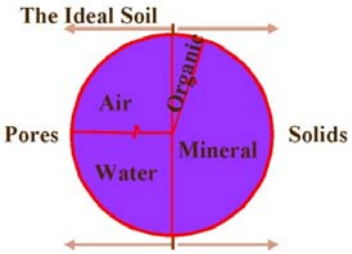
Garden Good Guys – Soil

By Nanette Londeree

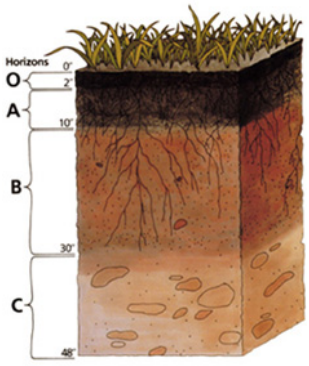
Whether it's fabulous roses or juicy tomatoes you want to grow, you need good soil to start. No matter how much you baby your plants, if the soil isn't functional and healthy, it won't matter much. Have you ever seen fluffy rich dirt that's chocolate brown, so light and workable that you can sink your hand into it up to your elbow? It's the stuff that gardening dreams are made of. Most likely, the native soil didn't look like that and the owner of the enviable dirt has been working at creating it for a long time.



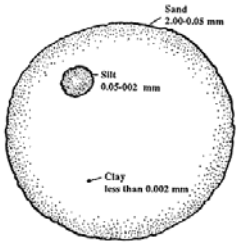
An ideal soil would be made up of 45% minerals (sand, clay, silt), 5 % organic (plant and animal) material, 25% air and 25% water. The mineral portion would be loam (20 – 30% clay, 30 – 50% silt and 30 – 50% sand). It would be crumbly, relatively dark in color, smell earthy and rich, team with microorganisms and earthworms, have plenty of nutrients and a pH between 6.5 and 7.5. This soil would be described as having good tilth. Tilth is to soil what health is to people. If you have this kind of soil now, you don't need to read any further. If you want to transform sticky dense clay or super sandy soil into this wonderful growing medium, it isn't hard. The first step is understanding what you've got to work with.

So what is soil? The dictionary defines it a "the top layer of the earth's surface, consisting of rock and mineral particles mixed with organic matter." A definition used by the U.S. Department of Agriculture expands on this a bit – it is "the unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants." For us gardener's it's the stuff we use to plant in. It is formed slowly as rock that is exposed at the earth's surface disintegrates into loose material through a process called weathering. Add organic matter - living and decomposing plants and animals to the mix along with air and water and you've got soil. And it's constantly changing from the effects of weather, chemical processes, microbes, plants and man.

The relationship of soil to the earth is analogous to that of an orange. The peel of the fruit may be irregular in thickness, color and texture like the layer of soil covering the solid portions of the earth's surface. Depending on location, the relatively thin layer of loose soil can range from a few inches to more than a hundred feet deep. This is on top of the solid layer of rock that's about 20 to 30 miles thick. There are twelve orders (types) of soil, each with unique characteristics, like color, texture, structure, and mineral content. The depth of the soil also varies. The kind of soil in an area helps determine what type of plants can grow.

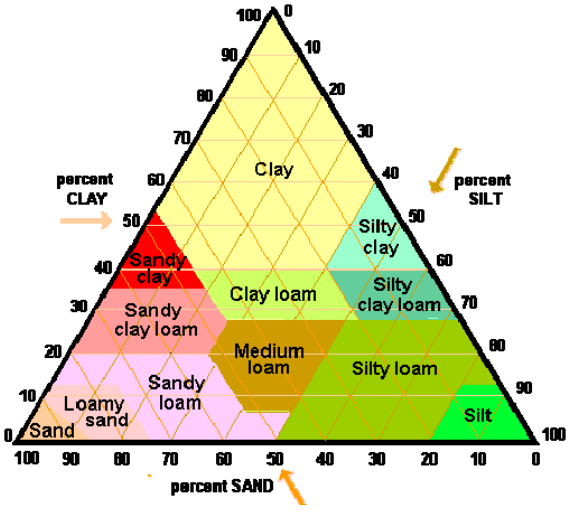


If you could look at a cross section of the earth's surface, you'd see layers or horizons. The top is the organic layer made up mostly of leaf litter and decomposed organic matter (humus). The A horizon, also known as the surface layer or topsoil, is made up of humus mixed with mineral particles. These two layers are the ones you plant in. The B horizon is the subsoil that contains clay and mineral deposits like iron, aluminum oxides, and calcium carbonate that it receives from upper layers when mineralized water drips from the soil above. The lowest level of soil is the substratum or C horizon. It is made up of slightly broken up bedrock. Plant roots don't penetrate into this layer. The unweathered rock below this level is bedrock which is not soil.



One of the most important things to know about your soil is its texture - the proportion of sand, silt and clay particles that make it up. The terms sand, silt and clay refer to the particle size of the material, not their chemical properties. Clay particles are less than 1/12,500 inch in diameter (smaller than most bacteria.) Silt particles range from 1/22,500 to 1/500 inch. Sand particles are from 1/500 to 1/12 inch with the largest sand particle being 1,000 times larger than the largest clay particle. The spaces around

the particles, the pores, are similar in size to the particles. The larger the particles and pores (as in sandy soil), the more quickly it will drain. Conversely, the pores around clay are very small and hold water once thoroughly wetted, draining very slowly.



Here's an easy way to figure out what your soil texture is: fill a glass container about two-thirds full of water. Add enough dry, crumbled soil to almost fill the container. Add a lid and shake vigorously for a few minutes, then set it aside for a day or two until the solids have settled out. Sand will settle to the bottom, then silt and clay will be the top layer. Take a ruler and determine the approximate percentage of each major layer. Find your approximate percentage on each side of the triangle on the left, then move towards the center of the triangle and find where the three percentages meet. That will identify your type of soil. Generic soil names are descriptive terms that are based on their composition of the three specific particles. The ideal mixture for plant growth is called a loam and has roughly 40% sand, 40% silt and 20% clay.

Another important element of soil is its structure, or how the particles are held together - how they clump together into crumbs or clods. A loose structure provides lot of pore spaces for good drainage and root growth. Structure is particularly important in clay soils since unstructured or weakly structured clay drains poorly, is sticky and difficult to work, and contains little air. Organic material is the main contributor to good structure, increasing pore space in the soil and separating some of the sticky substances that can bind clay particles together.

Try out this simple test to determine your soils structure. When the soil is neither too wet nor too dry, dig a hole 6 to 10 inches deep. Separate an intact section about the size of a soup can and break it apart with your fingers. Determine whether the soil is cloddy, powdery, or granular. Ideally, your soil should be made up of different sized crumbs that will hold their shape under slight pressure.

The organic portion of the soil consists of living and dead plant and animal matter in various stages of growth and decay, forming humus – a relatively stable, sticky mass of organic chemicals and microbes that is chemically complex and varied. While the organic portion makes up only 0.5% to 5% of most native soils, well-amended garden soil may contain 30% or more organic matter. It's the most important factor in improving your soil.

Once you know the texture and structure of your soil, look at its color (just dig up a big shovelful and look at it in bright light.) Soils vary in color depending on material make-up and location. While color by itself is not important, it can be an indicator of quality or conditions that are as well as provide a clue as to its mineral content. In general, the darker the soil, the more organic matter it contains. Soils with a reddish, yellowish, or brownish tint are caused by iron oxides; those with a white tint are influenced by carbonates, gypsum, or other salts. If your soil is blue-green or gray, it's a sign that the soil is continuously wet or saturated, a condition that's not good for most garden plants. Soil that is yellow indicates that it is imperfectly drained.

Next to its texture and structure , no other factor of your soil so affects the availability of nutrients and the vigor of your plants as its pH. No matter how much fertilizer, it may be for naught unless the unless the pH is correct. Look for more on this in a future issue.

Soil horizon diagram courtesy of USDA website; soil particle size figure courtesy of Resources for Earth Sciences and Geology Instruction website, soil texture triangle diagram courtesy of Soil Science Society of America website