

THE NATURE OF SOIL

LESSON NRES B2-3

Anticipated Problems

1. What is soil, and how do its resources help in supporting life?
2. What are the various components of soil?
3. What living organisms are found in soil?
4. How do plants use soil?
5. What are some agricultural uses of soil?
6. What are some nonagricultural uses of soil?

Terms

- mineral matter
- organic matter
- pore space
- soil aeration
- symbiosis
- tilth



What is soil?

- Soil is a layer on the earth's crust that provides a combination of resources.

How Does Soil Support Life?

- Oxygen—needed for adequate root growth.
- Temperature—determined by the amount of heat the soil absorbs from the sun and the amount it loses to the atmosphere.
 - Temperatures within a particular range are needed for plant growth and seed germination.



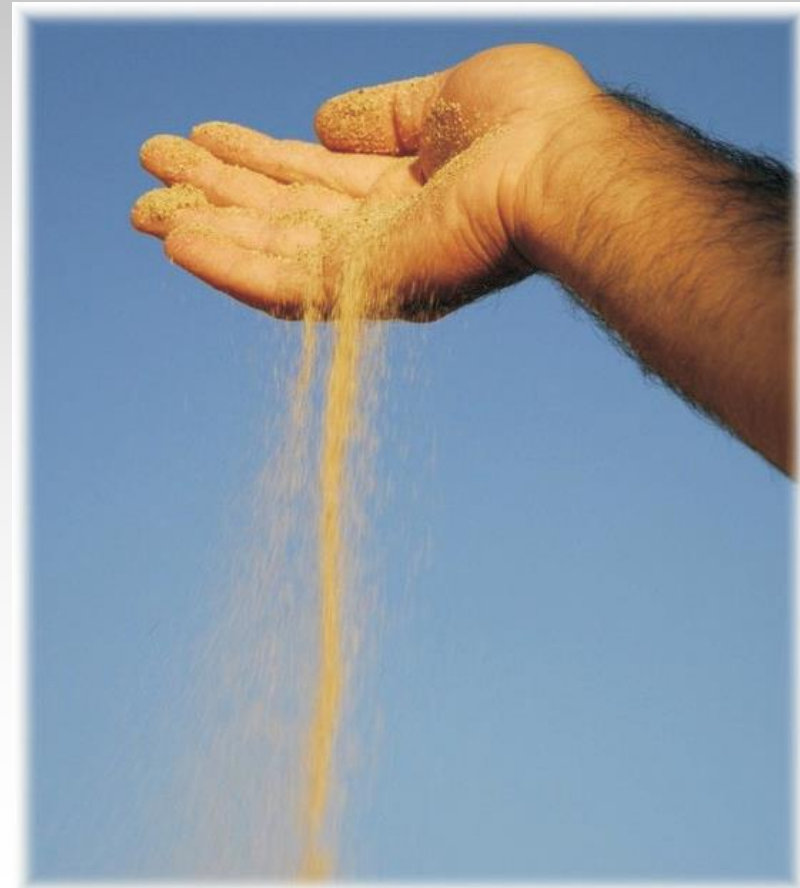
How Does Soil Support Life?

- Water—utilized for growth of plants.
- Carbon—utilized in the form of organic matter in the soil.
- Nutrients—provided as minerals.
 - Made available and recycled through decaying material in the soil



The Various Components of Soil

- Soil is composed of four primary components.
 - Mineral matter
 - Organic matter
 - Air
 - Water



The Various Components of Soil

- In addition, numerous living organisms, such as bacteria, insect larvae, earthworms, and fungi, are in the soil.
- Soil may vary from one area to another, but most will contain these basic components.



Solid Portions of Soil

- Solid portions (50 percent of soil volume) represent the space occupied by mineral and organic matter



Solid Portions of Soil

- ***Mineral matter***, which accounts for about 45% of the soil, is inorganic material originating from rock.
 - Sand, silt, and clay found in the soil.
 - Amounts vary depending on the type of soil
 - Also determine the soil's ability to hold water and provide nutrients

Solid Portions of Soil

- ***Organic matter***, which accounts for about 5% of the soil, is partially decomposed plant and animal matter.
 - Plant leaves, roots, and stems
 - Gives soil its dark color
 - Contributes to the soil's fertility as well as improved aeration and water-holding capacity



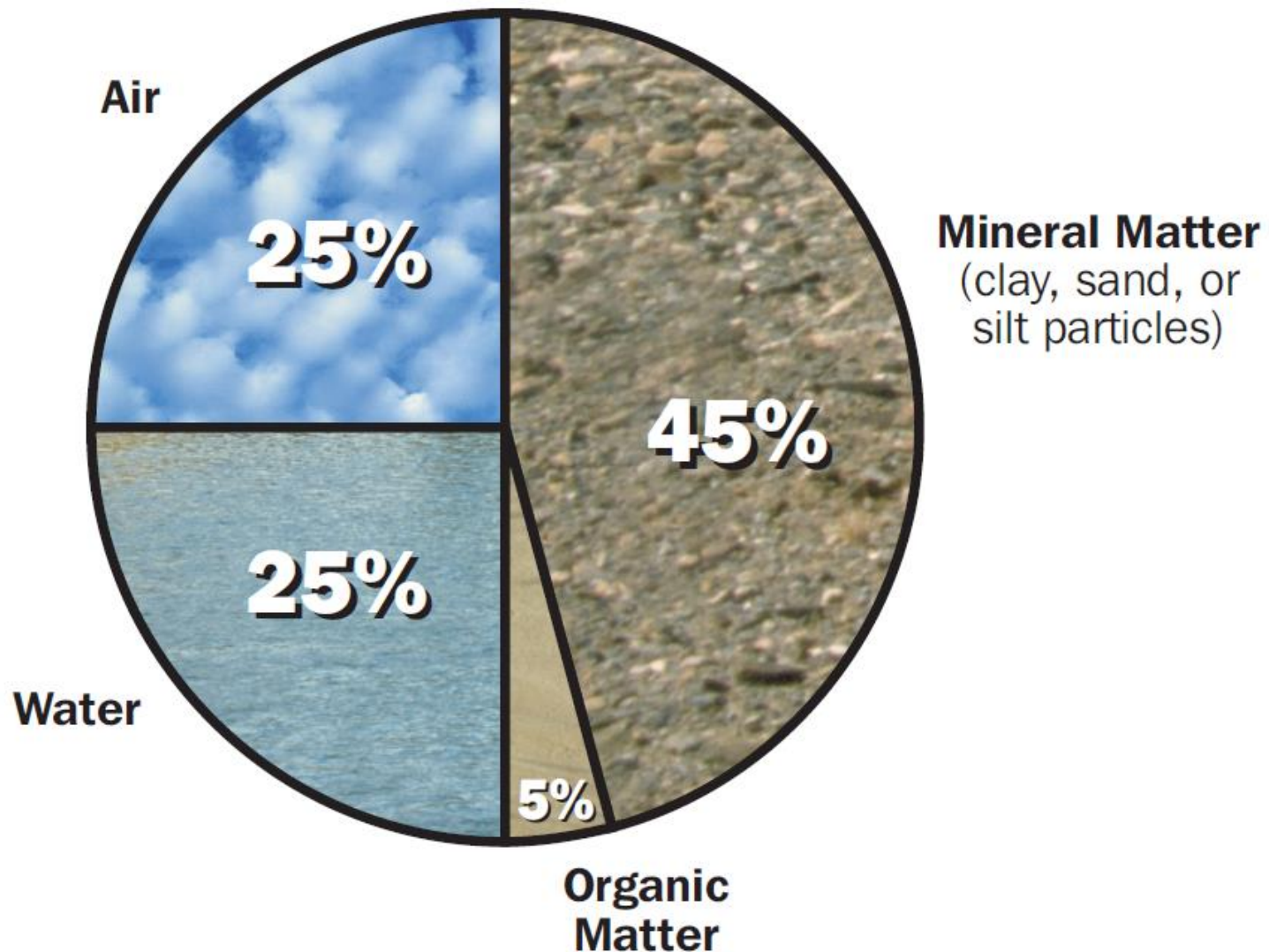
Pore Space of Soil

- ***Pore space*** (50 percent of soil volume) represents the space occupied by air and water.
 - There is a constant fluctuation in the amount of air and water found in the soil.

The Various Components of Soil

- Air, which accounts for about 25% of the soil, is part of the pore space in the soil.
 - Soil is wet, the amount of air will be less.
 - Soil is dry, the amount of air will be more.
- Water, which accounts for about 25% of the soil, is also part of the pore space in the soil.
 - When it rains, water will enter the soil or flow off the soil's surface.

COMPOSITION OF AVERAGE SOIL



Living Organisms Found in Soil

- Abundant life can be found in soil.
 1. Earthworms
 2. Insects
 3. Bacteria
 4. Fungi
 5. Other organisms



Living Organisms Found in Soil

- Bacteria and fungi have an important role in the soil.
 - They break down organic matter and release nutrients.
 - Mycorrhizae fungi have symbiotic relationships with plants.

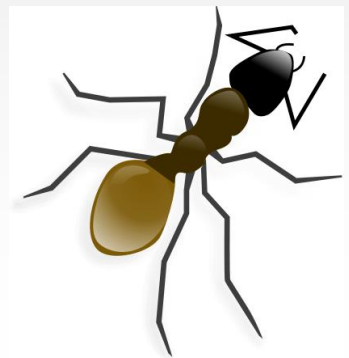


Living Organisms Found in Soil

- ***Symbiosis*** is the living together of unlike organisms.
 - The mycorrhizae fungi get glucose and sucrose from plant roots, and in return plants are assisted in the absorption of water and minerals.

Living Organisms Found in Soil

- Earthworms, ants, crawfish, moles, and other organisms improve the soil *tilth*, the ease with which soil can be worked.
 - These organisms create openings in the soil as they tunnel.
 - This enhances drainage and improves air exchange.



How do Plants Use Soil?

- Plants depend on soil to provide four basic needs.
 - Anchorage
 - Water
 - Oxygen
 - Nutrients



Anchorage and Water

- Anchorage—Soil acts to provide a firm support as roots grow throughout the soil.
- Water—Soil provides nearly all the water used by plants. Water is absorbed through the plants' roots.

Oxygen



- Oxygen—Nearly all living organisms need oxygen.
 - Plants release oxygen during photosynthesis
 - Plants consume oxygen during respiration.
 - Plant parts above the ground have an ample supply of oxygen.
 - Roots growing below the ground have less available oxygen.
 - The exchange of gases between the soil and atmosphere is **soil aeration**. This is important for the health of plant roots.

Nutrients

- Nutrients—Of the 16 nutrients considered essential for plant growth, 13 are obtained from the soil.
 - Root hairs absorb the nutrients dissolved in soil water.

Agricultural Uses of Soil

- Agriculture depends on soil to grow food, fiber, and ornamental plants for human societies.



FIGURE 7. Corn should be harvested at the right time when it contains the proper percentage of moisture. (Courtesy, New Holland North America, Inc.)

Agricultural Uses of Soil

- Cropland—This is land on which soil is worked and crops are planted, cared for, and harvested. Most cropland is devoted to annual crops:
 - Corn
 - Soybeans
 - Cotton
 - Vegetables



Agricultural Uses of Soil

- Grazing land—This is land used for grazing cattle and sheep. It is often planted with perennial forage.



Agricultural Uses of Soil

- Forest—This is land used for growing trees that are later harvested for building materials, paper, etc.



Agricultural Uses of Soil

- Water structures—Ponds and other reservoirs are constructed out of soil.
- Natural resources—Plant and animal wildlife in every biome depends upon soil.



Nonagricultural Uses of Soil

- Humans require soil for many other uses besides growing plants. Such nonagricultural uses include:
 - Recreation
 - Foundations
 - Waste disposal
 - Building materials

Nonagricultural Uses of Soil

- Recreation—Recreational uses include:
 - Playgrounds
 - Sports fields
 - Jogging paths
 - Golf courses
 - Parks
 - Campgrounds
 - Many others



Nonagricultural Uses of Soil

- Foundations—Buildings must be built on solid soil bases to remain structurally sound.



Nonagricultural Uses of Soil

- Waste disposal—Soil is often used for the treatment of human sanitary waste.
 - Soil filters some of the material, while microorganisms break down organic portions into less dangerous compounds.



Nonagricultural Uses of Soil

- Building materials—Homes and other structures are occasionally built underground, into hillsides, or even with soil piled over them.
 - Earth-sheltered buildings have lower heating and cooling costs.



Review

- What is soil?
- What are the four primary components of soil?
- What living organisms are found in soil?
- How do plants use soil?
- How is soil used in waste disposal?