Weak Branch Unions

Weak branch union = An epicormic branch or a branch union with included bark.

Trees may suffer from naturally formed imperfections that can lead to branch failure at the union of the branch and main stem. There are two types imperfections that create weak branch unions: a branch union with included bark, and, an epicormic branch. See Figures 3.105 and 3.106.

Figures 3.105. *Weak branch union due to presence of included bark.*

Figures 3.106. *Weak branch unions due to formation of epicormic branches.*

Figure 107. *Strong branch union.*

Branch unions can be characterized as strong or weak. Strong branch unions have upturned branch bark ridges at branch junctions. See Figure 3.107 and Box 15: Strong branch unions. Annual rings of wood from the branch grow together with annual rings of wood from the stem, creating a sound, strong union all the way into the center of the tree.

BOX 15

Strong branch unions

Strong branch unions have an upturned ridge of bark between the stem and branch. This is called the branch bark ridge (BBR) and can be found on the upper most part of the union. See Figures 3.108, 3.109.

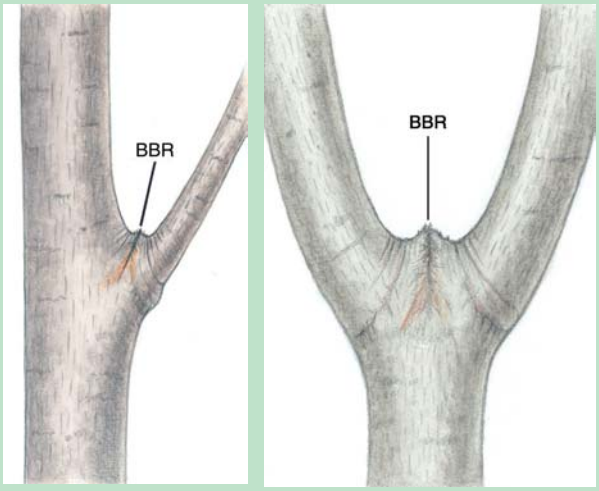

Figure 3.108 - 3.109. *Strong unions are characterized by upturned branch bark ridges (BBR).*

One type of weak branch union occurs when a branch and stem (or two or more codominant stems) grow so closely together that bark grows between them, inside the tree. See Figure 3.110. The term for bark growing inside the tree is "included bark." See Box 16: Included bark. As more and more bark is included inside the tree, the weak union is more likely to fail. See Figures 3.112 and 3.113.

In storm damage surveys conducted in 1997-1998 by the University of Minnesota's Forest Resources Department, 21 percent of all landscape trees that failed in windstorms failed at weak branch unions of co-dominant stems. Some species are notorious for having included bark: European mountain ash, green ash, hackberry, boxelder, willow, red maple, silver maple, Amur maple, cherry and littleleaf linden (Johnson and Johnson 1999).

Figure 3.110. *Weak branch union because bark is growing inside the tree.*

BOX 16

Included bark

Unlike the normal wood-to-wood connections of strong branch unions, these weak unions have bark-to-wood connections. Bark does not adhere to wood, so the branch is not tightly attached to the tree. See Figure 3.111.

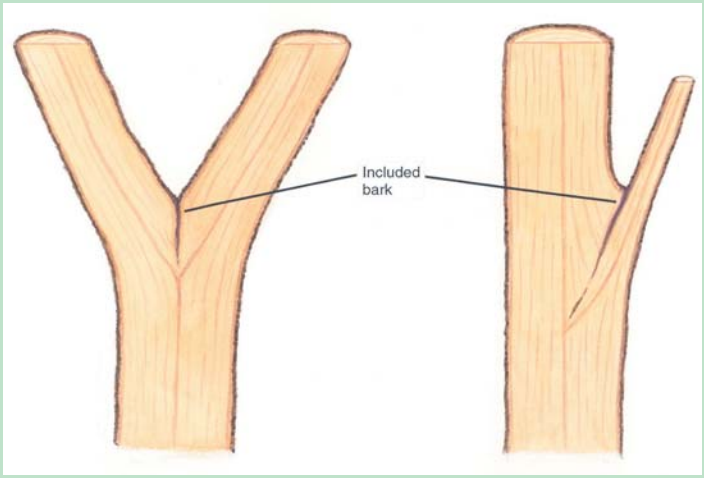

Figure 3.111. *Included bark between 2 codominant stems (left) and between the stem and a branch (right).*

Figure 3.112 - 3.113. *As more bark is included inside the branch union, the branch is more likely to fail.*

Epicormic branches (also called water sprouts) are formed as a response to injury or environmental stress. See Figure 3.114. Epicormic branches are new branches that replaced injured, pruned, or declining branches. Commonly, epicormic branches form on the stems and branches of topped trees. When old, large epicormic branches are growing on decaying stems or branches, the epicormics are very likely to fail. See Figure 3.115 and Box 17: Failure of epicormic branch on topped stem.

Figure 3.114. *Epicormic branches are new branches that replace injured, pruned or declining branches.*

Figure 3.115. *Large old epicormic branches are likely to fail.*

BOX 17

Failure of epicormic branch on topped stem

Epicormic branches, by their very nature, form weak unions because they are shallowly attached instead of being attached all the way to the center of the stem. Epicormic branches grow very quickly so they become heavy very quickly. After a time they loose their connection to the main branch and may fall to the ground because the underlying wood cannot support their weight. See Figure 3.116.

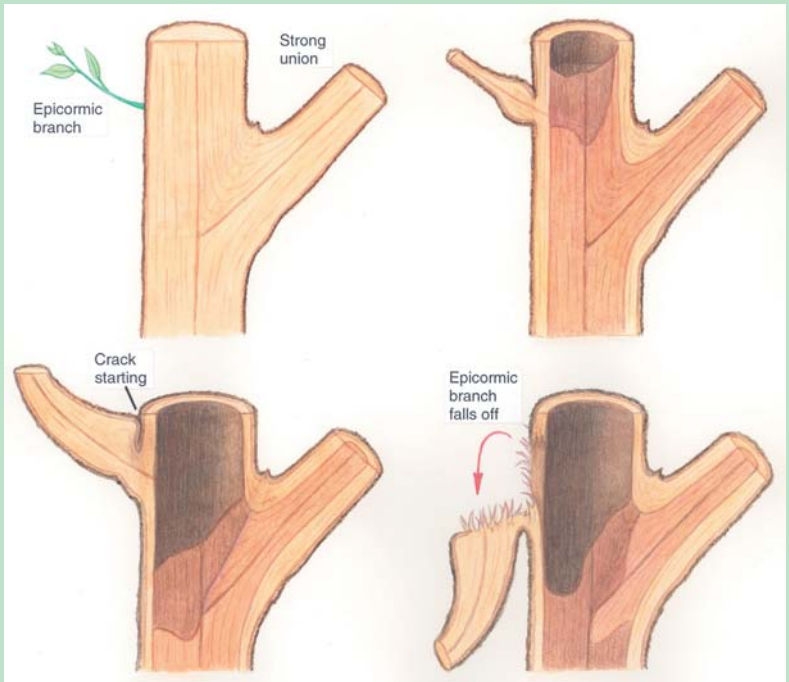

Figure 3.116. *How an epicormic branch forms, grows and eventually fails on a tree that was topped.*

If a weak union is also cracked, cankered or decayed, the union is likely to fail, causing the branch to fall off the tree. Sometimes, ridges of bark and wood will form on one or both sides of a weakened branch union in order to stabilize the union. The branch is very likely to fail when a crack forms between the ridges. See Figure 3.117.

Weak Branch Unions

High risk of failure:

See Figures 3.118 through 3.120.

- Weak union is also cracked, cankered or decayed.
- Large epicormic branch on decaying stem.

Moderate risk of failure:

- When a branch or codominant stem has included bark.

Figure 3.117. *If a weak union is also cracked it is very likely to fail.*

Figure 3.118. *High risk of failure: A weak union that is also cracked.*

Figure 3.119. *High risk of failure: A weak union that is also cankered or decayed. Note that branch is also cracked.*

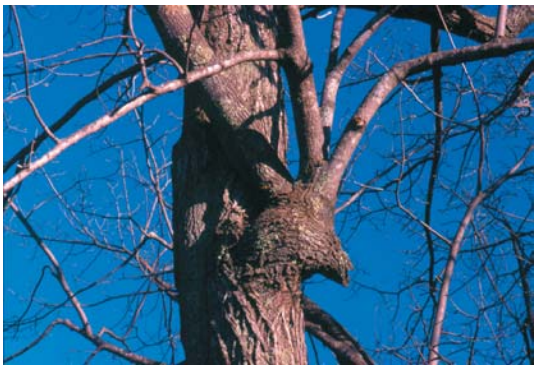

Figure 3.120. *High risk of failure: Large epicormic branches on a decaying stem.*

Cankers

Canker = an area where bark and/or cambium are dead.

Figure 3.121. *A canker is an area where the bark and the cambium are dead. Wood below the canker is also disfigured.*

A canker is an area on a branch, stem, or root where the bark and/or cambium are dead. As the tree adds a new annual ring of wood each year, the cankered area will not be able to do so. Large cankers or a number of small cankers in close proximity can predispose a tree to fail because there is not enough wood to support the tree at the location of the canker(s). See Figures 3.121 through 3.123. Stems and branches often fracture on or near their cankers.

Figure 3.122, 3.123. *Two views of same canker: Cankers can predispose a tree to fail because there is not enough wood to support the tree at the location of the canker.*

Cankers can be caused by fungi, insects, lightning, or mechanical damage such as wounds and gouges caused by vehicles, vandalism, lawn-mowers, or string-trimmers. See Figures 3.124 through 3.130. Bark may or may not adhere to the canker face. Fungal cankers are long-term, tree-fungus associations that prevent normal wood formation at the canker location. Sometimes fungal cankers quickly girdle the tree, killing the stem and branches above the canker.

Figure 3.124 - 3.126. *Many cankers have decaying wood below the cankered area.*

Figure 3.127 - 3.130. *Cankers can be caused by insects, fungi, and mechanical wounds, including vandalism.*

Regardless of origin, cankers can lead to tree failure if they affect 40 percent or more of the tree's circumference. If decay is also present, the combination of decay and canker can weaken the tree very quickly. When decay is present, evaluate shell thickness and size of opening caused by the canker.

Cankers

High risk of failure:

See Figures 3.131 and 3.132.

- Canker affects 40 percent or more of the tree's circumference.
- Canker plus decay affect 40 percent or more of the tree's circumference.

Moderate risk of failure:

- Canker or canker and decay affect 25 percent to 40 percent of the tree's circumference.

Figure 3.131. *High risk of failure: When canker affects 40 percent or more of the tree's circumference.*

Figure 3.132. *High risk of failure: When canker plus decay affect 40 percent or more of the tree's circumference.*