What is Soil?

Soil is a complex mixture of minerals, water, air, organic matter, and organisms, which forms at the surface of land and comes in many types. Put another way, **soil is the thin outermost layer of Earth's crust**, and like our own skin, we can't live without soil. Why? Soil performs many critical functions in almost any terrestrial ecosystem, whether a farm, forest, prairie, or city.

1) Most of our food comes directly or indirectly from plants anchored in, and nourished by, soil

2) Soils modify the atmosphere by emitting and absorbing dust and many gases, including carbon dioxide, methane, and water vapor

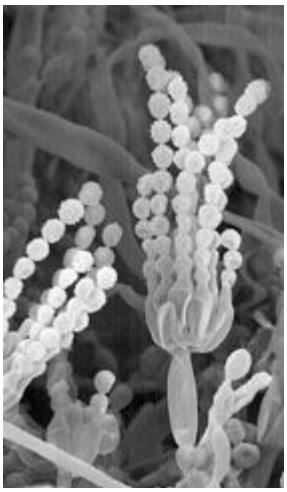
3) Soils provide habitat for soil organisms--mostly microscopic creatures that account for most of the life on Earth

4) Much of the water we drink and use every day has been filtered and purified by soil

5) Soils process and recycle nutrients, including carbon, so that living things can use them over and over again

6) Soils serve as engineering media for construction of foundations, roadbeds, dams, and buildings

Like our skin, soil is easy to take for granted – and to damage.



Each teaspoonful of soil contains billions of microorganisms like this soil fungus. Photo: USDA-ARS.

HOW DO SOILS FORM?

Soil profile

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.

Every soil originally formed from parent material: a deposit at the Earth's surface. The material could have been bedrock that weathered in place or smaller materials carried by flooding rivers, moving glaciers, or blowing winds. Over time, sun, water, wind, ice, and living creatures help transform, or change, the parent material into soil.

Changes with age

As a 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.

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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.

A profile of a northern Minnesota soil. The dark layer, or horizon, is very rich in organic carbon, thanks to the long-standing grass cover above it. Photo courtesy of USDA-ARS.

Soil Types

There are 12 types of soils, which soil scientists call **soil orders**. 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 particular soil. For example, "molisol" is from the Latin "mollis" meaning soft.

Alfisol: Moderately weathered
Andisol: Volcanic ash
Aridisol: Very dry
Entisol: Newly formed
Gelisol: Frozen
Histosol: Organic, wet
Inceptisol: Slightly developed (young)
Mollisol: Deep, fertile
Oxisol: Very weathered
Spodosol: Sandy, acidic
Ultisol: Weathered
Vertisol: Shrinks and swells

An entisol. Entisols are newly formed soils that show little or no development of distinct soil layers, or horizons. Photo courtesy of USDA-NRCS.

Each state and territory in the United States has a representative soil, like a state flower or bird. To find your state/territory soil, go to:
http://www.nrcs.usda.gov/wps/portal/nrcs/soilsurvey/soils/survey/state/

What Makes Soil, Soil?

Soil has 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 a 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.

Soil has 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 in 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.

Texture + structure = soil behavior. A soil’s texture and structure tells us a lot about how a 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.

Vertisol soils, like this one, are very high in clay content, causing them to swell when wet and shrink and crack when dry. Photo courtesy of USDA-NRCS.

Soil has color

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

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