Tree vs. Lawn: Uneasy Coexistence

by Gary Watson

INTRODUCTION

Any two plants growing in close proximity, above or below-ground, most compete for sunlight, water, and nutrients. Results of above-ground competition for sunlight can be quite obvious. In the dense forest, tall dominant trees shade out smaller trees and underbrush. When a tree dies, young trees and shrubs flourish in the opening. In the landscape, vigorous weeds can suppress more delicate landscape plants and dense, low branching trees can shade out everything underneath.

Underground competition for soil moisture and nutrients is not always so clearly apparent. 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. Extra water and fertilizer will help both plants grow better.

But what if they are not similar plants? Foresters and orchardists have known for years that grasses are able to complete 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 during dry periods, trees can also but to a much lesser extent. There were few places where both trees and grass thrived together in a natural 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 oxygen must diffuse into the soil from the above-ground atmosphere through the network of soil pores. There are fewer and smaller pores in deeper clay soils and too many of them can be filled with water rather than air. During all but the driest times of the year, deeper soils can be very wet and low in oxygen. The best balance of water and oxygen for roots is usually found in the upper 12 inches of undisturbed natural soils. In disturbed, compacted urban soils, particularly in newer developments, it is not uncommon to find poor soil conditions restricting all root growth to the top 6 inches of soil. Though most trees have a few roots in the subsoils, 'deep rooted' trees are rare and found only where soil conditions are especially favorable. The typical shallow rooting pattern of trees in the soils of any region, can be observed easily by taking notice of the roots of trees that are exposed by excavations accompanying construction or root systems uprooted by storms.

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

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less efficient at extracting water and nutrients from the soil. The underground stems of grass plants, called rhizomes, function to form additional new plants rapidly under good growing conditions, making the grass and grass roots so thick that nearly everything else is suppressed, even weeds.

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 — *the best 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. Many times the root spread of landscape and street trees is restricted by buildings and pavements, etc. Normally, the roots should spread twice as far as the branches. Take a look at the trees on your property and see if this is possible. In some settings roots may spread farther to get needed moisture and nutrients from the soil in order to compensate for the turf competition. As it spreads, the efficiency of the root system diminishes. Water must be transported a greater distance and more roots must be produced and supported by the tree, requiring energy.

A tree with such a handicapped 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 only 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 enhances 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! trees 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. If the mulch is porous and well aerated, there will be no reduction of roots in the deeper soils, only an increase in the soil near the surface. Plastic sheeting used under the mulch should

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be avoided since it may reduce oxygen in the soil, killing deeper roots, leaving only very shallow roots.

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.

When mulching a lawn area around a tree, care must be taken not to damage tree roots in any way. Do not actually remove the sod. Mulch will smother much of the grass, and any grass that does come through the mulch can be sprayed with appropriate herbicides (trade names Round-up and Kleen-up, or Grass-be-gone). Never use broad-leaf herbicides like 2,4-D around trees. Even using the latter to kill dandelions in your lawn can damage your trees. 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 bark or chips on top. Apply up to a total of 6 inches of mulch, which will settle to about 4 inches.

WHEN GRASS IS NECESSARY OR UNAVOIDABLE

When elimination of the grass around the tree is not possible, it is important to keep the area well watered and fertilized. Having plenty of water and nutrients available will assure that the tree will get enough.

Watering: The top 8-12 inches of soil should be kept evenly moist around trees, at least as far as the branches spread. There is no way to tell how much moisture is in the soil by looking at its surface. The only way to be sure of how much moisture is in the soil is to probe or dig. A trowel, metal rod or soil sampling tool can be used. Low-cost soil moisture meters are not very accurate but may be useful for rough estimates. A metal rod, such as the end of a root feeder (without the water running), may be the easiest tool for the homeowner to get and use. Very dry soil will resist penetration of the rod and indicate the need of watering. After a little bit of practice, anyone can learn to use this simple tool. A soil sampling tube is a must for landscape professionals.

It is impossible to give a formula on how much to water a tree to keep the upper 8-12 inches of soil moist. The amount required will depend upon specific conditions for each site. Any of several methods of watering may work well, depending on the specific situation. If the ground is level, simply letting an open hose run on the ground, moving it around occasionlly to get good distribution, may give best results. If the ground has even a little slope, too much water may run off with this method, and use of a sprinkler or soaker hose may be necessary to apply the water more slowly and obtain good distribution. If the slope is severe, a root feeder may be necessary. It shouldn't be inserted into the ground more than six inches and it will have to be moved around frequently since it only moistens a relatively small area of soil around the insertion point. Root feeders are also very useful for watering the root ball of newly planted trees. No matter which method is chosen, the important thing is to keep the top foot of soil evenly moist throughout dry periods. Excessively dry soils cause the death of small roots, reducing the tree's capacity to absorb water even after the soil is remoistened. Energy reserves must be used to replace the lost roots.

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Fertilization: When fertilization is required the form of fertilizer used and the method used to apply it are of minor consequence. Research shows that broadcasting granular fertilizer on the surface is effective and inexpensive. There is not scientific evidence that other methods such as 'deep root' fertilizing, liquid feeding, spikes, pellets or any other 'improved' application method is any more effective than broadcasting.

Nitrogen is usually the most needed nutrient because it is used up rapidly by the grass and also reaches readily through the soil. A soil test may be advisable before adding more than small amounts of other nutrients because soils vary so widely throughout the country. Gladiated soils of the Midwest are often rich in nutrients other than nitrogen, while soils from other parts of the country have little capacity to store nutrients.

The recommended rate of nitrogen fertilization for trees is 6 pounds of nitrogen per 1,000 square feet of root zone soil surface per year. This large amount of quick-release nitrogen fertilizer applied all at once will probably burn the lawn, and should be divided into several smaller applications spread out over the growing season. Another approach is to use slow-release fertilizer. The nutrients in these formulations are released over a period of months. The acidity or alkalinity of the soil should be considered when selecting a fertilizer. If the soil is too alkaline (pH above 7.0) you may want to use a fertilizer which will help acidify the soil, such as ammonium sulfate. The amount of actual fertilizer applied will depend on the amount of nitrogen in it. If the N-P-K (nitrogen-phosphorus-potassium) ratio listed on the package is 25-3-3-, then it is 25 percent nitrogen and 24 pounds of fertilizer must be used to apply 6 pounds (25 percent of 24) of nitrogen. Mature trees with substantial areas of mulch around them may not need to be fertilized at all. As the mulch breaks down, nutrients are released in the same way that nutrients are recycled in the forest.

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 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.

Trees and grasses do not usually grow together in nature. There is no reason we should expect them to thrive together in the landscape. The more naturalistic we can make the urban root environment, the better our trees will grow.

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