

MASTER 3.6

WHERE DOES SOIL COME FROM?
COME FROM?

NAME
DATE

<p>1 0 years</p>	<p>2 ~10 years</p>	<p>3 ~100 years</p>
<p>1</p>	<p>2</p>	<p>3</p>
<p>4 ~1,000 years</p>	<p>5 ~10,000 years</p>	<p>6 ~100,000 years</p>
<p>4</p>	<p>5</p>	<p>6</p>

MASTER 3.7

SOIL FORMATION

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Why are there layers in soil? Why doesn't soil look the same throughout its depth? The answers to these questions relate to how soil forms. Soil layers are called soil horizons. Soil formation actually starts with the parent material. When the parent material is rock, it may also be called bedrock. In this example we assume soil forms from rock, but parent material can also be loose sediment deposited by a river. Over time, the top layers of the parent material (R) start to break down into smaller pieces called regolith. This layer of smaller rocks and gravel form the C layer. Very few plant roots penetrate into this layer; very little organic material is found in this layer.

As time continues, plants start to grow on the surface. The growth and then death of these plants start to add organic matter to the forming soil. This organic matter mixes with minerals to form the A layer. The A layer is usually the darkest layer of soil because of the organic matter it contains. The A layers also contain a great deal of organisms, particularly microorganisms, that can help break down dead plant and animal remains to release their minerals into the soil. The A layer is often referred to as topsoil.

As more time passes, the A horizon may continue to thicken as more organic material and minerals mix. A layer of organic material (O layer) may form above the A layer. The O horizon is made up of leaf litter and humus (decomposed organic matter with fewer minerals than in the A horizon). As the A and O horizons continue to form, the C layer continues to move downward.

The next layer to form is the B horizon—also called the subsoil. This layer often has a coarser structure and is more varied in color than other layers. The B horizon contains clay and mineral deposits (including iron oxides, aluminum oxides, and calcium carbonate). These minerals leach out of materials in the layers above into the water. The water then drips into the B horizon.

The E horizon forms between the A and B horizons. The leaching of minerals, including more highly colored minerals like iron, out of the A horizon materials into the water, and into the B horizon is particularly intense at the bottom of A horizon. The B layer can become darker and the bottom of the A horizon lighter, this light colored, highly leached horizon is the E layer. The E horizon is made up mostly of sand and silt and contains less organic matter than the A horizon.

The six main factors that interplay to form soil are:

- the type of parent material (bedrock or sediments),
- environmental conditions,
- terrain,
- living organisms,
- time, and
- human activities.

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Because these factors differ across the world and develop at different times, the characteristics of soil can be different in different places. Any given soil may have all, none, or a few of these horizons.

PARENT MATERIAL: The parent rock or sediment is important for ultimately determining whether the soil is sandy, loamy, or high in clay. The nature of the parent material also influences the length of time it takes to form soil. It can take hundreds of years just to form one centimeter of soil if the parent material is very hard. If it is not as hard, soils can form more quickly.

ENVIRONMENTAL CONDITIONS: Temperature and amount of water (rainfall) are important influences on the formation of soil. Higher temperatures increase the rate at which the parent material breaks down. This also increases the rate at which nutrients are released into the soil. The freezing and thawing of water can also help break down the parent materials. Greater amounts of water carry nutrients deeper into the soil. Soils tend to be deeper in hotter, wetter environments (such as the tropics) and shallower in colder environments (such as the Arctic).

TERRAIN: The soil on steep slopes is generally shallower than in the valleys below or on the plains. The soil that does develop on hills or mountains often is carried downhill into the land below.

LIVING ORGANISMS: Living plants and microorganisms that decompose dead vegetation can release acids that act to break down the rock on which the soil is forming. The decaying plant (and animal) remains contribute nutrients to the soil. Animals like earthworms make channels through the soil that can help roots grow and water and nutrients move. Other organisms, especially microbial decomposers, play important roles in the recycling of organic matter and the release of nutrients into the soil.

TIME: Soils can be millions of years old in some areas of the world. In other areas, soils may be much younger. Geologic events, such as earthquakes, may disrupt the environment and cause soil formation to begin anew in the affected area.

HUMAN INFLUENCES: Farmers have cultivated and tended their soils for centuries, and farmed soils differ in many respects to those that have not been disturbed. Agricultural practices such as plowing and fertilizer use can change the topsoil (A horizon). In other areas, human practices have led to soil erosion that changes the soil horizons.

MASTER 3.5

SOIL HORIZONS

NAME
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