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[ag.arizona.edu/pubs/
garden/az1281.pdf](http://ag.arizona.edu/pubs/garden/az1281.pdf)

This information
has been reviewed by
university faculty.

Caliche is a common problem in southern Arizona soils. Caliche is layer of soil in which the soil particles are cemented together by calcium carbonate (CaCO₃). These layers may form at or below the soil surface.

Caliche may appear as light colored concretions (lumps) which range in size from less than 1 inch to several inches across. Caliche may also appear as a solid layer, ranging from a few inches to several feet in thickness. Caliche layers range from relatively loose to highly consolidated, solid rock-like conglomerations.

Where does caliche come from?

Caliche is the a natural formation in desert soils. Calcium is continually added to the soil, mainly dissolved in rain water. This calcium combines with carbon dioxide dissolved in soil water, forming insoluble calcium carbonate deposits. Over time, calcium carbonate builds up and consolidates into solid, sometimes massive deposits. Not all desert soils have caliche. Caliche formation depends on numerous factors, including amount of rainfall, water infiltration, and soil drainage.

What does caliche do to plants?

1. Solid caliche layers may be impenetrable to plant roots. As a result, roots are restricted to a small amount of soil, and must extract nutrients and water from a reduced amount of soil. Plants with shallow rooting systems are subject to drought stress, and may be poorly anchored and subject to uprooting in strong winds.
2. Impenetrable caliche layers restrict water movement. Water applied to the soil can not move into or through soil with a tight caliche layer. Water perched on top of the caliche can contribute to problems associated with inadequate root aeration. In addition, soils with poor drainage due to the presence of caliche will have a tendency to become saline as salts can not leach out of the soil and build up in the rooting zone.
3. Calcium carbonate is a basic (high pH) substance, and where caliche is present the pH may be high enough to cause iron to be unavailable to plants. The symptoms of iron deficiency appear on the youngest, newest leaves, the area between the leaf veins becoming pale yellow or white. No physical deformity occurs, but in severe cases the youngest leaves may be entirely white and stunted. There are several methods for addressing iron deficiency,

including reducing soil pH, or soil or foliar application of iron fertilizers. Contact county Extension agents for advice on correcting iron deficiencies.

How can caliche be managed?

Physical problems associated with caliche can be reduced or eliminated by breaking apart and removing as much caliche as practical when making holes for planting. Holes should penetrate completely through the caliche layer to allow water to drain rapidly. The latest planting guidelines recommend a shallow hole rather than a large deep hole. A hole no deeper than the root ball and up to 3 to 5 times as wide will permit normal development and growth of the roots and tops of your plants. If it is not practical to dig the entire diameter of the hole through the caliche, then a smaller drainage hole can be made that pierces through the caliche and provides drainage. Do not place drain holes directly under the root ball as this will force excess water through the root system and may encourage root suffocation and disease. Drainage can easily be checked prior to filling with soil or planting by partially filling the hole with water. If the water level drops at least four inches in four hours, then drainage should be adequate.

At a Glance

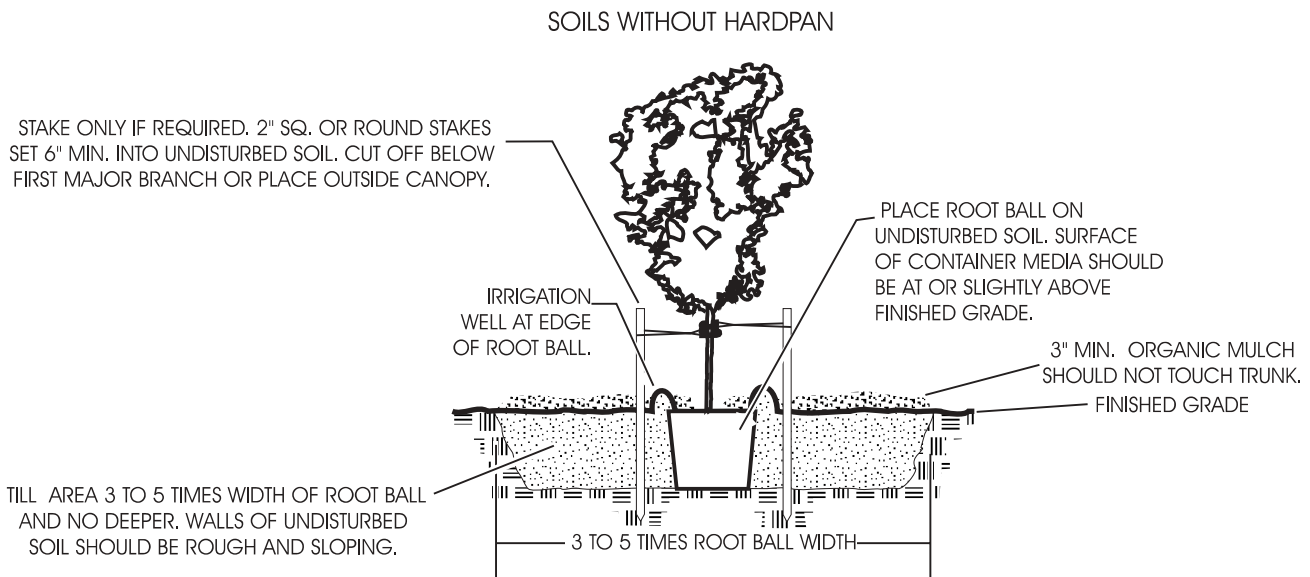
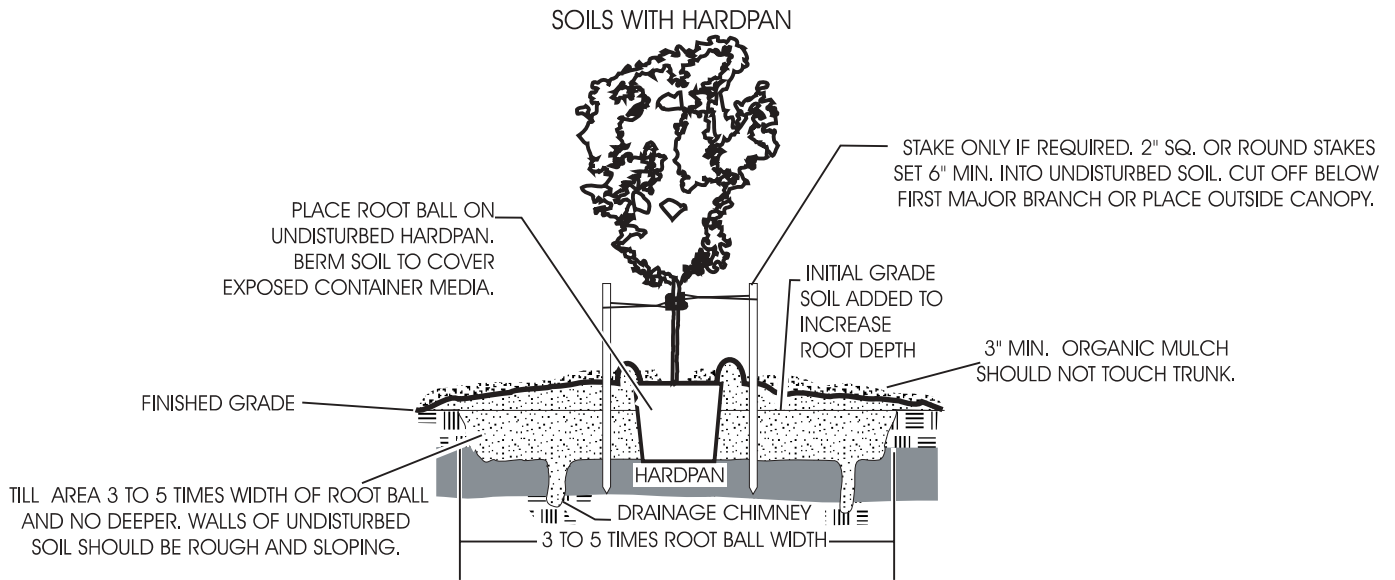
1. Caliche can cause plant growth problems by:
 - a. Restricting root development
 - b. Restricting water drainage
 - c. Causing iron to be unavailable to plants
2. When making a planting hole, penetrate caliche if practical. Remove solid chunks of caliche from the soil.
3. Before planting, make sure water drains from the hole make sure drainage will be adequate for the plant or else mound soil to provide enough soil for plant roots.
4. Mix sulfur with soil to enhance iron availability and soil drainage if non-desert species are being planted.

If good drainage can not be attained by penetrating caliche, soil can be added to increase the depth of soil available for rooting. Sufficient soil should be added to provide two feet total depth over the entire rooting zone (one and a half to four times the mature plant canopy). Use soil that is similar in texture and set trees and shrubs several inches above grade to allow for settling.

Solid chunks of caliche should be removed from the soil. Adding powdered or prilled (pelleted) elemental sulfur at the following rates will increase iron availability and may

improve soil drainage: ½ ounce (14 grams) per cubic foot of soil in sandy soils, 1 ounce (28 grams) per cubic foot of soil in silty soils, and 2 ounces (56 grams) per cubic foot in clayey soils. Sulfur should be thoroughly mixed with the soil. *Addition of sulfur is not recommended for cacti, succulents, or other desert plant species.*

If lawns are to be established where caliche occurs, at least eight inches of topsoil can be placed over the caliche to provide an adequate medium for the grass.



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