

Soil Characteristics

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CHAPTER

1

Soil Characteristics

- Describe the characteristics of soil.



How does soil resemble weathered rock?

The same processes that weather rock create soil. A large part of soil is weathered rock! If weathering processes didn't exist on earth we would have no soil. Earth wouldn't be a very good place to live. There would be very limited plant life and not much way to grow crops.

The Importance of Soil

You learned in the previous concept that weathering produces sediment. Weathering also produces soil.

People could not live on earth without soil! Your life and the lives of many land organisms depend on soil. **Soil** is only a very thin layer over solid rock. Yet, it is the place where reactions between solid rock, liquid water and air take place. Soil anchors plant roots and provides them with water and nutrients. We get wood, paper, cotton, medicines, and even pure water from soil. So soil is a very important resource. Our precious soil needs to be carefully managed and cared for. If we don't take care of the soil we have, we may not be able to use it in the future.

Characteristics of Soil

Soil is a complex mixture of different materials.

- Some of them are **inorganic**. Inorganic materials are made from non-living substances like pebbles and sand.
- Soil also contains bits of **organic** materials from plants and animals.

In general, about half of the soil is made of pieces of rock and minerals. The other half is organic materials.

In some soils, the organic portion is entirely missing. This is true of desert sand. At the other extreme, a soil may be completely organic. Peat, found in a bog or swamp, is totally organic soil. Organic materials are necessary for a soil to be fertile. The organic portion provides the nutrients needed for strong plant growth.

Soil Texture

The inorganic portion of soil is made of many different size particles. These different size particles are present in different proportions. The sizes and proportions of particles determines some of the properties of the soil.

- Water can flow easily through a **permeable** soil. Spaces between the inorganic particles are large and well connected. Sandy or silty soils are permeable, water-draining types of soils.
- Soils with lots of very small spaces are water-holding soils. When clay is present in a soil, the soil holds together more tightly. Clay-rich soil can hold more water.
- When a soil contains a mixture of grain sizes, the soil is called a **loam** (**Figure 1.1**).



FIGURE 1.1

Two layers of soil are shown here. A sandy soil is at the bottom. A soil with more clay is at the top.

Classification

Soil scientists classify soil by measuring the percentage of sand, silt, and clay. They plot this information on a triangular diagram. Each size particle is at one corner (**Figure 1.2**). The soil type is then known from the location on the diagram. At the top, a soil would be clay; at the left corner, it would be sand; at the right corner, it would be silt. Soils in the lower middle with less than 50% clay are loams.

Soil, the Ecosystem

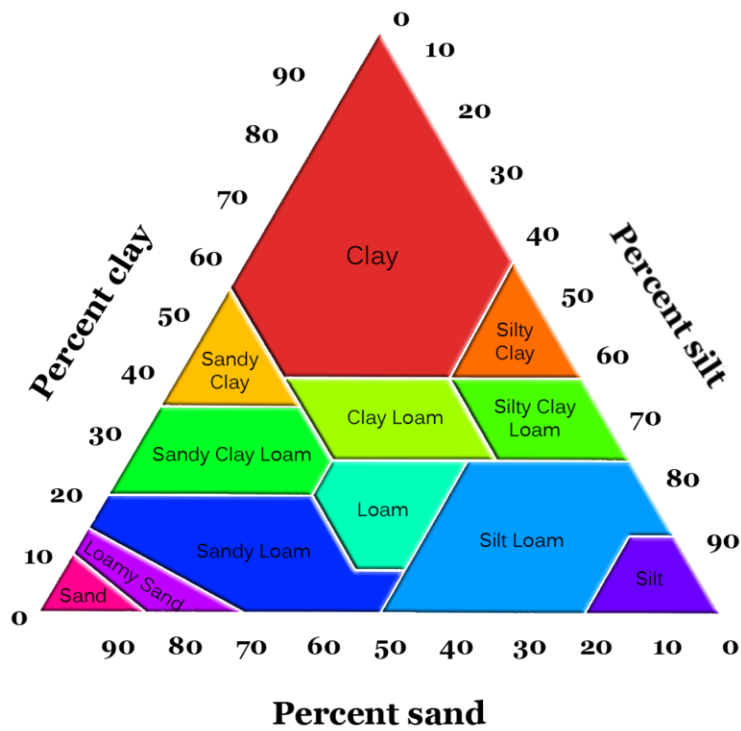
We can think about soil as a living resource. Soil is an ecosystem all by itself! In the spaces of soil are millions of living organisms. These include earthworms, ants, bacteria, and fungi. (**Figure 1.3**).

Vocabulary

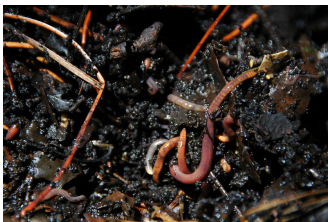
- **inorganic**: Not organic; not involving life or living organisms. For example, the rock and mineral portion of soil.
- **loam**: Soil texture with roughly equal amounts of sand, silt, and clay.
- **organic**: Something from living organisms.
- **permeable**: Material with interconnecting holes; water can move through it easily.
- **soil**: Top layer of earth's surface containing weathered rocks and minerals and organic material.

Summary

- Soil reflects the interactions between the lithosphere, atmosphere, hydrosphere, and biosphere.
- Permeable soils allow water to flow through.
- The proportions of silt, clay, and sand allow scientists to classify soil type.

**FIGURE 1.2**

Soil types by particle size.

**FIGURE 1.3**

Earthworms and insects are important residents of soils.

Practice

Use the resource below to answer the questions that follow.

- **Soil: Who Needs It?** at <http://www.youtube.com/watch?v=mJWM8xc-3i4> (14:26)



MEDIA

Click image to the left for use the URL below.

URL: <http://www.ck12.org/flx/render/embeddedobject/1615>

1. Why is soil important?
2. How many different types of soils are there? What is the composition of average soil?

3. What is humus?
4. What does the amount of humus determine?
5. How can texture affect plant growth?
6. What type of soil do farmers prefer?
7. How much soil being lost each year in the U.S.?
8. Describe the different types of erosion.

Review

1. What are the inorganic materials that make up a soil?
2. What are the organic materials that make up a soil?
3. In what environment are there no organic materials in soils? What soils are nearly all organic?
4. How are living organisms important to soil?

References

1. Soil Science. A sandy soil on the bottom and one with more clay on the top. CC BY 2.0
2. Courtesy of Natural Resource Conservation Service, US Department of Agriculture; modified by CK-12 Foundation - Sam McCabe. Categorizing soil types by particle size. Public Domain
3. Chika Watanabe. Earthworms and insects are important residents of soils. CC BY 2.0