Background Essay: Soils Around the World

A major portion of Earth's land surface is covered by a thin layer of soil — a mixture of loose, weathered rock; water; gases; microorganisms; and decomposing organic matter called humus. Soil develops over long periods of time through weathering processes. As bedrock breaks down through physical and chemical processes, the resulting particles and nutrients comprise a substrate, or material medium, in which vegetation can grow. The chemical interaction of the microbes, water, substrate, and organic material creates the dynamic matrix we call soil.

Mature soils are arranged as a series of layers, called horizons. The three major soil horizons are given letters according to their relative position and contents. The A horizon is nearest to the surface and is composed of mineral material mixed with organic matter and humus. Just beneath the A horizon is the B horizon, which is enriched with minerals such as calcium carbonate, aluminum, and magnesium oxides, as well as clay-sized particles that leach from the topsoil. The C horizon — the deepest layer — is defined as partially weathered bedrock.

The soil's texture is important because it affects how well the soil can retain moisture and support plant growth. Because fine-grained clay and silt soils have small air spaces between particles, water drains slowly from them. In contrast, coarse-grained, sandy soils have large air spaces between particles through which the moisture can easily drain. Because nutrients can easily leach out with the moisture, sandy soils are often infertile.

Soil fertility is a measure of how well a soil can support the growth of plants. Besides texture, factors that affect soil fertility include the availability of minerals and nutrients, the microbial population, precipitation, topography, and soil acidity. Fertility can be enhanced by adding minerals that may be deficient, or by removing minerals that may be superfluous.

Soil acidity, or pH, determines nutrient availability and influences the activity of soil organisms. Acid soils tend to break down organic matter rapidly, while alkaline — or basic — soils, which tend to form in dry climates, often contain significant concentrations of accumulated salts.

Soil color is a reflection of the soil's composition and the climate in which it develops. Dark coloring typically indicates that the soil is rich in humus or magnesium oxides. Red and yellow soils suggest iron oxidation has occurred.

Because climate determines the weathering processes that occur in a region, it is the main influence on soil development. A number of soil orders are frequently found in a specific climatic zone. These soils are often referred to as polar, temperate, desert, or tropical soils. Though not indicative of climate, a fifth grouping, volcanic, may also be used.

To learn more about the importance to farming of maintaining the top layer of soil, check out Organic Farming: Conserving Top Soil.

To learn more about polar soils and their influence on build structures, check out How to Build A Road.