the pruning cut originates in the branch defense zone, it is imperative that the branch collar is not cut or otherwise injured in pruning. To eliminate error, cut a little beyond the collar region (i.e., 1/8 inch for small diameter twigs, and 1/4 inch for larger branches).

In species where the branch collar is not clearly identifiable, look for the branch bark ridge. Make the final cut at the angle that mirrors (opposite) the angle of **branch bark ridge**.

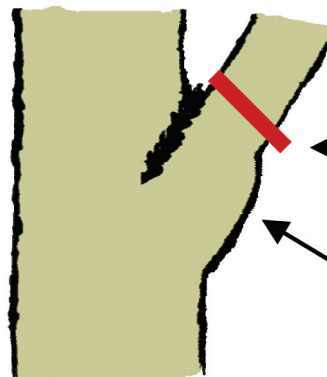


Figure 4.  
**Final Cut**  
made just outside the branch collar, taking care not to nick the branch collar.  
**Branch Collar**  
Trunk tissues overlap with branch tissues.

As discussed in fact sheet 7.820, *Tree Growth and Decay*, for a branch collar to develop, the side branch must be less than half the diameter of the trunk/

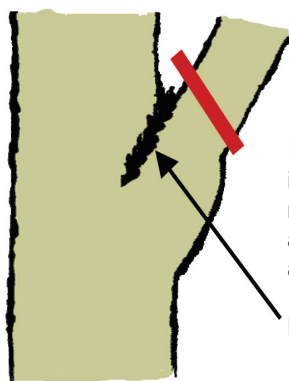


Figure 5. When the branch collar is not clearly identifiable, make the final thinning cut at the angle that mirrors the angle of the branch bark ridge.

**Branch Bark Ridge**

parent branch. In situations where a thinning cut is being made at a branch union without a branch collar, make the final cut at the angle that mirrors (opposite) the angle of branch bark ridge. Be aware that in this situation, there is no branch defense zone to activate rapid woundwood growth and a strong reaction zone to suppress the potential for decay.

With a proper cut, the woundwood grows out from all sides in a donut-shape over the wound. If the branch collar is nicked, the woundwood does not grow from that point. It is common to see a pruning cut where the woundwood fills in only from two sides, indicating that the top and bottom of the branch collar were injured.

When removing a dead branch, the final cut should be just outside the branch collar of live bark tissue. If the branch collar has begun to grow out along the branch, remove only the dead stub, leaving the collar intact. Do not cut into living tissues.

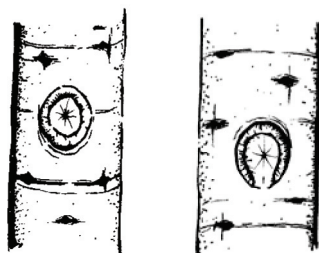


Figure 6. On the left, a proper pruning cut was made. Woundwood grows over the cut in a donut-like fashion. On the right, the pruning cut nicked the branch collar on the bottom. See how the woundwood fails to grow where the collar was nicked.

## Reduction Cuts

**Reduction cuts** remove a larger branch back to a smaller-diameter side branch. Reduction cuts are commonly used in training young trees. They are also the only type of cut that will significantly lower a tree's height.

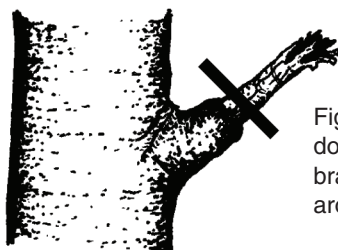


Figure 7. When removing a dead branch, do not cut into or otherwise damage the branch collar or woundwood growing around the dead branch.

However, reduction cuts do not have a branch defense zone, leaving the branch with a weak defense against decay. This is not a major concern on young, actively growing branches. However, reduction cuts are discouraged on mature trees and on limbs larger than 2-inch diameter. On trees under stress or in decline, avoid reduction cuts as it can accelerate the decline.

In a reduction cut, make the final cut to bisect (split the difference) between the branch bark ridge angle and an imaginary line perpendicular to the stem being removed.

To prevent undesired suckering at this point, the diameter of the smaller side branch should be at least one-third (one-half preferable) the diameter of the larger branch being removed. If the diameter of the smaller branch is less than one-third the diameter of the larger branch being removed, the cut is considered a heading cut.

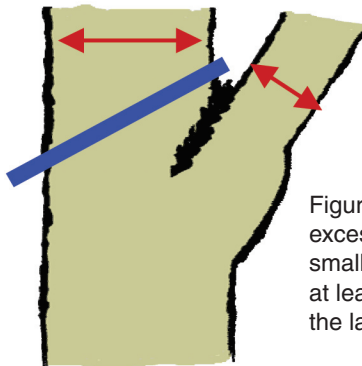


Figure 9. To prevent excessive suckering, the smaller branch should be at least 1/3 the diameter of the larger branch.

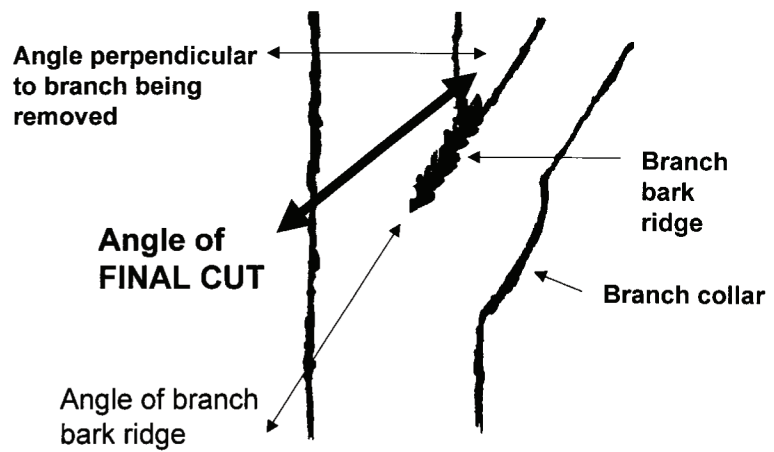


Figure 8. **Reduction cut** – When pruning back a larger branch to a smaller branch, the angle of the final cut should split the difference between the angle of the branch bark ridge and the angle perpendicular to the branch being removed.

## Heading Cuts

Figure 10. This adventitious sucker growth from a reduction cut is structurally unsound and prone to storm damage as it grows.



**Heading cuts** remove the growing tip of a branch. This releases the side buds to grow, resulting in a more dense growth at the point of pruning.

Heading cuts are undesirable for most pruning objectives on shade trees. Topping a tree with heading cuts give a surge of new branch growth at the tree's top. The new growth is often structurally unsound and prone to storm damage. Growth in the tree's interior thins out from increased shading, decreasing the tree's overall health and vigor.

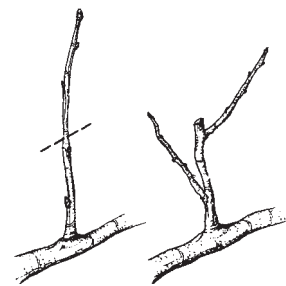


Figure 11. Heading cuts remove the growing tip of a branch releasing side buds to grow.

Another type of undesirable heading cut is the removal of a large branch back to a smaller side branch when the side branch is less than one-third the size of the larger branch being removed. Structurally unsound suckers often emerge along the branch and the tree may become more unsound than before the pruning.

On shrubs, heading cuts or "shearing" creates a very dense upper/outer canopy that shades out the lower/inner portion, creating a woody base.

## Three-Cut Method for Larger Branches

When removing any branch larger than 1-inch diameter, use a three-cut method to protect the bark from tearing.

- Cut 1. Coming out 12 to 15 inches from the branch union (crotch), make an undercut approximately one-third to half way through the branch.
- Cut 2. Moving a couple of inches out past the first cut, make the second cut from above, removing the branch. This double-cut method prevents the weight of the branch from tearing the bark below the collar.
- Cut 3. Make the third and final cut at the correct pruning point. For example, on a thinning cut, just outside the branch collar. For woundwood growth, take extra caution not to cut into or otherwise injure the branch collar.

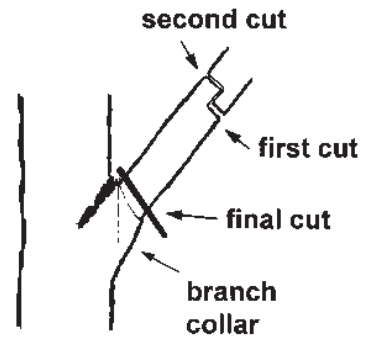


Figure 12. Use this method of pruning for branches larger than 1 inch.

## Wound Dressings

Wound dressings do not prevent decay organisms from moving in. In fact the older tar-type dressings actually interfere with the natural woundwood growth and may create conditions favorable for decay organisms. Generally, leave pruning cuts dry and untreated.

Occasionally a thin layer of water-based dressing or paint may be applied solely for aesthetic purposes. Never use an oil-based paint, tar or other materials that contain petroleum solvents. A dark-colored material over a wound may predispose the wound site to winter injury. In some disease management situations, like fire blight, a fungicide may be used as a wound dressing.

The key to good wound closure is proper pruning, making a smooth cut just beyond the branch collar, and making all cuts on branches less than 2 inches in diameter. Trees under stress (soil compaction, drought, overly-wet soils, insect or disease problems, lawnmower damage to the trunk, etc.) are less capable of fighting the invasion of decay organisms.

## Time of Year to Prune

Dead, diseased and damaged wood can be removed anytime of year, as needed.

When it comes to removing live wood, there are better times of year for pruning. Light pruning-up to 10 percent of the foliage-may generally be done anytime of year on healthy trees without stress factors.

**Late winter**-Pruning in the late dormant season (before buds swells) is considered the routine pruning time on many tree species. It may be the best time to prune young trees where growth is desirable. However, some species (including Birch, Black Locust, Elms, Goldenchain tree, Hackberry, Japanese Pagodatree, Kentucky Coffeetree, Maple, Mulberry, Poplar, Walnut, and Willows) are prone to bleeding if pruned in the spring. While this is more of a cosmetic issue than a health issues, most arborist avoid pruning bleeders late dormant season.

**Spring, during growth flush** is generally considered an undesirable time to prune trees. The bark and cambium tissues are easily damaged. It may stimulate excessive sucker growth, or may reduce tree overall vigor.



**Mid-summer following growth flush** (as leaves reach full size, harden and turn dark summer green) is considered an excellent time to prune. It's the preferred time for spring bleeders. It may give a slight temporary slowing of growth that may be desirable on some trees and undesirable on others. It may be the best time of year to suppress decay potential.

**Late summer to fall** is generally considered an undesirable time to prune. It may stimulate canopy growth and interfere with winter hardiness.

**Late fall to early winter** is generally considered an undesirable time to prune. Extreme cold (below zero) may cause cambium damage near the pruning cut.

**Drought** - Do not remove live wood from trees in drought stress. This removes stored carbohydrates that the tree is living on during the stress.

**Pest management consideration** - In some insect management programs, pruning may need to be timed before insect flight periods or avoided during insect flight periods.

## Amount of Wood to Remove

Dead and broken branches can be removed anytime. Removal of live wood is generally limited to 10 to 15 percent of the foliage per year. Under special need, a healthy young to medium age tree without stress factors may have up to 25 percent of the foliage removed per season. A healthy mature tree without stress factors may have up to 20 percent of the foliage removed per season. Live wood should not be removed on trees under stress or on older trees in decline.

When heavier pruning is needed, it should be done over a period of years. Removal of too much foliage in a season puts the root system under stress and may lead to structurally unsound sucker growth.

## Hiring a Qualified Tree Pruning Professional

Pruning large trees is a safety issue, beyond the training and experience of most home gardeners. Hiring a bonded professional is the best approach for most tree pruning jobs. Many are listed in the phone book yellow pages. Look for arborists or tree pruning professionals with **International Society of Arboriculture** or **National Association of Arborists** credentials. Also ask about liability insurance coverage.

## Additional Information

### Fact Sheets on Pruning

- 7.820, *Tree Growth and Decay*
- 7.821, *Tree Decay and Pruning Cuts*
- 7.822, *Structural Training of Trees with a Central Leader*
- 7.823, *Structural Training of Trees with Multiple Scaffold Branches*
- 7.824, *Structural Training of Trees – Pruning Flow Chart*
- 7.825, *Pruning Mature Shade Trees*
- 7.826, *Pruning Flowering Shrubs*
- 7.827, *Pruning Evergreens*

### Books

Edward F Gilman. *An Illustrated Guide to Pruning*, Second Edition. Delmar. 2002

### Web

<http://hort.ifas.ufl.edu/woody/pruning/>

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*<sup>1</sup>D. Whiting, Colorado State University, Cooperative Extension consumer horticulture specialist and Colorado Master Gardener coordinator; J. Bousselot, Extension horticulture agent, Douglas County; R. Cox, Extension horticulture agent, Jefferson County; and C. O'Meara; Extension horticulture assistant, Boulder County.*

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