

Improving Soil Conditions Around Existing Trees



Tree root systems are sometimes overlooked by arborists. Attention is given to trunks, branches and leaves, but rarely do arborists focus on the "landscape below ground." However, it is proven that a healthy root system is critical to a tree's overall vigor.

As a quick review, **most of a tree's absorptive roots are in the top 6 to 12 inches of soil and may extend well beyond the "drip line" or edge of the tree's canopy.** These roots take in water and nutrients, which the tree converts to energy that results in growth. Larger roots serve as a storehouse for unused carbohydrates. Roots also produce hormones that regulate the tree canopy.

Many roots are small, even microscopic in the case of "root hairs." **Small roots are easily damaged beyond repair.** Although trees have the capacity to regenerate roots, if soil conditions are not conducive to root growth, a tree will be unable to function properly and will slowly decline and die.

Usually, if a mature tree is thriving, roots need little or no manipulation. So why would an arborist need to improve soils around an existing tree? Trees can maintain their canopy with relatively few roots, so a tree's root system can be in decline for months or years before it actually dies.

COMPACTION PREVENTION

In general, **one of the greatest impacts on tree root health is soil compaction.** Soil compaction causes stunted growth, or prevents any growth from occurring. Compaction-based stress leads to insect infestations/or disease infections that contribute to tree demise.

Compaction often occurs due to construction around or near a tree. Heavy equipment, excessive foot traffic and grade changes kill absorptive roots.

Established native trees also can be adversely impacted when newly surrounded by human activities. For example, natural areas are desirable settings for parks or outdoor venues for concerts, nature paths and trails. These activities all result in traffic and compaction.

As with many maladies, prevention is the most desirable control method. Protecting root zones from foot traffic can be as simple as mulching heavily with organic matter or as complicated as redesigning the site to direct traffic away from trees. **During construction, mulching and sturdy fencing, along with regular inspections by an arborist to ensure compliance, can insure that the fragile root zone remains undisturbed.**

STEPS TO ALLEVIATE COMPACTION

But what if the damage is already done? This is a common occurrence and arborists are often called to "rescue" ailing trees that are declining months or years after construction is complete.

Extremes in soil moisture are not favorable for tree root growth. **Keeping soil moisture at an optimum level for the species is critical for its health.** At the same time, insure that drainage is adequate and that the roots are not "drowning" in standing water. Extremely dry or wet conditions can predispose trees to root rot diseases.

Preserving natural tree "litter" is the least expensive and easiest way to begin addressing soil compaction. Leaf litter is alive with biological activity. It provides food and shelter for many invertebrates such as earthworms and millipedes. In addition, eggs and larvae of spiders and other beneficial insects thrive in leaf litter. Leaf litter is also a carbon source for the underlying soil microbial community.

Leaf litter moved through the soil horizon by earthworms decomposes quickly. Mineral nutrients are slowly released from the microbial community to tree roots. Added carbon from leaf litter causes micro-aggregate formation in soils, thus lessening compaction. In addition, this "free" mulch results in well known benefits such as reduction in soil temperature, water evaporation and weed growth.



Protecting the root zone of a tree before construction begins is the best way to prevent soil compaction.
All photos courtesy: Russ Thompson

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In addition to allowing leaf litter to accumulate, mulch can be applied to speed up the recovery process. Clean, disease-free coarse wood chips from a chipper are an excellent resource easily obtained by most arborists. **Spread mulch about six to eight inches or so** (it will compress to about three to four inches) everywhere that litter would naturally fall and accumulate. If the tree has a nutrient deficiency, fertilizer can be broadcast before the mulch is applied. Water thoroughly, then be sure that the roots remain undisturbed.



A thick layer of mulch is one of the easiest and most inexpensive ways to improve conditions in a tree's root zone.

MECHANICAL METHODS

While there is little research supporting vertical mulching, the more invasive (and expensive) technique known as radial trenching, also referred to as soil replacement, is effective. In 2002, at the Morton Arboretum in Chicago, IL, Dr. Gary Watson's follow-up research showed that trenched trees had significantly more new root growth than controls, even after 14 years.

Radial trenching removes soil between the root buttresses perpendicular to the trunk, out to the edge of the tree's canopy or further. The trenches are then filled with compost or a compost/topsoil mixture. A layer of mulch can be spread over the surface of the soil to provide a "finished" look.

Watson's original experiment used a backhoe to dig the trenches. **Today, tools such as the air spade can literally blow away the soil, a much less invasive procedure that preserves much of the**

existing fine root system.

Although an expensive tool, the air spade can also be used for root collar excavations, trenching around existing trees for utility and irrigation installation and other projects. Equipment is also available for rent.

SLOW RECOVERY

Whenever trenches are made to invigorate trees, results will not be immediate. **Root regrowth and renewed tree vigor can take years.**

Mature trees should be protected from activities that can compact the soil beneath the canopies and beyond. However, although there are no miracle cures, in some cases trees can be saved and even thrive in the future.

It is essential that mature trees have room for litter fall and or mulch applications. This promotes longevity of their root systems.

In the worst-case scenario, recovery of declining mature trees can be an impossible goal to achieve. In other cases, recovery is a slow, long-term process that can literally take years. However, sometimes a tree's recovery is spectacular if soil conditions for root growth are improved. Considering the value of a mature tree, the return on investment of time, effort and materials is a payoff that is worth the attempt. 🍂

Further Reading/Links:

Soil Compaction & Trees: Causes, Symptoms & Effects

http://www.extension.iastate.edu/forestry/publications/pdf_files/for00-003.pdf

Ease Post-Construction Tree Damage with Radial Trenching

http://www.air-spade.com/literature/Tree_Care_Industry_Sep_2004.pdf

Soil Replacement: Long Term Results

http://www.mortonarb.org/images/stories/pdf/research/watson/soil_replacement.pdf



After creating radial trenches, soil is replaced with rich organic material.

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