

Avoiding Excessive Soil Over the Root Systems of Trees:
A Best Management Practice
By Gary Watson

An industry wide national working group was formed in 2003 to develop consensus on a complex national issue: tree decline and death in the landscape resulting from excessive amounts of soil over the root system. When structural roots are too deep below the soil surface, lack of oxygen can kill roots and lead to decline and death of the tree, especially in urban soils. In some species, prolonged moisture at the base of the trunk may increase root and collar rot diseases.

The working group has completed these best management practice (BMP) guidelines based on the practical experience of many professionals and the relevant scientific research available at this time.

How Deep Should Structural Roots Be?

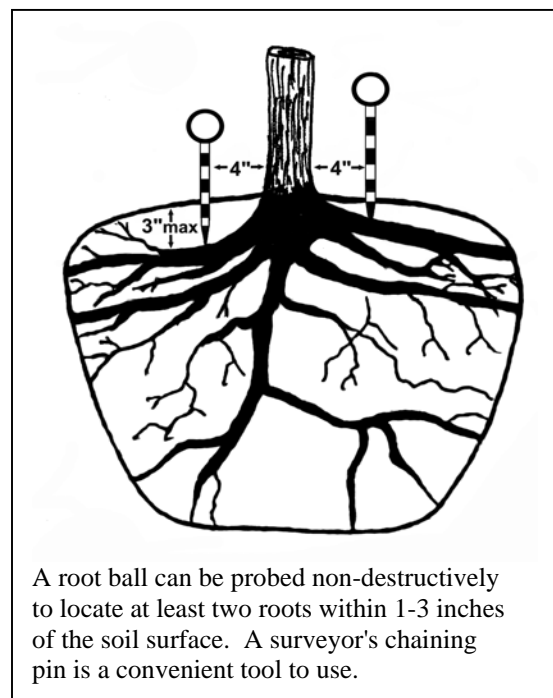
Generally, on a young tree, the uppermost structural roots (two or more) should be within the top 1 to 3 inches of the soil surface, measured 3 to 4 inches from the trunk. As a tree matures, roots thicken faster on the top side, effectively reducing the amount of soil above the structural roots and forming the root flare. Special situations requiring exceptions to this general guideline include the following:

- Some species may develop more strongly descending root systems; therefore, the structural roots may need to be located nearer the trunk.
- On landscape sites with poorly drained soil, the roots may need to be even shallower for adequate survival. Structural roots may need to be at, or slightly above, the surrounding grade under extreme conditions.
- In some species, the roots regenerated after transplanting can grow back toward the trunk and become girdling roots. Initial research shows that very little soil over the structural roots could be problematic. *Celtis occidentalis* (hackberry), *Fraxinus pennsylvanica* (green ash), *Acer rubrum* (red maple), *Tilia cordata* (littleleaf linden), *Populus* spp. (poplars), and *Malus* spp. (crabapples) are species for which this is known to be a problem. Other species with aggressive root systems may also exhibit this tendency.

How to Locate Structural Roots

Checking root depth can be done in the nursery before digging (preferred), or in the balled and burlapped (B&B) or container root ball just prior to planting. Presence of a visible root flare is a good indicator that the structural roots are just below the soil surface. However, on grafted trees, be careful not to confuse the swelling of the trunk below the graft union with the actual root flare. A gap around the trunk at the soil line is a sure sign that the first roots are at least several inches below the soil surface.

If none of these easily recognized signs are present in the field, or if the root ball burlap and twine cover the base of the tree, a surveyor's chaining pin or similar tool can be used to quickly and nondestructively probe for the roots. Probing approximately 3 to 4 inches away from the trunk will determine the true depth of the roots, rather than the depth of the enlarged root flare, if present.



A root ball can be probed non-destructively to locate at least two roots within 1-3 inches of the soil surface. A surveyor's chaining pin is a convenient tool to use.

At least two roots (preferably more) should be located within 1 to 3 inches of the soil surface.

Planting Process

When root balls arrive on site, the depth of the structural roots should be checked before placing the tree in the planting hole.

If the structural roots have been located within 3 inches of the surface, the root ball should be planted with the surface no lower than the same level as existing grade. One to two inches higher usually is preferable to allow for settling and “pancaking” of the root ball. Unless conditions are extreme, do not plant so high that the cut ends of the structural roots at the edge of the root ball are above the surrounding grade. Planting the tree any higher may expose roots after minor erosion or contribute to surface root formation in the long run.

If the structural roots are found to be deeper than 3 inches below the root ball surface, the root ball and the planting depth will have to be adjusted. Elevate the root ball so that the structural roots are at the correct depth relative to surrounding grade. It is best to leave B&B root balls intact until placed in the planting hole, rather than to unwrap them and strip the soil off the top before moving the root ball into the planting hole. Moving an unwrapped root ball may cause unnecessary damage.

Mulching

Mulching is an excellent way to conserve soil moisture, reduce competition from other plants, and prevent lawn mower injury. Two inches of mulch is the appropriate depth for 2- to 3-inch-caliper trees. Later applications to “refresh” the mulch should not increase the depth. Keep the mulch away from the trunk. Avoid thick layers of mulch around the base of the tree (often called “volcano mulching”), as far too often seen in landscapes. Do not pile the extra soil around the base of the tree and use mulch to hide it—excess soil should be removed from the planting site. Avoid organic material that can mat down and create a hydrophobic layer.

Remediation

There are many trees already planted in the landscape with the structural roots too deep. These trees are likely to have reduced vigor and shorter life spans if no remedial action is taken.

For recently planted trees (less than two to three months of warm soil for root growth), the greatest long-term benefit will be achieved by replanting the tree at the proper depth.

For partially established trees, the best remedial treatment may depend on several factors. Replanting a partially established tree will cause additional stress; therefore, the benefits of replanting such a tree must outweigh the risks. If the tree is in good health and growing vigorously, it may be best to do nothing. A tree that appears to be struggling may need to be replanted at the proper depth, as long as the tree is in good enough health to survive the additional stress of replanting. Do not waste money replanting trees that already show signs of serious decline. Trees on low-quality, poorly drained soils are more likely to need to be replanted than those on high-quality sites.

For larger, fully established trees, a practice being used regularly by arborists is a root collar excavation to remove the excess soil in contact with the trunk. Removal of this soil reduces the possibility of basal and collar rot diseases, and it improves aeration to the structural roots at lower depths.

Roots regenerated after planting originate mostly at the perimeter of the root ball and usually grow up to their natural depth closer to the surface. Do not expose these roots. When the structural roots moved with the tree are too deep, the newly generated roots sometimes have been observed to grow toward the trunk rather than away from the trunk, as is normal. Removing the soil near the trunk can expose these

“misdirected” roots and allow their removal so that they do not become girdling roots. The excavated soil is sometimes replaced with well-aerated mulch or gravel.

What Next?

A much deeper understanding of the causes and effects of deep root systems is needed. Studies have been initiated by researchers around the country. As more information becomes available through both research and practical experience, these best management practice guidelines will be updated.