

Soil Department

BACKGROUND INFORMATION

Major Concepts

- Physical and biological processes are responsible for soil formation.
- Soils are not considered a renewable resource.
- Soils are complex materials, containing both organic and inorganic components.
- Human activities can negatively affect water and soil conditions.
- Earthworms and decomposer insects are important soil producers.



Soil Production - Earth's Birthing Room

Soil is complex material. It is composed of inorganic particles, such as sand, silt, or clay, produced from the weathering of rock, and organic materials, such as humus, produced from the decomposition of plant and animal tissues. Soils that have high concentrations of organic matter are considered rich, because they usually are able to hold larger amounts of nutrients and moisture.

Oli Earthworm and all his workers are accustomed to life underground. To most of the folks that live “up above”, it appears that little is going on “down under”, but this isn't so. Lots of workers move through the soil, moving around nutrients or just making more open spaces for air to circulate. Important soil workers include earthworms, ants, fungi, bacteria, and other kinds of insects that help decompose dead plant and animal material. Oli Earthworm, (Soil Department Worker) and all his workers are accustomed to life “down under.” He likes to talk about his ‘recipe for soil’ which includes leaves, pine needles, tree branches, rocks, animal poop, guts, mushrooms, bacteria (he needs a hand lens to see these), water, and air.

Life on Earth depends upon healthy soils. It is possible to grow plants with hydroponics, that is, in fertilizer-enriched, water-filled tubes, but this requires lots of energy and constant computer monitoring for good production. Soils have several functions. They provide support for plants and anchor them against movement. Small particles in soil hold nutrients in place until they are needed by plants. Soils also provide a place for air, which is critical for the respiration or “breathing” of the living roots of plants.

In addition to providing these important services to plants, soils benefit other organisms too. Without the soil, where would the armadillo build its burrow? How would earthworms get their food? Where would leaf-cutting ants grow their fungal gardens? Where would food for all the plant-eating organisms grow?

In one sense, soils are a renewable resource because it can be created again and again over time. But, since it takes thousands of years to build a deep, healthy soil, we don't consider soil to be renewable. How is soil formed? Most soils are made by the weathering of rock, when wind, water, and temperature act together to break down rock into small particles. The action of plants and other microorganisms that release sugars and other chemicals also help to change the materials into soil. The decomposition of organic debris (plant and animal parts) adds humus to the soil, which helps it hold water and nutrients. Soils that are produced from the eruptions of volcanoes sometimes have just the right water-holding properties and nutrients to allow plants to grow on them within just a few years. However, these quickly-formed soils are unusual.

Two of the most serious threats to earth's soils are deforestation and erosion. Although global climate change might eventually affect Earth's food production systems, a greater threat is one that is already going on: the erosion of fertile soils. The topsoil, or upper layer of soil, is the best able to perform the job of growing plants. We can think of topsoil as a fertile blanket that covers the earth. However, it is the upper layer of soil that is most vulnerable to loss. If the soil surface is exposed and no longer covered by trees and other plants due to the removal of forests, rain will remove soil particles and much of this soil will run off into streams, lakes or other bodies of water. Erosion is more common and severe in areas that

have been disturbed by deforestation. Deforestation and erosion take place when people cut down trees. You can see it in your community when forests are cut to build new houses, stores, or roads.

Soil in Your Community

Open areas are the best places to look for the free services provided by soil workers such as ants, earthworms, fungi and bacteria. Find an area with exposed soil at the surface. Look for piles of crumbly soil on the surface. If you see no animal activity and the soil looks like small pellets, that is probably evidence of an earthworm burrow. If the soil looks more powdery, the activity is likely due to ants. At an ant nest, you almost certainly will observe ants entering and exiting. Fire ant nests are spectacular and show how much soil can be moved around by these small but busy creatures. Be careful when observing these ants! They will sting (some people say bite, but they just bite to hold on while they sting) and for most people the sting is mildly painful. Some people have a severe allergic reaction to this sting.

Another way to explore the soil department is to observe soil formation in progress. Take a shovel into a wooded area, or someplace that has a fair amount of plant debris on the ground surface. With the shovel, dig down and remove a core of soil about 8 - 12 inches in depth. Keep the clump of soil together so that you can observe the layers of soil. You should see leaf material at the surface, followed by partly decomposed organic material (this is usually black), the topsoil (brown crumbly soil), and then subsoil. The subsoil will appear drier and usually harder than the topsoil. It is usually a different color. You may also be able to see animal activity in the different layers.

Threats

- Erosion
- Deforestation
- Toxic and other waste dumping

Stewardship Actions

- Tree and groundcover planting restoration projects help protect soil from erosion

Quiz Yourself

1. Describe how “weathering” is important to soil formation.
2. Name five ingredients in Oli Earthworm’s Recipe for Soil.
3. True or False: Soils are considered a renewable resource.
4. List the three major functions of soils in growing plants.
5. What substance is formed from the decomposition of organic debris in soil?_____.



