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University of California
Agriculture and Natural Resources
Making a Difference for California

The Green Scene

UCCE

September 2021

Meetings and Announcements

Fall Horticulture Classes—last request, for now, for input

In the fall, I have customarily offered one or two horticulture classes, although Covid shut us down last year. It is possible I could offer specific topics or a series of topics, and I've received a couple of requests to offer something. If you have an idea or would like to offer any feedback, please send me an email, jfkarlik@ucanr.edu. I have received several emails expressing interest and also suggesting specific topics. I welcome your input.

Annual Winter Pruning Demonstration

We hope to hold our annual winter pruning demonstration. More information as we move closer to December.

39th Annual Landscape Management Seminar, February 2022

The all-day 39th Annual Landscape Management Seminar is scheduled for February 2022, probably at Hodels. We are working on the specific date and the program. Abate-a-Weed is cooperating as a sponsor for this meeting and will be handling registration. We expect eight hours of PCA credit for this meeting, including two hours of laws.

Soil Testing for Diagnosing Soil Problems

I've received several emails and calls recently about soil testing, so I am re-running a *Greenscene* article from a couple of years ago.

The soils of Kern County may not support optimum plant growth because of their chemical characteristics. Indeed, much of the land on the valley floor could not support agriculture until it was reclaimed in the early 20th century. If soil will not support plant growth, a soil test may help to identify the specific problem. Soil tests may also be of value if large or high-value landscape installations are proposed. For accurate results, a soil sample needs to be analyzed by a lab. Home test kits or meters may give an indication of what's going on, but a lab will use standardized tests and calibrated instruments.

The key to a good soil sample is making it representative of the area of interest. For a particular area, a sample might be composed of about a dozen soil cores taken from the surface to depth of a foot and mixed well in a paper bag. Sampling is a science all by itself, so additional discussion might be necessary to know how many cores to take and at what depth or depths.

Three major chemical problems may appear in various locations in Kern County soils, either singly or in combination. These are salinity, sodicity, and high boron level.

High pH is also a consideration, but does not usually impact plant growth as much as these three chemical problems. Remediation steps are specific to the soil problem encountered, and so it is important to identify the problem and the degree or amount of the problem. Although the term "alkali" is sometimes used to describe areas of soil where plants don't grow well, this term is not specific.

Let us consider each of these possible problems.

Salinity refers to an excess of soluble salts, the term salts referring not only to sodium and chloride ions (table salt), but positively and negatively charged atoms and molecules often found in soil. These include nitrate, ammonium, phosphate, potassium, iron, zinc, calcium, magnesium, and others. These salts are also plant nutrients, but if in excess, their total amount will result in water moving from plant roots into the soil solution resulting in drying (desiccation) of the plant. At lower but still excessive salt levels, plants will grow slowly although they may not exhibit obvious leaf symptoms.

Sodicity refers to an excess of the sodium ion. Sodium becomes directly toxic to plants at high levels. Too much sodium in relation to calcium and magnesium can result in very high pH, around 9, and can cause dispersion of soil organic matter and clay resulting in an impermeable layer on the soil surface ("black alkali"). Sodic soils are not common these days, since such soils were typically reclaimed in the past.

Boron is a necessary plant nutrient, but the line between sufficiency and excess is narrow. It is no wonder some Kern soils are high in boron, given that Kern County is home to the world's largest mine for boron minerals. A few years ago, I took soil samples from turf and an athletic field in the town of Boron (eastern Kern County along Hwy 58), which is just a few miles south of the mine, and, no surprise, the grass was not growing well as a result of high levels of boron.

A lesser problem, high pH is common in Kern soils, but pH values are usually in the mid-7s. Recalling that pH of 7.0 is neutral, our soils tend to be alkaline (pH above 7.0) rather than acid (pH below 7.0). Most landscape plants grow well in a pH range of 7.3-7.7. However, alkaline pH does limit the availability of iron and zinc in the soil solution, so iron and zinc deficiencies are fairly common in landscape plants, as shown below in photos of Chinese elms. Note the yellow new growth.

What about soil test results and management?

Salinity is evaluated via electrical conductivity with units of decisiemens per meter, or dS/m. These units are numerically equivalent to the older unit of millimhos (mho is ohm spelled backwards) per centimeter. Soil test values of less than 2 dS/m are conducive for plant growth. At levels above 2 dS/m, plants begin to be affected. A few plants, such as bermudagrass and date palms, can handle values as high as 16 dS/m. It is unusual to find high salt levels in the upper two feet of Kern soils, including desert soils, with the exception of the Buena Vista Lake area and a few other spots. (If salt content of water is expressed as TDS, total dissolved salts, in parts per million (ppm), the value is numerically equivalent to milligrams per liter. An EC of 1.0 is approximately the same as 640 ppm TDS.) To remedy soils high in salts, the soil must be leached; that is, clean water must be applied and allowed to dissolve salts and carry them below the rootzone of plants. As a rule-of-thumb, about a foot of water is needed to clean a foot of soil.

Sodicity is evaluated by comparing the amount of the sodium ion to calcium plus magnesium. That comparison is expressed numerically as sodium absorption ration (SAR) or exchangeable sodium percentage (ESP), which have similar threshold values. If SAR or ESP is below 15, the soil should be OK. In general, remediating soil high in sodium involves application of gypsum and tilling, followed by irrigation with low-sodium water. A specific recommendation can be developed given data for a particular soil test.

Boron is measured in a soil test and its value given in ppm. A boron level is not limiting to plants if less than 1 ppm, but boron becomes increasingly toxic to plants at levels above 1 ppm. To remove boron, soil needs to be leached with water low in boron, and because boron tends to stick to soil, about three feet of water is needed to clean a foot of soil, the amount of water depending on the actual boron level and water quality.

Soil pH is best determined in a lab by a calibrated meter. Test strips found in home test kits can give an idea of pH, usually within a half unit. It is possible to lower soil pH prior to planting by using sulfur. A few acid-loving plants may grow better if planted in soil with an amendment, such as acidic peat moss. Such acid-loving plants include azaleas, rhododendrons, gardenias, and to a lesser extent camellias. I say grow better, because these plants are from cool forest environments, and they're not well adapted to the San Joaquin Valley and its blazing summer sun. Again, a soil test can give precise results for pH that will inform the need for soil modification.

Our Cooperative Extension office has a list of soils labs that we can send to you by surface mail or as an email attachment.

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Environmental Horticulture/Environmental Science