

**MINISTRY OF EDUCATION**  
**SECONDARY ENGAGEMENT PROGRAMME**  
**INTEGRATED SCIENCE**  
**GRADE 9**

**WEEK 11**

**LESSON 2**

**Topic:** Terrestrial environment

**Sub-topic:** Soil

**Objective:** After readings and observing students will accurately  
Define the term soil in one sentence.  
Identify the components of soil.

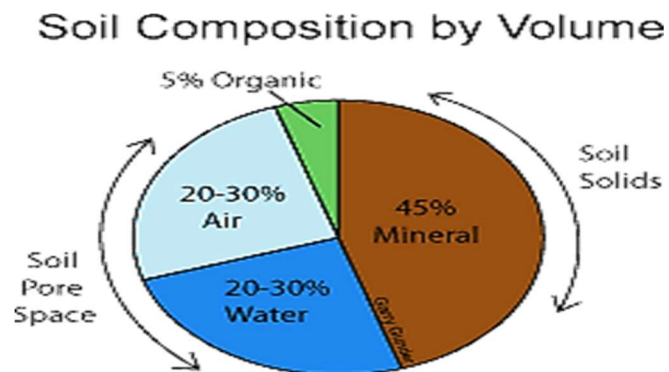
**Content**

**Definition**

**Soil** is a material composed of five ingredients — minerals, **soil** organic matter, living organisms, gas, and water.

**Components of soil**

Soil is composed of both biotic—living and once-living things, like plants and insects—and abiotic materials—nonliving factors, like **minerals**, **water**, and air. Soil contains air, **water**, and **minerals** as well as plant and animal matter, both living and dead. These soil components fall into two categories. The composition of soil varies from one type of soil to the next.



**Soil Air:** This contains the same components as the air above, but the oxygen and the carbon dioxide concentrations fluctuate according to the change in temperature, moisture content and depth of the soil. Air gets into the roots by the process of diffusion between soil particles, along the cracks in the soil, and through the soil. Animals in the soil obtain oxygen from the atmosphere above and produce carbon dioxide, which goes back into the atmosphere.

**Soil Water:** Soil water is found in the pores or voids in the soil. It contains mineral elements and salts such as sodium, manganese, calcium, potassium, sulphates, bicarbonates, nitrates and chlorides.

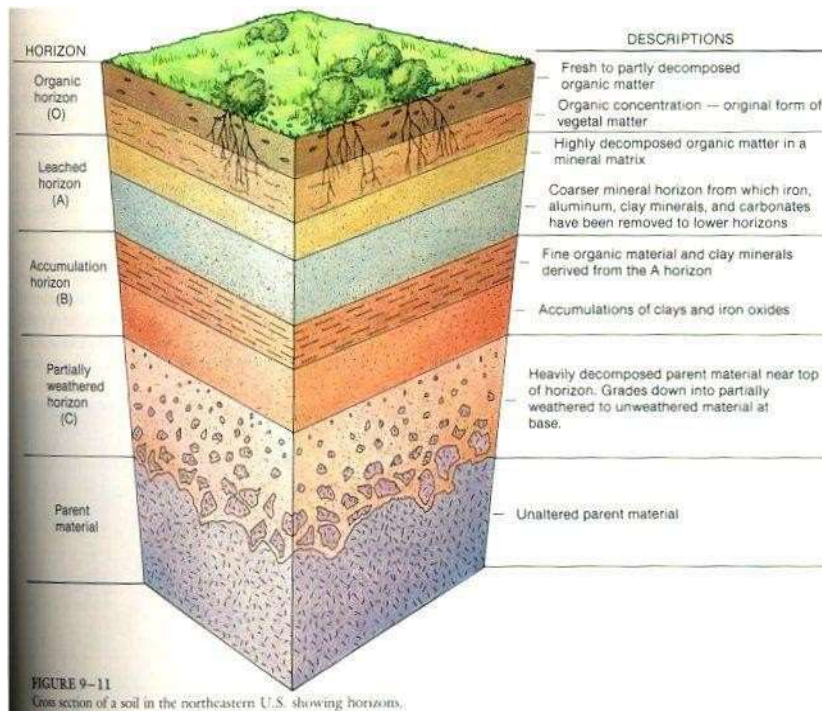
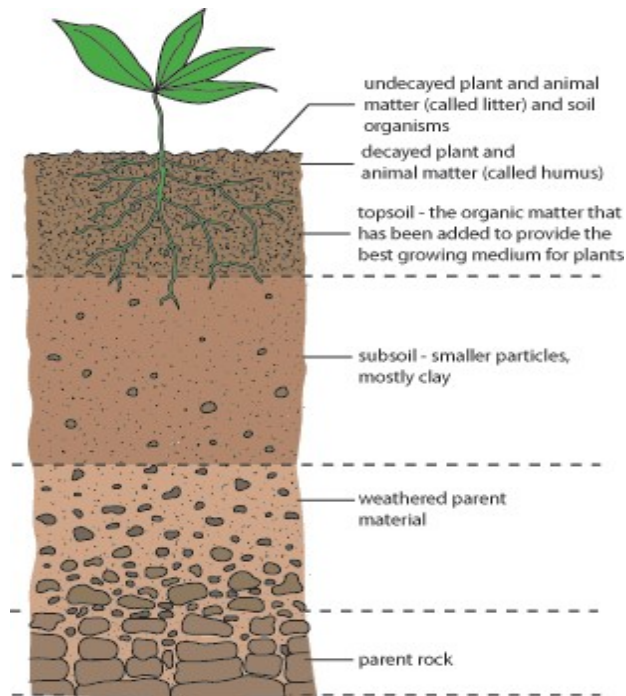
1. **Capillary water:** This is water that rises above the water table in the ground and is held in the fine and medium spaces in the soil by adhesion and cohesion. This water is readily available to plant roots.
2. **Gravitational water:** This is water not held by the soil, and therefore drains out under the influence of gravity. It is used to a limited extent by plants.
3. **Hydroscopic water:** Some of the water becomes strongly adhered to the soil particles and is not readily available for plant use.

**Minerals:** Mineral matter consist of solids inert particles, which are found in most soils. The size of these particles ranges from  $>2.00\text{mm}$  (gravel) to  $<0.002\text{mm}$  clay. These particles are all products of weathering. Sandy soils contain coarse particles of quartz, feldspar, mica and silica. Silt contains intermediate size particles of the same minerals as sandy soils while clay contains the smallest particles. Common minerals in the soil include silicon, iron, aluminum, calcium, magnesium, potassium, and sodium. They usually exist as salts in solution in the form of a film around the soil particles but they can also be part of soil particles. For example, clay soils are mostly composed of aluminum silicates. Mineral particles are also absorbed by the clay and humus particles of the soil which reduces leaching.

**Organic Matter:** This consists of all rotting leaves, bark, branches, roots of dead plants and decomposed animal products. The rotted plant material forms a dark mass called 'humus' which is vital to soil fertility and soil structure. Soil however, has a large number of living organisms – both plants and animals. The plant population consists of fungi, bacteria, and algae, while the animal population consists of protozoa, nematodes, earthworms and insects.

## Soil Profile

A **soil profile** is a vertical cross-section of the **soil**, made of layers running parallel to the surface. These layers are known as **soil horizons**. The **soil** is arranged in layers or horizons during its formation. These layers or horizons are known as the **soil profile**.



## Homework

Create a soil profile using the following materials.

1. A plastic bottle, water and soil (from the backyard)
2. Place the soil into the bottle.
3. Add water into the bottle (3/4)
4. Cover the bottle and place it in a corner on a level surface.
5. Observe the bottle the next day and label each part.

## **References**

- Bernard, Myrna et.al (2003) Science in Daily Life Book 3 (Unit 5) Ministry of Education
- <https://byjus.com/biology/soil-profile/>
- <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/soil-profile>