Understanding Pruning and Injury Wounds in Fruit Trees

A wound is any break in the outer protective bark of the tree that exposes the xylem. This can be caused by intentional actions such as pruning, or unintentional events like wind storms, mechanical injury, or animal damage. After a wound occurs, new space and nutrients become available to a number of organisms. At the same time, the wood cells react to these new invaders by forming a chemical barrier of mainly phenolic compounds. When perennial plants, such as fruit trees, are wounded, they can react to form physical and chemical barriers that contain the injured area and eventual effects. Most of the time, the tree (if in good health before the wounding event) will be able to close the wound and contain any infection through a process called compartmentalization.

Compartmentalization is a way for a tree to keep invading organisms in check. Compartmentalization is not a process of healing, but rather a way for the tree to extend its lifespan under the stress of wounding. The first indication of change at the wound site is discoloration of the wood tissue. Discoloration is an alteration of cellular content, but it does not represent a change in structural strength. Decay, which may follow discoloration, is an indication of compromised cellular integrity.

Wounding causes xylem cells next to the wound to form a compartment with four walls. Each wall performs a different function. The first wall plugs xylem cells above and below the wound to prevent a vertical progression of the injured area. The second wall has thickened cells that slow the inward spread of decay. The third wall is made up of radial xylem rays that prevent the horizontal progression of symptoms. The fourth wall is the new xylem that is formed after wounding. Each of the walls differs in its ability to resist decay. The first wall is the least resistant to decay, whereas the fourth wall is the most resistant. However, the fourth wall is structurally the weakest and can lead to separations along the annual ring, also called ring shakes.

The term “healing” is a misnomer when it comes to trees. The plant tissues that have been injured are not replaced or repaired (in most cases) to their previous condition. The wound is instead confined with a closure, called callus tissue (Figure 1). Callus formation is faster when trees are vigorous, and practices that encourage vigor will help speed the wound closure process, as well as prevent decay. Proper management through fertilization, irrigation, pest control, and crop load management can also positively influence vigor.

Figure 1. A relatively recent pruning wound on a pear tree. The callus tissue formation has begun and is well on its way to closing off the wounded area.
The time it takes for a wound to close also depends on where on the tree the wound is located, when the injury occurred, and what was exposed by the wound. Callus formation is primarily observed from the sides of a wound and less so from the top or bottom (Figure 2). Research has found that the shape of the wound isn’t much of a factor when it comes to rate of closure, but size of the wound is important. So, care should be taken to minimize wound size when pruning.

Wounds inflicted in the spring, summer, and winter close at similar rates, but wounds made in the fall close about 20 percent slower. Even though wounds made in spring or summer close at the same rate, they will not achieve the same amount of closure in the same season due to the length of the growing season. Callus around spring wounds will cover three to six times more area than around summer wounds at the end of the season.

Wounds that occur late in the growing season may be infected more rapidly because of coinciding sporulation of fungal populations. Any dry or loose bark in or immediately adjacent to, the wound should be removed to eliminate protective cover for insects. It would also be preferable to make smooth surfaces out of ragged breaks. Cut so that water will not sit on the wound area.

Wound dressings are unnecessary. They have not been proven to speed the closure process nor to reduce infection. A wound dressing is only used for aesthetic purposes. A wound dressing that cracks may result in moisture accumulation under the dressing and actually promote decay.

In the case of storm damage when a branch breaks off, it must be properly pruned to prevent potential decay at that location. Most cases of decay or discoloration of the wood will be confined to the branch stub (Figure 3) that remains; however, if the branch is improperly pruned (a flush cut; Figure 4), the trunk tissue will be exposed. This may lead to infection from disease or act as an entry point for insect pests. Pruning cuts should be done at the branch collar and not disturb the trunk wood. Most of all, keep the wound as small as possible, especially the width (from where most of the callus formation will be derived).
Trees also may form cavities when, in an advanced stage of decay, wood is consumed by insects and fungi (Figure 5). When a tree has a cavity, tree vigor plays an important role in the development of new bark and wood formation; thus, it is paramount that tree vigor be encouraged. If the cavity is large and threatens structural stability of the tree, or is a haven for pests, then the tree should be removed.

The tree will continue to be productive and have structural integrity up until the time when the number of wounds and the advance of fungal and insect pests begins to compromise its health. As with all living organisms, this is a natural progression of life. All trees will eventually succumb to diseases, insects, and other disorders; however, effective management can delay the inevitable.

Figure 5. A pruning wound on an apple tree that did not close and is being broken down by fungi and insects.