

Tree vs. Lawn: Uneasy Coexistence
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COMPETITION BETWEEN PLANTS

Any two plants growing in close proximity, above or below-ground, must compete for sunlight, water, and nutrients. Two similar plants competing for a limited supply of soil moisture and nutrients will each get a smaller share than if either one were growing alone, and the growth of both will be stunted.

But what if they are not similar plants? Foresters and orchardists have known for years that grasses are able to compete more vigorously than trees for soil moisture and nutrients. When grass and trees grow together, it is the growth of the trees that is most reduced. Landscape professionals and homeowners should also learn to understand tree-turf competition. The trees that we use in the urban landscape evolved in the forest with similar plants where moisture was generally plentiful. Grasses were found in the prairie which was intermittently dry. Grasses can go into a dormant state to cope with dry periods. There are few places in the natural landscape where both trees and grass thrive together. There is no reason we should expect them to thrive together in the landscape.

WHERE ROOTS GROW

Roots of all plants need water, oxygen and mineral nutrients in proper amounts to grow. Conditions are usually optimal for root growth near the soil surface. Both water and oxygen are found in the pores of the soil. The best balance of water and oxygen for roots is usually found in the upper 12 inches of undisturbed natural soils. There are fewer and smaller pores in deeper clayey soils and too many of them are often filled with water rather than air. 'Deep rooted' trees are rare and found only where soil conditions are especially favorable. In disturbed, compacted urban soils, particularly in newer developments, it is not uncommon to find poor soil conditions restricting most root growth to the top 6 inches of soil.



Grass roots are sometimes so vigorous that tree roots cannot grow in the same soil. Grass roots grow very fast compared to roots of trees. Grass root systems are composed of numerous long thread-like roots with many even-smaller branches so fine that they can be difficult to see without magnification. These roots can quickly and thoroughly penetrate every part of the soil extracting all available resources ahead of other plants. Roots of trees are slower growing, and even the finest roots of trees are coarsely branched compared to grass roots and also less efficient at extracting water and nutrients from the soil.

Studies at the Morton Arboretum have shown that turfgrass drastically can reduce the amount of tree roots present in the top few inches of soil by 90 percent. This cannot be compensated for by other parts of the root system and consequently, the tree simply has fewer roots to support it. The roots cannot form at deeper levels because the poor soil conditions will not allow it. If unrestricted, typically the roots spread about as far as the branches, but many times the root spread of landscape and street trees is restricted by buildings and pavements, etc.

Tree-turf interactions may be more than just competition for water and nutrients. Chemical interactions may be involved. Allelopathy is the term used to describe a

Root profiles of sugar maples (*Acer saccharum*) growing in similar soils with grass competition and in a naturally mulched woodland area.

situation in which one plant produces a chemical which has an effect on another plant. For example, it is well known that walnut trees produce a chemical called juglone in the leaves which will inhibit tomatoes and other plants from growing in the area. We are just beginning to understand this type of chemical relationship between grass and trees. Several scientific studies in recent years have shown that grasses produce chemicals that stunt the growth of trees. This situation is probably more common than we currently understand and is another good reason for keeping trees and turf separate in the landscape.

A tree with a reduced root system from grass competition will be under more stress and therefore will be more prone to certain insect and disease problems and shorter lived. Keeping the lawn away from the trees will benefit most trees, though the limitations of the urban landscape won't allow it in every situation. Many situations may call for creative thinking in order to have a beautiful landscape with healthy, vigorous, turf-free trees. The concept of landscapes with turf from property line to property line will have to be modified or even abandoned. Turf is useful and appropriate where there is foot traffic. Trees should be placed on the perimeter of turf areas.

THE MULCH ALTERNATIVE

Organic mulch, like wood chips or composted leaves, is one of the best and most inexpensive soil and root enhancers available and a good alternative to turf around trees. It is very similar to the forest floor environment where leaves, branches, and other plant parts constantly accumulate and then decompose to enrich the soil. In the landscape, fallen leaves can be added to the mulch each autumn to recycle their nutrients. The layer of mulch covering the soil prevents water from evaporating before the trees can absorb it. A mulch layer also moderates extremes in soil temperature, which reduces root damage as well. With improved soil moisture and more available organic matter, the earthworms and soil insects will flourish. The tunneling activity of these creatures will help to incorporate the rich organic matter into the soil and provide improved aeration. Not only will more roots be able to grow in the improved soil beneath the mulch, the tree roots will grow up (yes! tree roots can grow up) into the lower layers of decomposing mulch, providing excellent additional rooting medium for more roots in the same amount of space.

Many fear that if mulch is added on top of the soil surface, the changes in the soil environment will cause the tree roots to be shallower and more subject to injury during drought. Well-aerated mulch does not cause roots to migrate to the surface, but there can be an increase in the soil near the surface. Plastic sheeting used under the mulch should be avoided since it may reduce oxygen in the soil, killing deeper roots, leaving only very shallow roots.

When mulching a lawn area around a tree, care must be taken not to damage tree roots in any way. The sod can be removed with a sod-cutter, but it may be easier to just let the mulch smother the grass, and kill any grass that does come through the mulch with glyphosate herbicide (Round-up). Any material like wood chips, shredded bark, and leaf compost can be used for mulch. Ideally a layer of composted material is applied first with a layer of fresher layer chips on top. Apply up to a total of 6 inches of mulch, which will settle to about 4 inches. The practice of forming a small, deep mulch layer around the tree (often referred to as 'volcano' mulching) is seen more and more in the landscape. There is no good reason for this, and the moist mulch against the bark could harm the tree. A large shallow area is much better for the tree.



'Volcano mulching' can harm the tree trunk, and may cover extra soil that has been piled around the trunk after planting. Mulch should be no more than 3-4 inches deep.

Mulch is not considered equally attractive by everyone. Shrubs, groundcovers and perennials can be planted in the mulched, turf-free areas around trees to achieve an attractive landscape. While still offering some competition to the trees, the roots of these plants are more similar to the tree roots. The natural forest understory is a good comparison for this situation. The more we can mimic nature in urban landscapes, the better our trees and their roots will grow.