



## *Girdling Roots*

*Bruce R. Fraedrich, Ph. D., Plant Pathologist*

**G**irdling roots are usually lateral roots at or slightly below the soil line that cut into at least one side of the main trunk. These roots restrict water and nutrients, which may be translocated to the leaves. Branches will eventually become weakened and the tree may die in five to fifteen years from the girdling roots alone, or in conjunction with environmental stresses or attacks by insects or diseases. Cultural practices like fertilization, irrigation and pruning will not offset the slow growth caused by girdled roots. Once diagnosed, they should be treated promptly.

### **CAUSES AND PREVENTION**

Girdling roots are caused by nursery and transplanting practices, soil obstructions and unknown factors.

When plants are held in containers for too long a period of time, many roots begin to circle around the pot (Figure 1). These eventually can girdle the tree. When planting trees and shrubs with this condition, be sure to loosen these roots from the container root ball and spread them out in the planting hole before back filling. Circling roots two or more years old will be woody and may have to be cut and removed from the root system, because they will have taken the permanent shape of the container and cannot bend enough

without breaking. Although this reduces the size of the root system, it will prevent the development of girdling roots in the future.



**Figure 1. Roots growing in containers frequently begin circling if held in the container for too long.**

When a planting hole is not dug wide enough or deep enough, bare-rooted stock can be twisted into the hole in order to make it fit. This undesirable practice can cause root growth encircle the trunk and produce girdling.

Be certain to make planting holes wider than the root area in order to prevent encircling roots from forming.

The third major cause of girdling roots is planting in very compacted soil, where the new roots have difficulty growing out of the planting hole and into the surrounding hard soil. Roots can circle the bottom of the planting hole, not unlike those growing in an undersized container. Eventually, several of these roots can begin girdling the trunk. Other soil obstructions like foundations, curbs or large rocks can deflect roots and may contribute in some cases to the development of girdling roots.

### **SYMPTOMS AND DETECTION**

Trees which leaf out late, have small chlorotic leaves or needles, drop their leaves early, and are dying back should be checked for a girdling root, particularly if the normal flare or buttress swell is absent. This condition is associated with placing too much fill over the roots, a procedure not uncommon in new housing developments.

Probably the most reliable aboveground characteristic of a girdling root is a trunk indentation or flattening at the base of the bole. Non-girdled trees rarely show this abnormal development. Note that not all girdled trees show crown symptoms commonly attributed to girdling roots.

Most girdled trees are not severely girdled, with few roots ever circling more than 50% around the bole. Since most girdled trees are girdled by more than one root, careful examination around the entire circumference may be necessary. Species like sugar, Norway maple, and white pine particularly are prone to forming girdling roots. Soil excavation is often needed to find girdling roots.

A large majority of girdling roots is found in the top several inches of soil, although they can develop at a somewhat greater depth. Frequently they can be seen on the surface

where erosion has removed one or two inches of soil from around the base of the trunk. Some girdling roots are present at the soil line.

### **TREATMENT AND REMOVAL**

A girdling root must be removed in a manner that will minimize injury to the trunk cambium beneath the root. First excavate soil from around the root uncovering the entire length to be removed. Using a chisel or saw, cut the root at a point 6 – 12" out from the trunk. The final cut is made where the root attaches to the trunk (figure 2). This prevents the root from being pulled violently away from the embedded area causing extensive cambium injury if the root happens to be under tension. This is important since occasionally it is best to leave the girdled root in the tree after cutting because the trunk and cambium would be damaged severely by gouging out the deeply embedded root so that it does not grow back together. Detach the root if it is not embedded very deeply.

Prune deadwood, and if large roots were removed, thin the crown to compensate for the loss of roots. Very large girdling roots should not be cut or removed.