Low Cost Soil and Irrigation-Water Testing

for Gardeners, Homeowners, and Landscapers

If you're planning a new yard or garden, or if you're having poor plant growth, consider having your soil analyzed. Soil tests reveal chemical problems that are invisible to the eye, except when plants are dying or sickly.

Have your soil tested to learn about:

- **plant nutrients**: levels of Nitrogen (N), Phosphorus (P), Potassium (K), and more.
- **pH**: the range from acidic to neutral to alkaline.
- **electrical conductivity** (EC): the ability of the water in soil to carry an electrical current. EC measures the level of nutrients and salts.
- **texture**: the proportion of soil particle sizes: sand, silt, and clay.

Plant Nutrients

Nitrogen (N)

Plants uptake nitrogen when it is in its nitrate form. Symptoms of nitrogen shortage include slow or stunted growth and yellowing of leaves.

Climatic conditions in arid parts of Southern California do not favor the accumulation of organic* matter in soil. As a result, local soils often lack nitrogen and sometimes other nutrients. N is derived from organic matter, air, or fertilizers, not from the soil mineral particles. To make sure there is plenty of nitrogen available to plants, many gardeners add this nutrient to the soil each year.

Phosphorus (P)

A shortage of phosphorus slows flowering, seed production, and root growth. Symptoms of phosphorus deficiency appear in older leaves first. Leaves become dark gray-green or somewhat purple. Western soils are usually high in phosphorus, so California gardeners rarely need to add P, yet it frequently comes in fertilizers.

Potassium (K)

Symptoms of potassium shortage include mottled yellow or pale green mature leaves with scorched edges. Potassium deficieny is not common in inland Southern California.

Symptoms of nitrogen deficiency appear first on the oldest leaves, and as the deficiency becomes more severe, later appear on the younger leaves. Mature leaves slowly bleach to a mottled irregular green and yellow pattern, become entirely yellow and then are shed.

*_Organic_ simply refers to anything that was once living. Organic materials include decaying plant residues and animal wastes.

pH

pH is measured on an acid-to-alkaline scale of 0-14 with 7.0 being neutral. Most plants are adaptable enough to grow well in any soil from pH 6.5 to 7.5.

pH influences the availability of plant nutrients. Levels less than 6.5 and greater than 8 can reduce the absorption of certain nutrients, even when there are adequate nutrient levels in the soil, causing some plants to show signs of stress or nutrient deficiency.

Acidic soils (pH<6) are most common in regions where rainfall is heavy.

Soils tend to be alkaline (pH>7.5) in regions with light rainfall. Alkaline soils are typically high in calcium carbonate (lime) and other minerals such as sodium. Alkalinity affects the availability of phosphorus and metal micronutrients including iron, zinc, copper, and manganese.

If a soil drains quickly, deep watering may help reduce alkalinity. To lower a soil's pH, add organic matter or acidifying soil amendments such as gypsum, ammonium sulfate, and sulfur. For acid-loving plants, apply an acidic mulch.

Electrical Conductivity

Electrical conductivity (EC) is a measurement of how well the liquefied soil sample conducts electricity. It measures the level of nutrients and salts.

<2	= very low
2 to 4	= low
4 to 8	= moderate
8 to 16	= high

It is difficult for plants to absorb water when there is high salt concentration (high conductivity). High salt concentrations stunt growth, inhibit germination, and cause "salt burn", which may appear as scorched and yellowed leaves or browned and withered leaf margins.

Salts are naturally present in some soils, while other soils gain salt from irrigation water, chemical amendments, or manures. High salt concentrations are common in places where annual rainfall is low, such as in parts of the West. High rainfall and deep, infrequent irrigations help leach salts through the soil, below the root zone. Gypsum and sulfur are also used to lower salinity.

Texture

Soil texture is a measurement of the particle sizes that are mixed in a soil. Soils are a mixture of sand, silt, and clay particles of varying proportions. Sand is the largest particle and clay is the smallest.

Sandy soils, those with a high proportion of sand, feel coarse. They will not hold in the shape of a ball when moist, but crumble and fall apart. Sand has the largest spaces between particles. Those spaces, or pores, drain water so easily that sandy soils need to be watered frequently.

Soils that are high in silt, the medium sized particle, feel slick or slippery when wet, and soft, like powder when dry.

Clay soils are those that have more clay than sand or silt. Large cracks on the surface are an indication of high clay content. Wet clay will mold into a ball and hold shape without breaking apart. Clay particles hold together tightly and harden when dry. Clay feels sticky when wet.

Soils that are high in clay content are easily compacted when the soil is wet. Water infiltrates slowly, requiring slow irrigation applications to prevent runoff. Compost can be used to reduce compaction in high-clay soils.

Loam is the term for a soil that has relatively even proportions of sand, silt, and clay particles. Loam will form into a ball, but when pressure is applied, the ball will break apart easily.

Loams are considered the "ideal" mix for plant growth. The clay in loam holds moisture and provides nutrients. The sand particles allow water and air to move easily through the soil.

Our soil tests measure the proportion of particle sizes, but you may wish to try to determine texture using the feel method: www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/kthru6/?cid=nrcs142p2_054311

If your land has not been disturbed by construction grading or other human activities, you can find information about your soil from USDA soil surveys at the SoilWeb interactive maps app: http://casoilresource.lawr.ucdavis.edu/soilweb-apps .

Collecting Samples

Chemicals from your skin or dirty containers may alter test results. Use residue-free plastic or glass containers. Use rubber gloves or plastic bags over your hands to collect and mix soil.

Soil Sample

For accurate soil testing, collect a sample that is representative of the entire growing area. Avoid sampling unusual areas such as bare or wet spots, near compost piles or other impacted or disturbed areas. Collect soil from several locations in the growing area and combine the samples.

Use a shovel, trowel or probe to collect soil samples.
For each area to be tested:

1. Clear 4 to 10 small sampling areas; remove plants, rocks, plant debris.
2. Dig a small hole in each cleared area using a shovel or trowel. Depth of hole: 4" for turf, 12" for trees/large shrubs at or within drip line, 6" for flower beds, shrubs, vegetables.
3. Cut a 1/2-inch thick vertical slice from the surface to the bottom of the hole. From each shovel slice of soil, cut a 1-inch wide vertical core. When using a cylindrical tool, such as a soil probe or hollow curtain rod, simply take a 1-inch core from the surface down.
4. Place the samples together in a clean plastic pan or bag. Thoroughly mix together the samples from the area, breaking up clods and removing rocks and plant debris (roots, leaves, sticks). Place at least one cup of the mixture into a plastic bag or nonmetal container. If the soil is initially too wet to mix, spread out the sample to air-dry first.
5. Label each combined sample with name, date, and area, such as “vegetable garden”, “side lawn”, “fruit trees”.

Please provide information about special problems of the area, the plants that grow or are planned for the area, and depth of sample.

Water Sample

For water samples, take 1 pint of water from a well or canal after the water has run for at least 5 minutes.

Costs

Within District
Complete Set of Tests

Soil **$20.00**

Nitrite-Nitrogen, Nitrate-Nitrogen, Phosphorus, Potassium, pH, Texture, and Conductivity

Irrigation Water **$10.00**

Nitrate-Nitrogen, Phosphorus, pH, and electrical conductivity

Additional Tests **$5.00** each

Aluminium, Ammonia Nitrogen, Calcium, Chloride, Ferric Iron, Humus, Manganese, Magnesium, Potassium, and Sulfate.

Rush Orders: There is an additional charge of $10.00 for test results to be available after 3 working days, excluding holidays.

Out of District
Complete Set of Tests

Soil **$50.00**
Irrigation Water **$25.00**

Additional Tests **$10.00** each

Rush Orders: There is an additional charge of $25.00 for test results to be available after 3 working days, excluding holidays.

To verify current pricing, or for testing information, please call:
(951) 683-7691 Ext. 223

Prices subject to change.

The top layer of native soil (topsoil) is the best for plant growth. Unfortunately, during construction, topsoil is removed or compacted. What remains is often hard, rocky, and low in organic matter and plant nutrients (low fertility). To build topsoil, mix compost into the soil surface.

Photo by Jim Archambault, USDA Natural Resources Conservation Service

What You Can Do

If you suspect that your soil may be causing poor plant growth, first check to make sure the cause is not a physical problem such as:

- over or under watering
- disease or pest infestations
- soil compaction (impedes air, root, and water movement)
- a hard layer (hardpan) that prevents water from draining through the root zone. Poor drainage reduces air between soil particles.

Soils that are well managed help produce healthy plants that are less susceptible to pests and disease. To improve soil and replenish plant nutrients, apply fertilizers, either organic types such as compost and manure or chemical amendments. Compost is the preferred amendment, because it is made of organic matter that has undergone the decomposition process, so nutrients are readily available for plant use.

Compost contains micronutrients, nutrients that are needed in small amounts, yet are essential for plant growth.

Compost increases soil biological activity, water-holding capacity, and creates a crumbly, tillable medium for air, root, and water movement. To improve sandy or clay soils, till compost or organic matter into the top 6-8 inches of soil before planting.

Chemical fertilizers dissolve in water easily, so they can flow away in runoff or percolate below the root zone. If you use chemical fertilizers, apply the correct amount and at the right time. Consider weather conditions and timing of applications. For example, apply fertilizers during a plant's growing season and not during heavy rains.

Additionally, too much fertilizer leads to excessive plant growth. By applying the correct amount or by using slow release fertilizers, you limit an excess of new plant growth that would invite pests. For native plants, it may be detrimental to raise fertility levels higher than the natural levels found in native topsoil.

Because nitrate-N is highly soluble in water, it may leach (drain below the root zone), especially in coarse-textured sandy soils. To help reduce nitrogen loss, apply smaller amounts more frequently.

Fertilizer Selection and Use

Plants need many chemical elements, but nitrogen (N), phosphorus (P), and potassium (K) are needed in the largest amounts. Commercial chemical fertilizers are prepared in proportions of N-P-K, and their percentages are labeled on fertilizer bags, for example 16-20-0 is 16% nitrogen, 20% phosphorus, and 0% potassium. To calculate the pounds of actual nitrogen, multiply its percentage by the total weight of the bag of fertilizer.

Learn about soil health at: www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/

RIVERSIDE-CORONA RESOURCE CONSERVATION DISTRICT

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(951) 683-3814 FAX www.rcrcd.org

District boundaries encompass portions of Riverside and San Bernardino Counties, including Riverside, Canyon Lake, Colton, Corona, Norco, Reche Canyon, Gavilan Hills, Grand Terrace, Temescal Valley and surrounding areas.