

Arid Zone Times

An Arid Zone Trees Publication

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Soil Types and Organic Amendments

Few environmental factors have a greater impact on the health, vigor and longevity of desert trees than the soils they grow in. As trees grow, roots colonize large volumes of soil, extracting essential mineral nutrients and water. This exploration process serves to distribute roots through the soil, anchoring the tree and allow it to resist the force of winds and remain upright. Different soils are made up of varying proportions of sand (fragment of pulverized rock), loam (a mixture of sand, silt and clay particles), clay (tiny plate like crystals that tend to stick to one another) and organic matter (decomposing pieces of everything from soil microbes to plant and animal fragments). Soils are classified or named on the basis of the proportions of each to these soil fractions, like a sandy clay loam, clay loam or sandy soil.

Each soil type has unique properties that influence tree growth. Chief among these is the movement and storage of water in the soil. Water moves in soil in response to two forces, gravity and capillary action. Gravity tends to pull the water down through the soil matrix while capillary action accounts for the lateral or sideways movement. Capillary action is the tendency of water molecules to adhere to other water molecules and to the sides of thin tubes or capillaries. These properties allow water to literally pull itself into small openings. The microscopic spaces between soil particles create tiny capillaries that draw water laterally through the soil. In light or sandy soils, the pull of gravity is greater than the capillary forces and water is quickly drawn almost straight down. In heavy or clay soils the spaces are so small and numerous that the capillary force is greater than the pull of gravity and water penetrates very slowly if at all. Certain clays swell when they are wet, making the capillaries even smaller and can further impede water penetration. Ideal soils (sandy loams, sandy clay loams and loams) allow moderate rates of water penetration and lateral movement with good short term water holding capacity. In these soils, water travels through the soil at a rate that is slow enough to allow the roots to absorb water and nutrients yet drains quickly enough so roots are not left standing in water.

Some desert species, like Foothill Palo Verde flourish in the fast draining, highly porous rocky soils found along hillsides and rocky slopes. Ironwoods and Blue Palo Verdes are adapted to bajadas of desert slopes where the soils are less porous yet drain relatively quickly. Others, like the mesquites and Desert Willows are stream-side or riparian trees that can survive periods of water saturated soil conditions.

Desert soils run the spectrum from sandy (in some cases dune sand) to heavy clay. The feature common to all desert soils is very low levels of low organic matter. By weight, organic matter usually accounts for less than 1% of desert soils with some soils having significantly less than 1%. Consequently desert tree species have evolved to survive with little or no organic soil amendments. In recent years horticultural professionals are increasingly recommending that organic material NOT be used in back-fill soil mixes when transplanting trees. Where drainage is good to adequate NO back-fill amendments are recommended. With heavier clay soils or soils with poor drainage back-fill with a combination of native soil and masonry sand is recommended. The actual proportions of sand to native soil in the back-fill will depend on the severity of the drainage problems. Even when sand is added to transplant back-fill, careful irrigation management is necessary if desert trees are to thrive in heavy clay soils. Irrigation practices in such soils are further complicated by under-story plantings of shrubs and ground covers. Tree placement and the selection of desert trees species should be sensitive to soil type and overall irrigation requirements for the entire landscape.

Application of organic or rock mulches to the surface of the soil under trees is an effective method for reducing moisture loss from the top layers of soil. Such practices mimic the conditions found in the desert beneath "nurse trees," where leaf and small branch trash, in combination with leaf canopy shade, create an environment conducive for germination and growth of tender young desert plants.