

TREE AND SHRUB SOIL CHALLENGES

Quite often tree and shrub disorders can be caused by the soil environment. About 80% of shade tree problems can be attributed to soil issues. Unfortunately, most arborists and groundskeepers don't have direct access to the soil and root zones below ground and this can make diagnosis difficult at best. The surrounding environment such as sidewalks or landscaped beds, poor drainage or limited soil volume can complicate the diagnosis process. Insect infestations on plants can also manifest as a soil problem.

Above ground symptoms can provide a basis for diagnosing underlying soil issues. There are eight type of problems that are outlined here, and include;

1. Planting too deeply
2. Soil compaction
3. Excessive or not enough mulch
4. Poor drainage
5. Low moisture
6. Soil mix interface
7. Limited soil space
8. Raise in soil grade

The symptoms suggested here can be determined as simple field tests by anyone with limited soil understanding.

Planting too deeply

When looking at the trunk of a tree, the visible absence of a root flare and the presence of girdling roots and suckers can be an indication that the tree has been planted too deeply. Plant roots require oxygen. Oxygen levels are at the greatest near the soil surface and decrease the lower you go. The lack of oxygen disrupts normal root formation and can cause the development of girdling roots. To determine if a tree is planted too deeply one must locate the lateral main roots. To do this use a probe, pushing down into the soil within 2 to 3 inches of the trunk. A long screwdriver can serve as a probe. Take note of the length of the probe that goes below the soil surface, with repeated tests. Two to four lateral roots should be found right near the surface. The average length of the depth to the lateral roots gives you an idea of how deep they are growing. If these roots are exposed at the surface, the root system is at the correct depth and probing the soil is not necessary. Removing the excess soil above the root flare or replanting the tree are the best methods to get the tree to the correct planting depth.



Never plant a tree too deep

Soil compaction

Compaction of the soil can cause loss of vigor. A tree with poor vigor will have smaller, yellow leaves, less new twig growth, and any wounds will be slow to close. The vigorous growth of a tree is poor because compaction reduces the rate that water is taken up by the tree. Operation of heavy equipment or repeated vehicle driving too close to a tree or shrub drip-line can cause soil compaction. The water-

holding capacity of the soil is decreased and the soil has limited aeration. Plant roots have a much more difficult time penetrating soil that is compacted. Compaction can be detected by using a probe and pushing it into the soil. The soil should be moist when using the probe. Again, a screwdriver can serve as a probe. Test several areas where you suspect the soil could be compacted and particularly note the resistance encountered when pushing into the ground. The more compacted the soil, the more difficult it will be to push the probe in. Then do a comparison test with non-compacted soil. The best way to deal with compacted soil is to trench the soil outward from the base of the tree or shrub using a shovel. Once a number of trenches have been made you can add a mixture of topsoil and organic matter into the trenched material. Cover the trenches but do not pack the soil down.

Excessive mulch

If too much mulch is added around trees the roots of trees will begin to grow above the soil surface or sprout from the base. During periods of drought mulches can act like a sponge drying out the soil by absorbing surface moisture and causing roots to die. Mulch layers should not exceed 4 inches in depth and should not be placed in a “volcano” against the base of the tree.



Poor drainage

Poorly drained or overwatered sites make trees and shrubs more susceptible to *phytophthora* root rot disease. The symptoms of the disease include yellowed, wilted leaves or dull colored foliage. Plants growing in these soils suffer from a lack of oxygen. The oxygen is deficient because the pore spaces of the soil are filled with water. Soils with a high clay content is susceptible to poor drainage.

The color and odor of a soil can be an indicator of a drainage problem. The lack of oxygen frequently causes a distinctive and offensive foul smell. And a pale yellow or gray color to the soil can be indicate poor drainage.

Some options to deal with poor drainage include selecting plants that are tolerant of poor drainage and planting in a raised bed. For trees that are already in place and experiencing drainage problems the soil can be treated with vertical mulching, creating holes vertically into the soil and adding organic amendments into the holes. The soil conditions will improve over time.

Lack of moisture

A lack of water to trees and shrubs causes leaf scorch. The symptoms appear as leaf edges that turn brown. Extended high temperatures and drought cause low soil moisture. Newly planted trees, which have a limited root capacity, and dormant evergreens, are sensitive to water stress.

Determining the level of moisture content in soils is the best way to have adequate moisture. Using the “feel” method and the appearance of the soil are used to judge moisture adequacy. Soil that is light in color, has a powdery texture, and easily crumbles when handled is moisture deficient. Low soil moisture can be prevented with careful water management and can include the use of mulch and soil amendments.

Mixing soil types

A condition where two distinctly different soils, with different properties in the plants root zones, is called soil interface. Poor soil interface can cause chronic leaf wilt and leaf scorch. For example, planting tree that has been container grown in a high sand content, then into a highly organic soil may result in poor interface. Or, planting nursery grown ball and bur-lapped trees and shrubs into a soil that is high in clay or is very rocky, can result in poor soil interface. Vertical mulching or the addition of organic matter when the tree or shrub is first planting can help the transition of roots into the adjoining soils.

Limited soil space

Trees and shrubs that are planted in “pits” or are bounded by hard surfaces such as concrete or plastic boxes are frequently stressed due to the limited space in which they are growing. The limited availability of nutrients and water to the roots within the planting frequently show symptoms of drought. The best way to avoid this problem is to estimate the soil space that is needed for the tree to survive over time. Trees that are 4 to 24 inches diameter at maturity may require 200 to 1600 cubic feet of soil volume for adequate growth and development.

Raise in grade

A symptom that can take a number of years to show up is caused by an increase in grade. Trees and shrubs will exhibit a gradual dieback over time. The placement of soil over the existing ground surface can restrict the movement of air and water into and out of the root zone. The placement of as little as 1 or 2 inches of soil containing a high amount of clay, or adding crushed gravel or rocks, can cause severe injury to landscape trees. The trees will exhibit dieback from the top of the tree down. The best solution is to remove the added soil and vertically mulch the tree. Trimming dead and dying limbs and branches afterward, can correct the problem.

Troubleshooting chart

Soil Problem	Plant Symptoms	Diagnostic Test(s)	Treatments*
Planted too deeply	Lack of trunk flare, girdling root	Determine root depth	Root crown excavation
Compaction	Loss of tree vigor	Probe soil	Radial trenching
Excessive mulch	Roots growing in mulch	Investigative dig	Root crown excavation
Poor drainage	<i>Phytophthora</i> root rot	Odor, color, percolation test	Vertical mulching
Low moisture	Leaf scorch	Feel method	Water management
Interface	Persistent leaf wilt and scorch	Observe soil types	Vertical mulching
Limited space	Slow decline in vigor, drought symptoms	Estimate area available for root growth	Water management, mulching
Raise in grade	Gradual decline and dieback	Probe soil	Root collar excavation