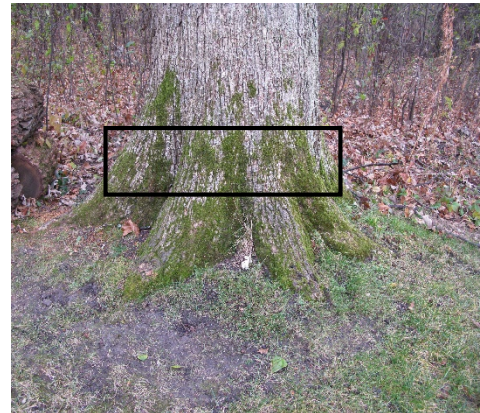


Root Collar Disorders

E. Thomas Smiley, PhD, Urban Forestry

A tree's root collar is the area where the roots join the main stem or trunk. This area is typified by a flare leading to the major buttress roots (Figure 1).

Figure 1: Exposed root collar and flare roots



The root collar is part of the tree's trunk and requires the movement of oxygen and carbon dioxide in and out of the phloem (inner bark) to survive. Planting too deep or adding excess soil or mulch on the root collar can inhibit this gas exchange and kill phloem cells, interfering with the downward movement of food (photosynthate) to the roots. Eventually this can lead to root dieback, reduced water uptake and possibly tree death.

Root collar burial predisposes trees to a variety of health problems. Root collars with damaged bark are more susceptible to infection and disease caused by certain pathogenic fungi, especially *Phytophthora*, *Leptographium* and *Armillaria*.

Symptoms

Symptoms of root collar disorders are often first evident as foliage yellowing, early leaf coloration and drop, and dieback in the upper crown.

Some trees will show no symptoms at all prior to their death during a hot, dry period of the summer. Secondary invaders such as canker fungi and insect borers often invade trees stressed by root collar problems (Figure 2). Cankers may cause sunken areas near the soil line. Since a disruption of translocation has occurred, some of the growth regulators responsible for hardening off in preparation for winter might not have reached the above-ground portion of the tree. Dieback due to winter injury thus might also be a symptom of a root collar problem which becomes apparent in the spring.

Figure 2: Buried root collar predisposed this dogwood to secondary invaders



Most tree and shrub species can develop problems from root collar burial. Very sensitive plants include sugar maple, California live oak, dogwood, Japanese black pine and Eastern white pine.

Diagnosis

The easiest way to check a tree for a root collar disorder is to look for natural root flare. If flare is present, the problem is most likely elsewhere. Small trees with root collar issues can often be rocked back and forth in the ground due to root dieback.

If no root flare is present, an excavation should be made. Especially on thin-barked trees, bark might become loose and easily dislodged as it is exposed (Figure 3). To determine if the soil or mulch against the collar has started to cause problems, remove a small amount of bark and sapwood from the trunk just above the roots. If the inner bark is reddish brown and moist, and the sapwood is creamy white, the phloem dieback is due to abiotic (noninfectious) factors. *Phytophthora* produces a reddish brown color in the phloem, which progresses into the sapwood where a black stain is produced. Infection may also extend above the soil line. *Armillaria* produces a white spongy rot of the phloem and sapwood accompanied by a white fungal mycelium fan and black shoestring-like rhizomorphs. *Leptographium* also kills the phloem and stains pine wood bluish black.

Treatment

If a tree is severely declining from a root collar disorder, removal is recommended before it becomes hazardous. If, on the other hand, decline symptoms are detected early then remedial actions can often be taken which might save the tree.

First, all soil or mulch in contact with the root collar must be removed. Root collar excavations can be done by carefully using small digging tools and a brush or using a high pressure air tool such as the *AirSpade*®. Whichever method is used, great care must be used to avoid causing further injury to the tree (Figure 3).

Soil should be removed from an area as large as possible around the trunk. A radius of approximately

15 cm should be considered the minimum excavation distance. It is best if the slope angle of the excavated area is not more than 10°.

The depression which is created by this excavation, can either slope to the original grade or be walled with

Figure 3: Root collar excavation carefully done on a thin-barked maple



treated wood, brick or stone. If it is not practical to leave the depression open, it can be filled with stone or coarse gravel. Dirt and debris will need to be removed from the gravel every four or five years. A layer of mulch up to several inches thick is appropriate on top of the soil, but not against the bark. An open depression might fill with water during storms, but should not cause a problem if it drains within a few days.

The second action to be taken is fertilization. Recommendations should be based on soil analysis and may be soil injected or included with root invigoration.

The third action is to provide appropriate irrigation during dry periods. Care should be taken not to over-water. Irrigation water should never be applied directly to the trunk or root collar area.

In summary, trees and shrubs with buried root collars may decline and are more susceptible to attack by secondary pests. It is best to treat the situation as soon

as it is discovered by means of a root collar excavation. Other actions such as fertilizing and proper mulching will promote tree health thus improving chances for recovery.



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