What is soil?

In short, soil is a mixture of minerals, dead and living organisms (organic materials), air, and water. These four ingredients react with one another in amazing ways, making soil one of our planet's most dynamic and important natural resources.

Soil is used by people in numerous ways. Because of this, it has many definitions. An engineer may view soils as a material upon which infrastructure is built, while a diplomat may refer to "soil" as a nation's territory. From a soil scientist's perspective, soil is:

The surface mineral and/or organic layer of the earth that has experienced some degree of physical, biological and chemical weathering.

Soils are limited natural resources. They are considered renewable because they are constantly forming. Though this is true, their formation occurs at extremely slow rates. In fact, one inch of topsoil can take several hundred years or more to develop. Soil formation rates vary across the planet: the slowest rates occur in cold, dry regions (1000+ years), and the fastest rates are in hot, wet regions (several hundred years).

How do soils form?

Soil Profiles - Dig down deep into any soil, and you'll see that it is made of layers, or horizons. Put the horizons together, and they form a soil profile. Like a biography, each profile tells a story about the life of a soil.

Soil Changes with Age - As soil ages, it gradually starts to look different from its parent material. That's because soil is dynamic. Its components—minerals, water, air, organic matter, and organisms—constantly change. Some components are added. Some are lost. Some move from place to place within the soil. And some components are transformed into others.

CLORPT - Soils differ from one part of the world to another, and even from one part of a backyard to another. They differ because of where and how they formed. Over time, five major factors control how a soil forms. They are climate, organisms, relief (landscape), parent material, and time--or CLORPT, for short.

What are the soil types?

To identify, understand, and manage soils, soil scientists have developed a soil classification or taxonomy system. Like the classification systems for plants and animals, the soil classification system contains several levels of detail, from the most general to the most specific. The most general level of classification in the United States system is the soil order, of which there are 12.

Each order is based on one or two dominant physical, chemical, or biological properties that differentiate it clearly from the other orders. Perhaps the easiest way to understand why certain properties were chosen over others is to consider how the soil (i.e., land) will be used. That is, the property that will most affect land use is given precedence over one that has a relatively small impact.

The 12 soil orders all end in "sol" which is derived from the Latin word "solum" meaning soil or ground. Most of the orders also have roots that tell you something about that soil. For example, "molisol" is from the Latin "mollis" meaning soft.

What makes soil, soil?

Texture - The particles that make up soil are categorized into three groups by size: **sand, silt, and clay**. Sand particles are the largest and clay particles the smallest. Although the soil could be all sand, all clay, or all silt, that's rare. Instead, most soils are a combination of the three.

The relative percentages of sand, silt, and clay are what give soil its texture. A loamy texture soil, for example, has nearly equal parts of sand, silt, and clay.

Structure - Soil structure is the arrangement of soil particles into small clumps, called "peds". Much like the ingredients in cake batter bind together to form a cake, soil particles (sand, silt, clay, and organic matter) bind together to form peds. Peds have various shapes depending on their "ingredients" and the conditions under which the peds formed: getting wet and drying out, freezing and thawing--even people walking on or farming the soil affects the shapes of peds.

Ped shapes roughly resemble balls, blocks, columns, and plates. Between the peds are spaces, or pores, in which air, water, and organisms move. The sizes of the pores and their shapes vary from soil structure to soil structure.

A soil's texture and structure tell us a lot about how the soil will behave. Granular soils with a loamy texture make the best farmland, for example, because they hold water and nutrients well. Single-grained soils with a sandy texture don't make good farmland, because water drains out too fast. Platy soils, regardless of texture, cause water to pond on the soil surface.

Color - Color can tell us about the soil's mineral content. Soils high in iron are deep orange, brown to yellowish-brown. Those with lots of organic material are dark brown or black, in fact, organic matter masks all other coloring agents.

Color can also tell us how the soil behaves. The soil that drains well is brightly colored. One that is often wet and soggy has an uneven (mottled) pattern of grays, reds, and yellows.

What do soils do?

Soils are amazing! Life as we know it would not exist without them, as they provide countless services that benefit all humans. Clean air and water, the clothes on our backs, habitat, and food for plants and animals are just a few things we can thank soils for. These 'goods and services' provided by soils are called ecosystem services.

Credit: Soil Society of America