

GardenNotes #612

Developing Strong Branch Unions

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Developing a Strong Branch Union

Note: In this publication the term “trunk” refers to the trunk or parent branch and “side branch” refers to the adjacent side branch arising from the trunk (parent branch). The same relationship exists between a side branch and secondary side branch.

Most storm damage in Colorado landscape trees results from failures at the **branch union** (crotch) primarily with **co-dominant trunks** (adjacent trunks of similar size). Primary objectives in training young trees are to develop strong branch unions and eliminate structurally weak co-dominant trunks.
[Figure 1]



Figure 1. Co-dominant trunks (adjacent trunks of similar size) account for the majority of storm damage in Colorado landscapes.

Structural strength of a branch union is based on the development of a **branch collar**. The branch collar is where the annual growth rings of the trunk overlap the annual growth rings of the side branch like shuffling a deck of cards. In lumber the branch collar is called the knot.
[Figures 2 and 3]

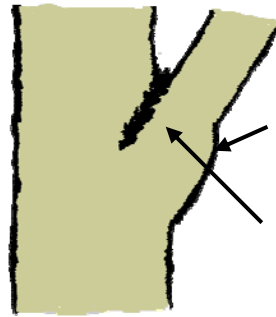


Figure 2. Structural strength of the branch union (crotch) is based on development of a branch collar.

Branch Collar

Trunk tissues overlap with side-branch tissues

Branch Bark Ridge

Trunk bark meets branch bark

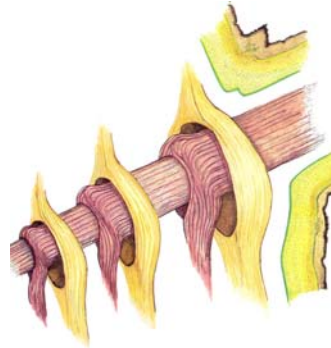


Figure 3. The branch collar is where annual growth rings of the trunk overlap the annual growth rings of the side branch like shuffling a deck of cards. This creates a very solid section of wood, known as the “knot” in lumber.

As the branch collar develops, side branch tissues connect into the trunk in a wedge-shape making a structurally strong unit. For the branch collar to develop, the side branch must be less than half the diameter of the adjacent trunk. Less than one-third is preferred. If the side branch is too large in diameter, prune back the side branch significantly to slow growth or remove the branch entirely. [Figure 4]

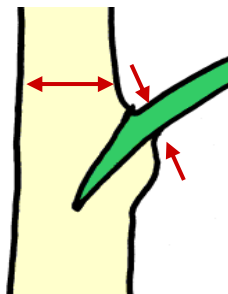


Figure 4. As the branch collar develops, side branch tissues connect into the trunk in a wedge-shape making a structurally strong unit. For the branch collar to develop the diameter of the side branch must be less than half the diameter of the adjacent trunk. Less than one-third is preferred.

A branch collar will not develop on co-dominant trunks (adjoining trunks of similar size) making this branch union structurally weak. [Figure 5]

Multiple branches arising at the same location also compromise the branch collar’s structural strength. Some tree species (like elm, maple, and crabapple) naturally develop multiple branches at one location. This predisposes the tree to storm damage if the situation is not corrected by structural training when the tree is young. [Figure 5]



Figure 5. (Left) A branch collar does not develop on co-dominant trunks making the branch union structurally weak. (Right) Multiple branches arising at the same location are also structurally weak as the branch collars can't knit together into a strong union.

Minimizing the spread of decay

The development of a branch collar significantly reduces the potential spread of decay. Also branch unions with a right angle of attachment are more effective in preventing the spread of decay. To reduce the potential for decay, 1) prune to develop branch collars (side branch must be less than half the diameter of the adjacent trunk) and 2) select branch unions with a wide angle of attachment. In pruning, remove co-dominant trunks and narrow branch unions while young (smaller than two inches). [Figure 6]

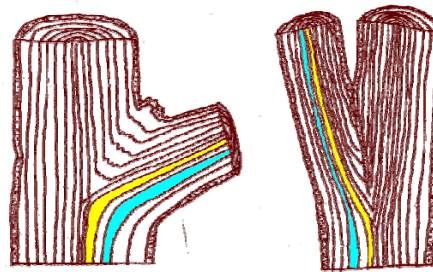


Figure 6. Branch unions that form a right angle are more resistant to decay. A branch union with co-dominant trunks and narrow angle of attachment is highly prone to the spread of decay.

Implications for pruning

In training trees for structural integrity, the arborist has zero tolerance for co-dominant trunks. Co-dominant trunks should be corrected immediately when they start to develop or at least before the trunks grow to a two-inch diameter.

In training trees for structural integrity, give attention to developing strong branch unions with branch collars. For the collar to develop, the side branch must be less than half the diameter of the adjacent trunk. Less than 1/3 is preferred. If the side branch is too large, significantly prune back the side branch to slow its growth rate.

In pruning, select branch unions with a wide angle of attachment.

Ideally, all pruning cuts are two inches and smaller in diameter. Any

pruning cut four inches and larger must be justified by taking into account the high potential for decay. For additional information on pruning cuts, refer to *CMG GardenNotes* #613, *Pruning Cuts*.

Additional information

CMG GardenNotes on pruning

- #611 *Tree Growth and Decay*
- #612 *Developing Strong Branch Unions*
- #613 *Pruning Cuts*
- #614 *Structural Training of Young Shade Trees*
- #615 *Structural Training of Young Shade Trees—Pruning Flow Chart*
- #616 *Pruning Mature Shade Trees*
- #618 *Pruning Evergreens*
- #619 *Pruning Flowering Shrubs*

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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