



## Soil: It's Complex, Be Informed!!

By Penny Villanueva

UCCE Master Gardener of El Dorado County

The Boy Scout motto, “Be Prepared,” could be transformed for gardeners to “Be Informed.” Most people think soil is stacks of bags sold at the nurseries -- not what’s in their backyard. Soil may sound boring, yet it is a key reason plants survive. Soil is not just a substance to hold up plants, but requires care. Robert. E. White states: “soil is distinguished from pieces of rock by the presence of living organisms and organic matter.” And Michael Pollen in “Second Nature” says: “soil is a mystery of complex biological not just a chemical wilderness that we can nourish.” These men hint at the fact soil is a complex subject.

White creatively defines soil profile by functionality: he calls the first layer litter layer. This includes what falls onto the soil like leaves, pine needles, or twigs and what may be added to the soil such as compost and mulch. The litter layer creates biological activity by the addition of organic matter. The second layer of biological activity initiates the ecosystem between soil organisms and plant roots; this influences what types of nutrients are added to the soil and is available for plants. The third layer is called zone of accumulation, which is the end product of organic decomposition. Finally, there is the parent material layer, the origin of the soil like DNA for people.

Most Sierra foothill gardens contain clay soil, but some areas may have a different mix of the original parent material. Soil texture is the relationship between clay, sand, and silt particles. For practical application, the soil texture determines ease for tilling, nutrient content, and water holding capacity. Try digging into clay soil after it has baked in the hot sun for two weeks! Soil structure determines how particles of clay, sand, or silt clump together. Structure also affects how water filters through the soil, how much air is trapped between soil particles, how fertile the soil is, how dense it is, and how soil affects the push of plant roots growing into it.

Soil contains a diversity of soil organisms, and this is the most exciting part of soil called its ecosystem. These organisms develop complex food cycles within the soil through symbiotic relationships, meaning they help each other grow and mature. The result is an increase of available nutrients for absorption by plant roots.

To understand how complex this soil food web is, think of it as an external gastrointestinal tract for plants. Soil organisms contribute to this web in interesting ways. Microbes like algae, bacteria, fungi, protozoa, and actinomycetes decompose organic matter. Arthropods, beetles, insects, termites, spiders, nematodes, and earthworms all reduce soil making nutrients for plant roots. The changes that occur in the soil from this interdependent activity leave residues, which are important sources of nutrients for plants.

An exciting example is mycorrhizae, or beneficial fungi. These fungi attach to the plant roots and enable increased root absorption of valuable minerals and nutrients. In turn, plant roots help the fungi by providing carbon compounds that are a food source for the fungi. Another beneficial bacterium in the soil is Saprophytes, which promotes decomposition of decaying plants by producing nutrients which can be absorbed by plant roots.

Understanding this delicate soil balance is complex, however gardeners should realize they can help manage their soil. Soil change can occur, but it is a process and often takes time. Adding compost and mulch improve the soil content of organic matter. As these additives decompose, humus increases in the soil and texture and structure are improved. Increasing organic matter provides food for beneficial soil organisms.

Soil compaction affects how plant roots are able to penetrate the soil, and compressed soil reduces pore space. Keep heavy equipment off garden areas to avoid slow drainage, lack of air space between soil clumps, and impeded root growth. Clay is easier to compact based on its fine particle structure. Water-logged soils inhibit nutrients for plant growth, so it's best to create pathways throughout the garden, and don't work in the garden when the soil is wet.

Soil cultivation can disrupt soil improvements, soil organisms and the mutually beneficial balance between plant roots and soil microbes. Limit cultivation, for as White says, "life in the soil is a struggle, but the cycle of growth, death, and decay is essential for healthy soil formation."

Plants need healthy roots to collect air, water, and nutrients; so provide a soil environment that nurtures the vast amount of microscopic life that lives within it. Strive to meet the needs of soil-living insects, microorganisms and plant roots -- and you'll be richly rewarded with healthy plants. The next part of the story is to "be informed" how plant roots grow, develop, function and search for food ... but then there are those darn gophers. Never a dull moment exists in the garden!

Learn what your soil needs to keep your plants healthy and growing strong at this Saturday's free Master Gardener class: Working with Soils. Master Gardeners Shilo Nielson and Cindy Young will share how to feed soils in our foothills while protecting the environment. Class is from 9:00 a.m to noon on March 8 at the Veterans Memorial Building, 130 Placerville Drive, Placerville.

Master Gardeners are available to answer home gardening questions Tuesday through Friday, 9:00 a.m. to noon, by calling [\(530\) 621-5512](tel:5306215512). Walk-ins are welcome at our office, located at 311 Fair Lane in Placerville. For more information about our public education classes and activities, go to our Master Gardener website at [http://ucanr.edu/sites/EDC\\_Master\\_Gardeners/](http://ucanr.edu/sites/EDC_Master_Gardeners/). Sign up to receive our online notices and e-newsletter at <http://ucanr.edu/mgenews/>. You can also find us on Facebook.