

The Nature of Soil

WE WALK on soil. We grow crops, trees, gardens, and lawns in soil. It is all around us, and it is obviously important to our well-being. Yet, most people don't give soil a second thought, and few people know what makes up soil.



Objective:



Describe the soil and its value in supporting life.

Key Terms:



mineral matter
organic matter

pore spaces
soil

soil aeration
tilth

Soil and Its Value

Soil is the outermost layer of the earth's crust. Depending on where you are on Earth, the layer of soil may be several inches thick or many feet deep. Soil is a complex material that supports life. It may take a thousand years for just 1 inch of soil to form. Therefore, managing soil properly for the benefit of future generations is critical.

Soil supports life in many ways. Its structure allows oxygen, needed for adequate root growth, to enter. Soil maintains temperatures satisfactory for plant growth by absorbing heat from the sun and losing heat to the atmosphere. Soil is a reservoir for water. Organic matter in the soil provides plants with carbon. Soil is a source of mineral nutrients for many forms of life.

SOIL COMPONENTS

Soil is made of mineral matter, organic matter, water, and air. The solid mineral matter and organic matter make up about 50 percent of the soil. The average soil contains about 45 percent mineral matter and about 5 percent organic matter. These solids are not tightly packed.

Instead, there are spaces between the solid particles called pore spaces. Pore spaces are filled with either water or air. In good soil, water makes up about 25 percent of the soil, and air makes up about 25 percent of the soil.

Mineral Matter

Mineral matter is inorganic material. Mineral matter began as rock. Soil generally has mineral particles of different sizes. These particles are labeled sand, silt, or clay, based on their size. Sand is the largest soil particle. Silt is the mid-size soil particle. Clay is the smallest soil particle.

Organic Matter

Organic matter, which accounts for about 5 percent of the soil, is partially decomposed plant and animal matter. Most organic matter is from plant leaves, roots, and stems. Organic matter gives soil its dark color. Organic matter improves aeration and water-holding capacity and contributes to the soil's fertility.

Pore Spaces

Pore spaces are the gaps between solid soil particles. They are occupied by water or air. The amount of water and air found in the soil fluctuates constantly. When the soil is wet, the amount of water occupying pore spaces is greater than the amount of air. Conversely, when the soil is dry, the amount of air is greater than the amount of water.

Living Organisms

An abundance of life can be found in soil. Earthworms, insects, bacteria, fungi, and other organisms inhabit soil. Bacteria and fungi play an important role in breaking down organic matter to release nutrients. Earthworms, ants, crawfish, moles, and other organisms tunnel through the soil improving the soil tilth. **Tilth** is the ease with which soil can be worked. Tilth enhances drainage and improves air exchange.

MOST PLANTS NEED SOIL

Most land plants depend on soil to provide four basic needs; anchorage, water, air, and nutrients. Soil provides firm anchorage or support for plants to grow upright. Soil acts as a res-

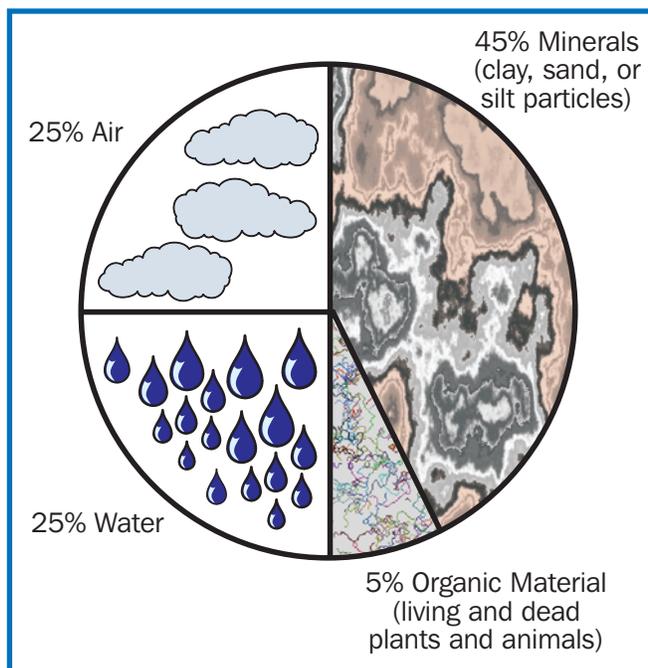


FIGURE 1. This pie graph shows the approximate contents of most soil.

ervoir of water. Nearly all the water used by plants is absorbed through the plants' roots growing in soil. Plant parts growing below the ground require oxygen for cellular respiration. Good **soil aeration**, or the exchange of soil and atmospheric air, is needed to maintain adequate oxygen for plant roots. Of the 16 nutrients considered essential for plant growth, 13 are obtained from the soil. Root hairs absorb the nutrients dissolved in soil water.

SOIL USES

Soil is an important part of agriculture because soil supports the growth of plants for human use. Soil is worked and supports crops, such as corn, soybeans, cotton, and vegetables. It supports the growth of forage plants used for grazing animals. It is the foundation on which forest trees grow. Ponds and other reservoirs are constructed out of soil.

Humans require soil for many other uses besides growing plants. Soil is needed for recreational facilities, including playgrounds, sports fields, jogging paths, golf courses, parks, and campgrounds. Soil is the base upon which buildings rest. Soil is often used for the treatment of human sanitary wastes. Soil filters some of the material, while microorganisms break down organic portions into less dangerous compounds. Occasionally, soil is used as a building material. Houses and other structures are built underground, into hillsides, or even with soil piled over them. Earth-sheltered buildings help in lowering heating and cooling costs.

Summary:



Soil is the outermost layer of the earth's crust. Soil is made of mineral matter, organic matter, water, and air. Living organisms are also present in soil. Mineral matter began as rock, and soil generally has mineral particles of different sizes. Organic matter is partially decomposed plant and animal matter. Pore spaces are the gaps between solid soil particles. They are occupied by water and air. Earthworms, insects, bacteria, fungi, and other organisms inhabit soil.

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FIGURE 2. Plowing is one of the most popular ways to aerate soil. (Courtesy, Deere & Company)

growth of plants for human use. Soil supports crops, such as corn, soybeans, cotton, and vegetables. It supports the growth of forage plants and is the foundation on which forest trees grow. Humans use soil to make ponds and other reservoirs, for recreational facilities, for building foundations, for treatment of wastes, and as a building material.

Checking Your Knowledge:



1. What is soil?
2. What are the components of soil?
3. How does soil support life?
4. Of the 16 nutrients considered essential for plant growth, how many are obtained from the soil?
5. How is soil used by humans?

Expanding Your Knowledge:



Obtain soil samples from several different sites, such as a garden, cropland, forest, and building site. Examine the soil samples with the unaided eye. Then, look at the different samples under a microscope. What do you observe? What are some similarities and differences between the samples?

Web Links:



Soil

<http://www.sccdistrict.com/soilpro.htm>

What Is Soil?

<http://www.sidney.ars.usda.gov/sidebar/justforkids6.html>