DendroDiagnostics, Inc.
1901 Martin Road • Chapin, SC 29036
Phone: (803) 730-2930
www.dendrodiagnostics.com

Construction and Your Trees
How Damage Affects a Tree

Have you ever noticed how many trees in new neighborhoods seem to decline in the years following development? However, with advance planning it is possible to construct housing on wooded lots while maintaining many of the trees.

To understand why some trees fare poorly after construction, we need to discuss some basic tree biology. Trees have several different types of tissues that are varied by the functions performed. For this discussion, we will start under the ground and work up the tree.

Roots perform the functions of holding the tree upright and absorbing water and nutrients needed for growth. The large roots under the trunk comprise the root plate, which actually holds the tree up. These roots extend for about .4 to .8 feet from the trunk for each inch of trunk diameter. For instance, a ten inch diameter tree would have a root plate radius of about six feet. This is critical since damage to the root plate destabilizes the tree and greatly increases the chances for uprooting. Additionally, buildings or other hardscapes (like concrete walks) built on top of root plates will be cracked as the tree sways in the wind. This is why we never recommend leaving or planting trees closer than ten feet to structures (more distance for larger trees or trees which grow to large size).

The balance of a root system consists of feeder and transport roots. Feeder roots are microscopic and do the actual uptake of nutrients and water. These are connected to the tree by a network of transport roots. These roots are generally in the top six inches of the soil and may extend farther from the trunk than the tree is tall. They are fairly shallow since they require oxygen for their growth and oxygen concentration is highest in the upper layers of the soil. Because these roots are close to the surface, they are easily damaged by construction.

The above ground portions of trees are the trunk, limbs and foliage. The trunk supports the branches and foliage (commonly called the crown). If the trunk is damaged during construction, wood decay can occur. This can result in a weakened trunk that may break under stress, such as wind or ice loading.

Branches hold the foliage and distribute it so that it can intercept maximum sunlight. The foliage itself is the life support system for the tree and transforms water (delivered by roots) and carbon dioxide (from the air) into sugars. These sugars feed tree growth. Extra sugar is converted into starch and is stored in the roots, twigs and other woody tissues for later use. A major use of starch is for the production of new leaves each spring.

With this basic knowledge, we can now understand how trees are impacted by construction, and thereby how to minimize the damage.

Consider a house built on a wooded lot. The lot is cleared of underbrush, undesirable trees and trees that will be under the footprint of the house. This is usually done with heavy equipment. Site grade is changed by cutting high spots and adding fill dirt to low areas. This damages roots directly and indirectly.

Direct damage occurs when equipment treads dice the upper inch of soil. Indirect damage occurs from soil compaction as the pore space in soil is crushed and available oxygen for roots is decreased.

Next, the foundation is excavated and concrete footers are poured. This destroys any roots previously existing there. Building begins and soil is further disturbed. Moreover, many chemicals used in construction are toxic to roots or alter the soil chemistry to the detriment of remaining roots.

Once actual construction is over, the site is often landscaped. This commonly involves addition of topsoil, irrigation and lighting installation and planting of ornamentals and turf. Pipes for underground utilities or irrigation are commonly installed using a trencher. This process cuts all the roots it encounters and separates them from the tree. The addition of topsoil in tree root zones further reduces available oxygen.

In a healthy tree, the roots and top are in balance with approximately 60% of the tree's volume above ground and 40% underneath. If the roots are damaged, symptoms of root damage are reflected in the tops of affected trees. This usually takes the form of top dieback or thinning and yellowing of foliage. Trees with root damage attempt to regenerate new roots while root decay fungi attack and further destroy wounded roots. As foliage and limbs die to balance the roots and top, trees often experience extensive sprout growth. Sprouts are limbs that grow from latent buds under the bark. The leaves on these limbs attempt to replace the loss of photosynthetic potential from top dieback. While this is a healthy reaction, sprout limbs are weakly attached to the trunk and are only effective for a few years.

If a tree has sufficient stored nutrient reserves, it may recover from moderate damage. In cases of heavy damage, affected trees enter a decline spiral characterized by continued top and root dieback.

Construction damage is often amplified by opportunistic insect and disease attacks (primarily wood boring insects and root decay). In fact, these secondary attacks are often identified as the cause of tree death.