

How soils form

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A thin layer of soil, called topsoil, can support plant life. Soil develops from a mixture of minerals and organic matter. Photo: Crusenho Iho/Pexels

Soil is one of the most important resources that nature provides. Like air and water, it is necessary for life on Earth. It's full of pores and channels that allow air and water to pass through.

Without soil, plants could not grow and the animals that rely on plants, directly or indirectly, could not live.

Topsoil: Rich But Thin

Only a thin layer of soil, called topsoil, can support plant life. Along major rivers, this fertile soil can be hundreds of feet thick. However, in most places, topsoil is only about 15 centimeters (6 inches) thick. To protect this thin layer, people must replace the nutrients that crops remove from the soil. They must also prevent erosion, which is when soil is stripped away from unprotected land.

Replacing lost soil takes a long time. It takes 500 to 1,000 years to make 2.5 centimeters (1 inch) of topsoil. That's why it's important to conserve and protect this resource.

Minerals And Organic Matter

Soil is made from minerals and organic matter, which comes from living and decaying organisms and is made largely of carbon. Soil forms over many years and is influenced by a number of factors.

The original material that forms the soil is called the parent material. There are three kinds of parent material: transported, residual, and organic. The type of parent material influences the soil that is developed.

Most soil is transported. This means it was carried by wind, rivers, or glaciers from one place to another. One example includes loess, or fine, mineral-rich dust and silt that was formed by glaciers and creates fertile prairie soils and dune soils. Another example includes material transported by rivers into low-lying areas called river deltas that spill into the sea. River deltas are rich and productive for growth.

Residual parent material is formed from loose, slightly weathered rock called regolith. Residual formations settle in layers so that the weathered material is at the top and the unchanged parent material is at the bottom.

Organic parent material comes from decaying organisms. In wet or cool areas, deposits of decaying material develop over time into peat, or bog soil.

Soil Health: Weather And Climate

Weather and climate--specifically temperature and precipitation--are two other factors that affect soil development. In dry regions, temperatures change from day to night. This causes rocks to expand and contract, eventually cracking into smaller and smaller pieces.

The health of soil can be determined by its pH, which is a measure of how acidic or alkaline (basic) something is. In dry regions, the soil has a neutral pH or it is alkaline. That is because there isn't much water to draw these materials out of the soil. In regions with a lot of precipitation, rain draws the salts and minerals out of the soil quickly. This makes most tropical and semitropical soils very acidic.

The size of soil particles differs depending on how much materials have weathered, or broken down. Gravel and sand are larger than silt and clay, which have smaller particles. When weathering is most intense, elements such as potassium, nitrogen, calcium, and magnesium are removed.

The Risk Of Erosion

Land surface is another factor that affects soil development. The shape of the land affects erosion of topsoil and influences how water drains into the soil. On a steep slope, for instance, soil takes longer to develop. Steep slopes are at high risk of erosion, which removes the soil as it forms. On the other hand, low lying land with poor drainage will slow the growth of plants, which are helpful for forming soil.

Plants and animals also help develop soil. When plants die, water carries decaying plant matter deep into the soil's pore spaces. This helps the soil stay crumbly and porous with lots of gaps. Plant

roots help water drain into the soil, and during dry times, roots can bring water and nutrients back up.

The waste and decayed bodies of animals help fertilize soil. Some animals, such as ants and earthworms, help mix the soil while insects help by fertilizing flowers, spreading plant life.

Quiz

- 1 Which answer choice describes two CENTRAL ideas of the article?
- (A) Some areas have rich, fertile soil; weather and climate can affect the quality of soil.
 - (B) Soil is crucial to life on Earth; a variety of factors influence the development of healthy soil.
 - (C) Plants require fertile, properly drained soil to grow; topsoil is sometimes damaged by erosion.
 - (D) Organic materials and minerals are needed for soil development; climate can influence the health of soil.
- 2 Which statement would be MOST important to include in a summary of the article?
- (A) Soil is full of pores and channels that allow air and water to pass through.
 - (B) Soil is transported by wind, rivers and glaciers from one place to another to create fertile areas of land.
 - (C) The three kinds of parent materials are transported, residual and organic.
 - (D) Soil is affected by several natural factors including land surface, animals and plants.
- 3 What is the main reason the author includes the section "Soil Health: Weather And Climate"?
- (A) to describe how too much precipitation removes important elements from soil
 - (B) to explain how healthy soil is required for supporting plant and animal life
 - (C) to share the ways the temperature and precipitation can change the quality of soil
 - (D) to show how rising and falling temperatures affect soil development
- 4 What is one reason why the author includes information about the amount of time it takes for topsoil to be made?
- (A) to illustrate to readers how crops might damage topsoil
 - (B) to explain to readers the process of soil development
 - (C) to caution readers about protecting topsoil
 - (D) to share with readers why topsoil is necessary