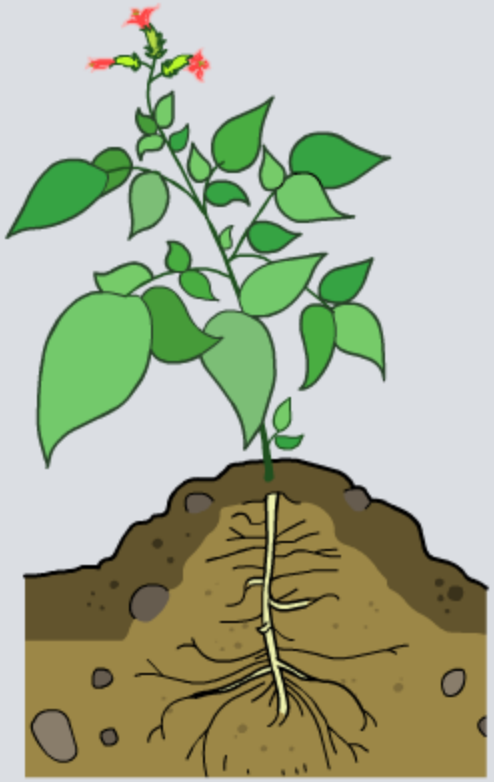
Soil



Why is soil important?

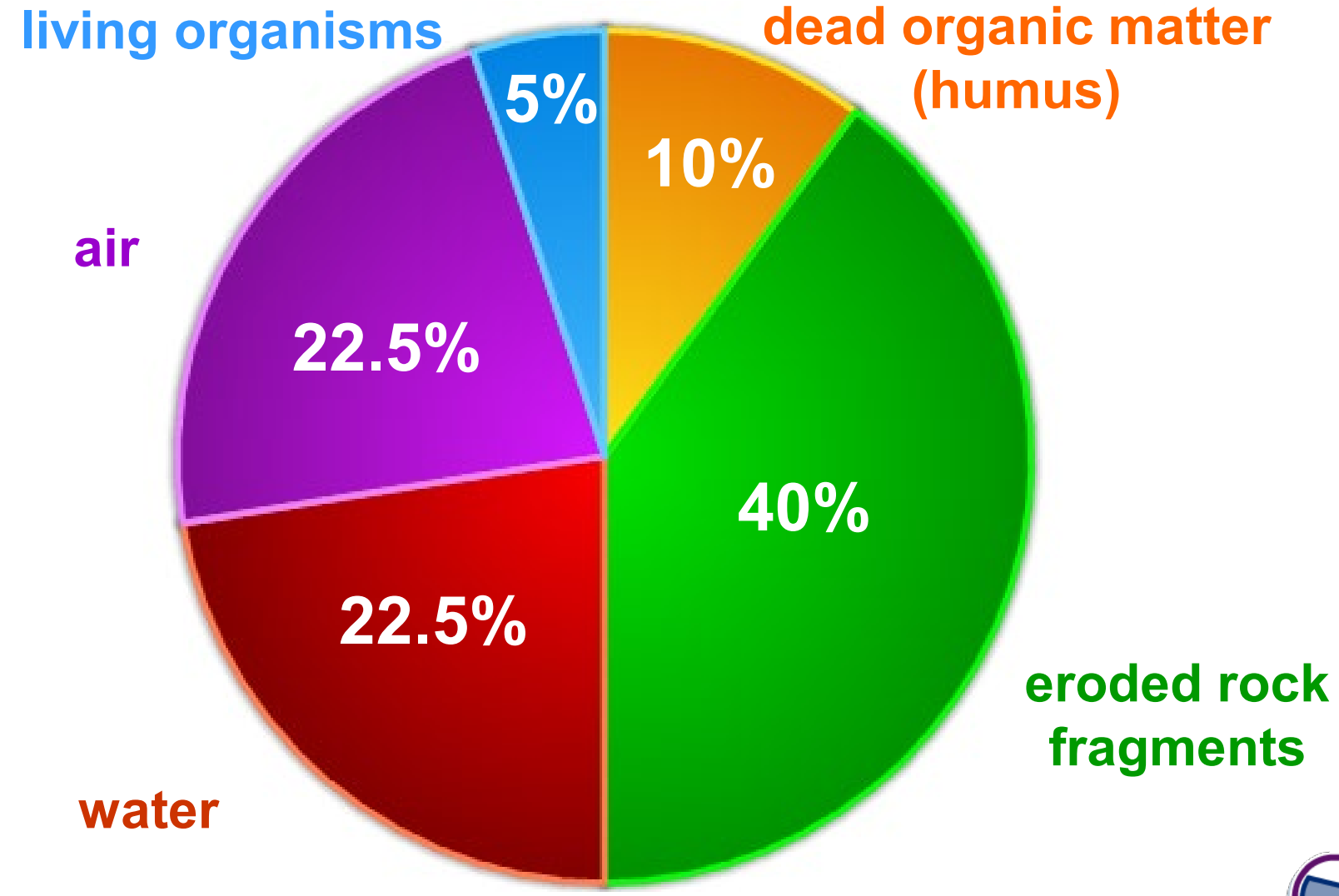
Soil is an essential part of the ecosystem:

- separating the Earth's crust from the living environment
- supporting the growth of plants
- recycling nutrients from dead organisms
- providing a habitat for organisms such as bacteria and worms.

There are different types of soil, depending on its composition. These support different types of plants and influence the ecosystem that develops.

What is soil?

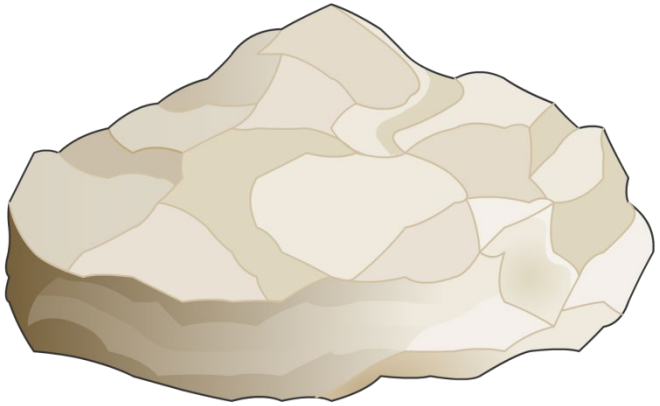
Soil is made up of 5 components:



How is soil created?

Soil is created in two main stages:

1. Erosion of the underlying parent rock

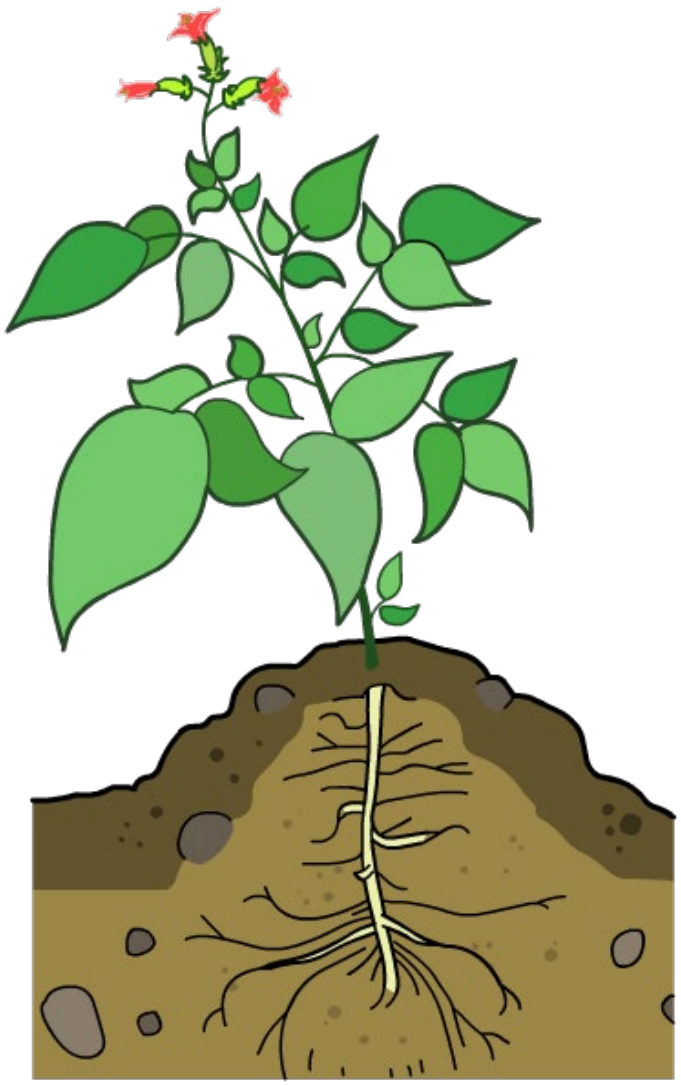


Fragments of rock accumulate at the site of erosion. These are the source of minerals in the soil. The mineral composition of the soil therefore depends on the type of parent rock.

2. Production of topsoil

This is where the other components are added. The accumulation of organic matter is affected by the climate and topology of the area.

Uses of soil



Most plants grow in soil. Soil provides **anchorage** to hold the plant in one place.

Soil is a source of minerals. Plants produce their own food, but have to obtain minerals from the environment. Plants growing on soils that are lacking in minerals often show symptoms related to deficiencies.

Soil also provides plants with water. Plants obtain water via their roots. Soil traps water, providing a reliable supply for plants.

True or false?

Are these statements about soil true or false?

1.	Animals could survive without the presence of soil on Earth.	
2.	Soils differ if they are produced from different rock sources.	
3.	Living organisms form the largest component of soil.	
4.	Humus is the term for dead organic material.	
5.	Plants can synthesize their own minerals.	
6.	The first stage in producing soil is the accumulation of organic matter.	

true false

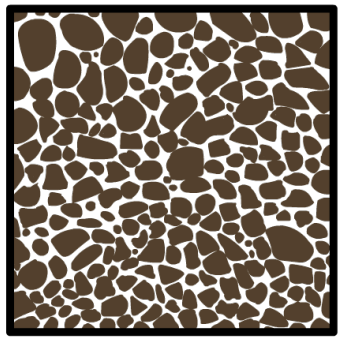
solve

Oxygen and water

Most of the organisms living in soil require oxygen and water for respiration. The amount of water and oxygen that a soil can hold depends on the soil's structure and texture.

Large soil particles have large spaces between them, and water can drain away rapidly.

Sandy soil



Smaller particles have smaller spaces and retain more water.

Clay soil

Air can only remain in the spaces that are not filled with water. **Waterlogged** soils have very low oxygen levels. This is beneficial to anaerobic bacteria but not to aerobic organisms.

Aeration and drainage

In many parts of the world there is a shortage of food, so improving poor soils to grow crops is a priority for farmers and governments.

Most soils can be improved if the water and oxygen levels are kept at the correct level.

Dry soils can be **irrigated** to increase the amount of water present.

Waterlogged soils can be improved by plowing in gravel or compost or simply by adding holes or drains. These increase the **porosity** of the soil so that water drainage is enhanced.

Neutralizing acidic soil

The pH of soil influences plant growth. Acidic conditions can affect enzyme function in soil organisms and alter the availability of mineral ions.

Acidic soils often occur in areas of higher rainfall because the alkaline calcium is leached out. Farmers add lime to neutralize acidic soil, a process which is called **liming**. Lime is a mixture of calcium compounds.

Liming releases carbon dioxide into the atmosphere. This may contribute to global warming.

What should you do?

Match the solution to the soil problem

dry	plough in gravel
waterlogged	add lime
acidic	add fertilizer
depleted minerals	install an irrigation system

?

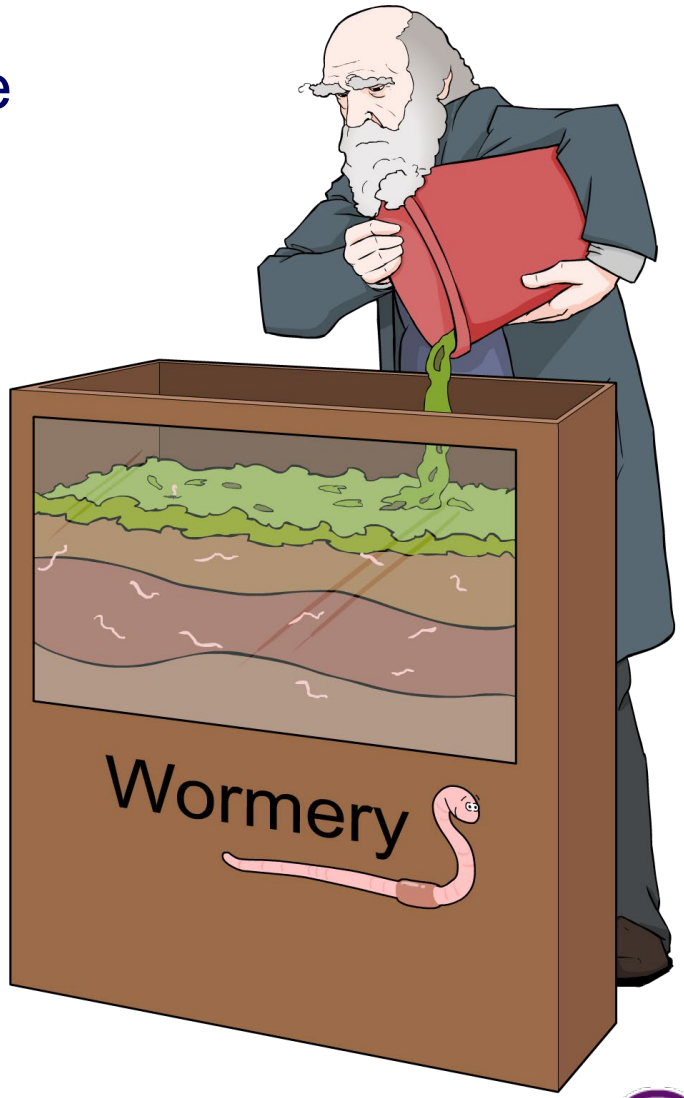
solve

Charles Darwin

Charles Darwin was one of the first scientists to appreciate the importance of earthworms to soil fertility.

He studied earthworms in his garden, and created the first **wormery**. Darwin noticed that the earthworms dragged leaves down into the soil. In doing so, they mixed the decaying matter with the lower subsoil, creating a much deeper layer of fertile soil.

Darwin called earthworms “nature’s plow” and estimated there were 53,000 of them in every acre of land.



Earthworms

Earthworms are present in most soil throughout the world, except in Antarctica. They improve its quality by:

- burrowing through the soil, which mixes and aerates it, and improves drainage
- breaking up large pieces of organic matter by dragging it into the soil, and consuming parts of it.

Soil and matter pass through their intestines and emerge as **castings**. Castings are higher in mineral content than topsoil. They increase the surface area of the material which is available for decomposition by bacteria and fungi.