UNLV
UNIVERSITY OF NEVADA LAS VEGAS

SOIL ALKALINITY

Western soils are considerably different than those found in other parts of the county. A certain amount of salt, much like table salt, is present in our native soils. Due to the limited rainfall we receive, these salts are not "leached" or washed out of the soil profile. As a result, the salt content in our soil may become quite high.

The addition of water by irrigation may also increase the levels found in the soil, particularly if the amount of water added is minimal or if the water has a high level of salt in it. It is said that if one were to place a foot of water on an acre of soil that 2,000 pounds of salt would be added to the site. Now that's a ton of salt. With this in mind it is no wonder that salts accumulate in the desert.

To put this all in perspective, certain terms require explanation. One is pH. This term refers to a scale or measurement of hydrogen ions in the soil. The scale is from 1 to 14, with 7 indicating a neutral state. The soil is said to be acidic, if the value is below 7. The soil is said to be alkaline, if the value is above 7. If the value were say 10, it would be very alkaline. Our soils in the desert tend to be alkaline and frequently measure over 8.0 on the pH scale. Incidentally, plants perform best if the soil pH is near 7.0.

Alkalinity is a broad term (which is rarely used by soil scientists anymore) for a multitude of things that may occur in the soil chemistry. Alkalinity is due in part to the nature of parent material from which the mineral soil is derived. As a result, a number of elements contribute to alkalinity, including calcium, sodium and magnesium. The white stuff that we see in the winter on the surface of porous materials is often referred to as alkali, and it is most often molecules of the previously mentioned elements and/or calcium carbonate.

As water evaporates from porous materials such as soil, concrete surfaces, and rocks, the water is pulled through the material, which is a process known as "wicking". The alkaline material in the water does not evaporate with the water molecules. As a result, a white residue is left behind on the surface. Often this phenomenon is quite visible and it may appear as if it had recently snowed.

This event tends to be more noticeable during the winter months for a number of reasons. In part it is due to the fact that more moisture is present in the soil from winter rains. Due to the lower temperatures the evaporation occurs more slowly, but the wicking activity is still strong. You may even see it appear on concrete walks, cinder blocks or in the landscape. This is known as "efflorescence". The process occurs during the summer months too, but the moisture levels tend to be lower and the salt crystals are either buried or blown away.

The University Arboretum
4505 Maryland Parkway • Box 451018 • Las Vegas, Nevada 89154-1018
(702) 895-3392 • FAX (702) 895-4173

The alkali residue can be quite destructive to porous surfaces. The salt crystals as they expand exert pressure on the surface of the material, which leads to the decomposition of the surface. This deterioration may be particularly damaging on smooth concrete surfaces.

This pressure exerted by the salt crystals is a natural "weathering" process that also occurs on rock surfaces. Depending on the nature of the rock material and the size of the rock particles, the decomposition of the rock material may be more pronounced.

Several things may be done to alleviate the chemical properties which are caused in part by alkaline soils. The pH may be reduced over small areas by the incorporation of soil sulfur. Contact your county extension agent to determine the amount to apply. The incorporation of organic matter may also help. The application of water may also work to leach the salts lower into the soil profile provided that drainage is adequate. This often is considered a temporary fix and unfortunately drainage is not always good in our desert soils.

In the event that none of these options is feasible, one may also consider the application of vinegar. Vinegar is a weak acid, actually acetic acid. One may apply a vinegar solution directly to the affected surface to remove the residue and to wash it away. You may actually see a fizzing occur as the vinegar comes in contact with the alkali. To mix a solution, combine one cup of vinegar to one gallon of water and simply pour it over the affected surface. Or you may wish to consider the use of a hose end sprayer. One may place pure vinegar in the canister and apply liberally to the surfaces through the hose.

Muriatic acid or commercial pool acid is also a worthwhile product that is a much stronger acid than vinegar. It may be used more economically for this reason. One cup would be adequate for five or more gallons of water. Remember that due to the relative strength, great caution should be exercised in the use of this product. Be certain to wear protective clothing, rubber gloves and eye protection when handling this product. Also, apply products such as these on a calm day and avoid breathing the mist produced

Weak acid solutions are not harmful to adjacent plants. In fact, lowering the pH of the soil will be beneficial to most plants. However, be sure to wash off the foliage of adjacent plants to ensure that no residue is left behind.

As an added consideration, concrete surfaces in the desert should be composed of Type V cement, which is considered alkali resistant. Older concrete structures should be cleaned and then sealed with a product intended for that purpose to hinder deterioration. Theoretically, rock surfaces in the landscape may be sealed in the same manner, but this may not be practical.

Prepared by Dennis Swartzell, Arboretum Director