Lesson and Activity Suggestions for Grades 3 - 5

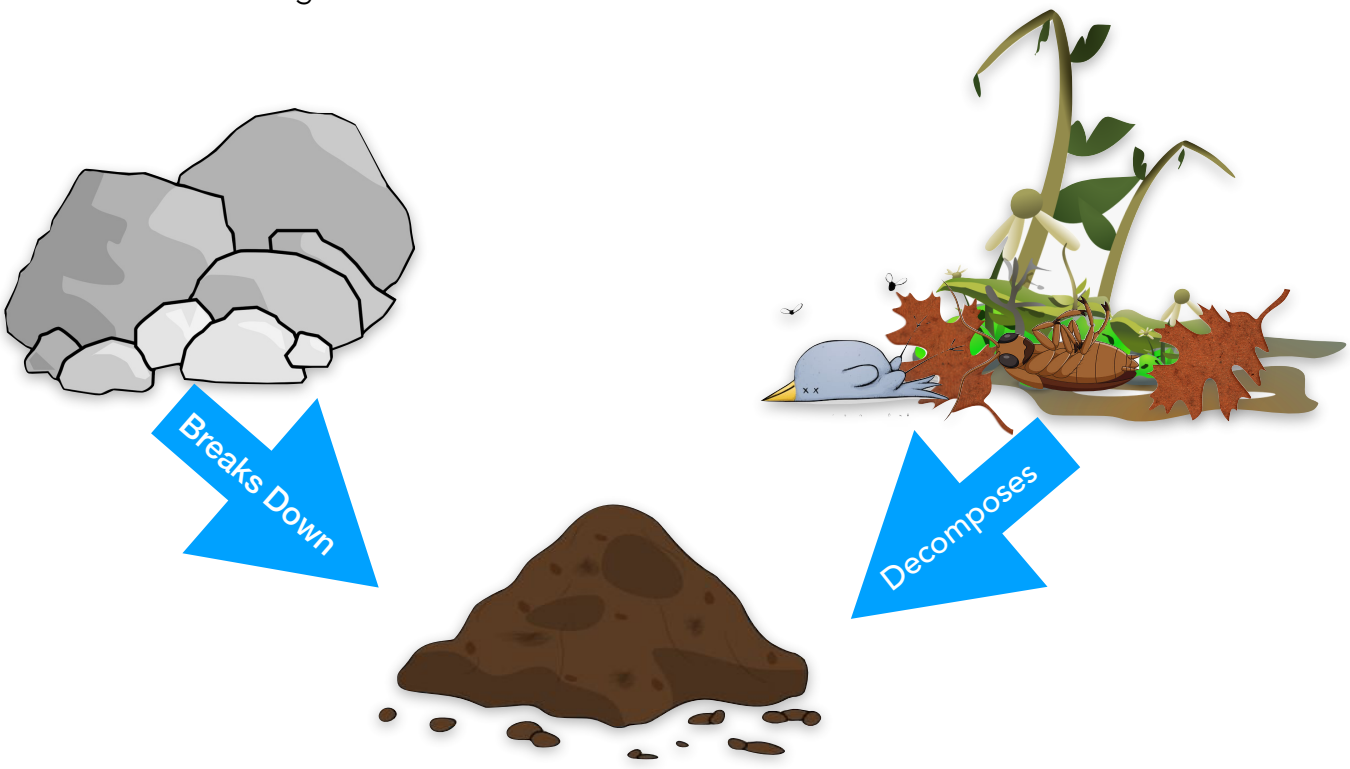
Soil Science

Now that you are becoming a gardener, you need to learn what kind of soil your plants need. Most of us call it dirt, but when we talk about plants, we need to know it's much more than that. It is its own living, changing material. These activities can help you learn about the different layers of soil and which types are better for growing healthy plants.

Where does soil come from?

Soil is formed in several ways. The key ingredient to the making of soil is the living and once-living things that are found in it. These living and dead organisms are called **organic matter**. They turn sand, silt, and rock pieces into a mixture that is perfect for helping plants and animals to live and grow. This organic matter can be from plants, insects, or animals — any thing. In the circle of life, animals eat plants or other plants to live, but when they poop and when they die, that matter breaks down into the organic matter that becomes soil that grows the plants.

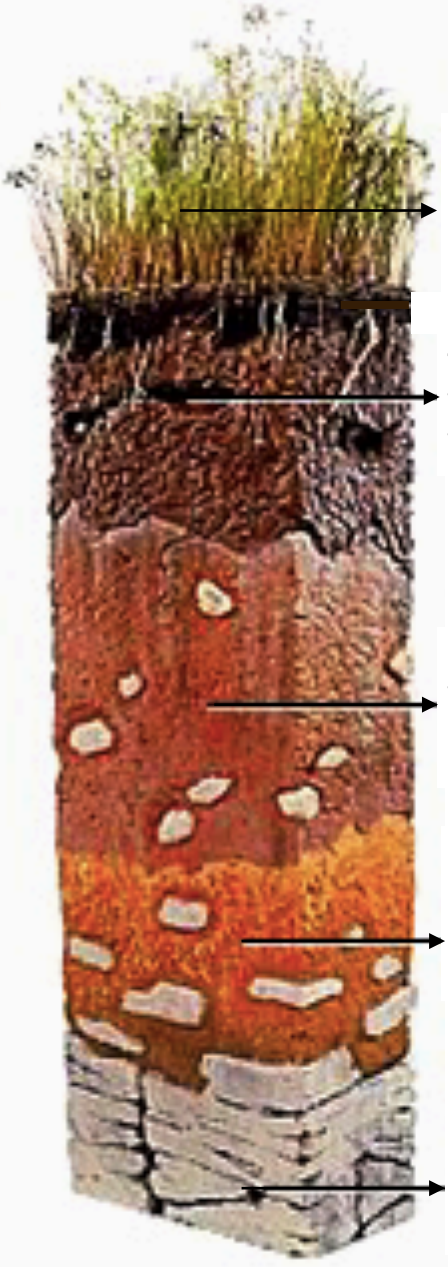
The breakdown, or **weathering**, of rocks is one way soil is being formed. Water, wind, and ice help to weather the rocks into smaller and smaller pieces, as well as carry them to different places where they settle and mix with organic matter to become soil.



Soil Layers

A layer of dark, fertile **humus** made of rotting organic materials lies at the soil's surface. Underneath, the **topsoil** contains plant roots, and plant and animal remains that bacteria and fungi are helping to break down. The **subsoil** contains fewer plant and animal remains but has plenty of minerals washed down from the layers above. Below are rock fragments, then solid **bedrock**.

This slice of soil from surface to bedrock shows its five main layers:



Humus
Made up of organic living material such as worms, moss, and insects as well as decaying organic material like manure, leaves, and animals. It is very dark and thin.

Topsoil
This second layer of soil is often rich in humus, minerals, bacteria and fungi. This is the area in which you want your plants' roots.

Subsoil
This layer is made of sand, small rocks, and clay. It is poor in humus, but rich in minerals.

Parent Material
Little or no plant or animal life lives here. It is mostly rock that has been slightly weathered.

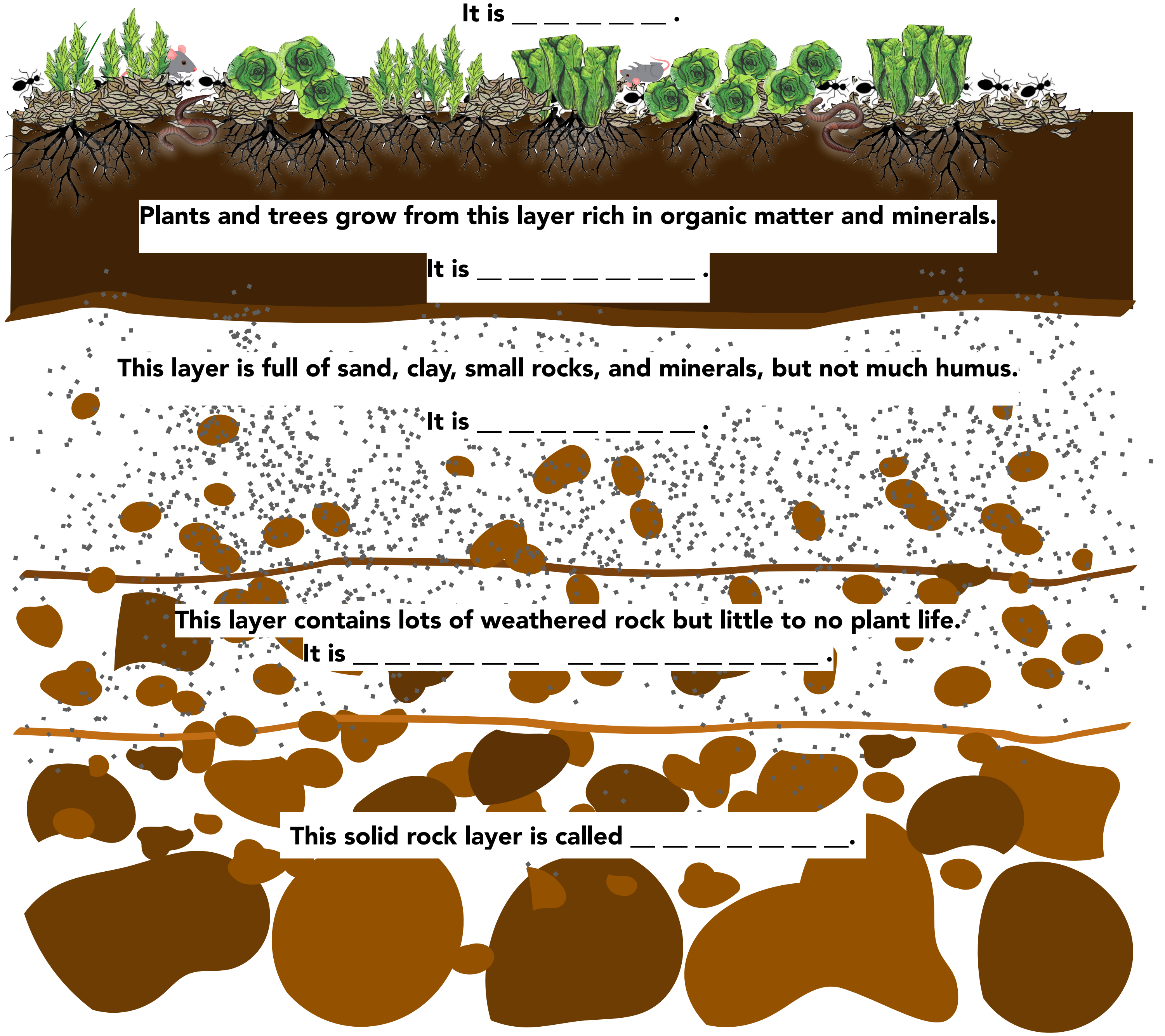
Bedrock
The lowest layer of soil is a solid rock layer.

Soil Layers

You have learned that each layer of soil has a specific name. Look at the drawing below, read the hints, and then write the name of the correct soil layer underneath the clue.

This layer is made up of fallen leaves as well as dead insects and animals.

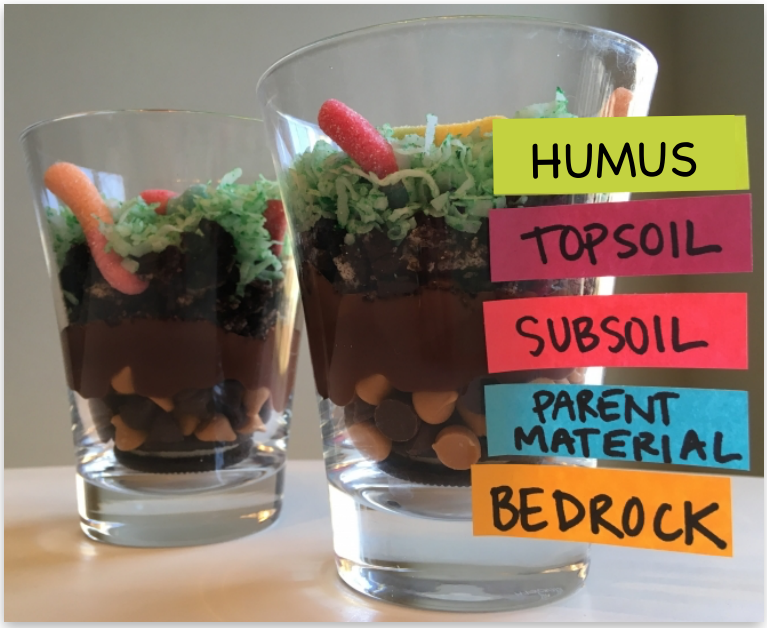
It is ________ .



Let's Eat Some Soil!

If all that gardening has made you hungry, you're going to *dig* this treat! (Get it? Dig? Ha ha!) It demonstrates the different layers of soil and is dirt-loving delicious!

You will need:
Chocolate and butterscotch chips mixed together
Chocolate pudding
Whole Oreos and Crushed Oreos
Shredded coconut mixed with green food coloring (or any green candy like M&Ms or jellybeans)
Gummy worms
Clear cups or glasses
Sticky notes or labels



Directions:

1. Put a whole Oreo (or two or three) into the bottom of your glass to represent the **bedrock**.
2. Add a layer of chocolate and butterscotch chips on top of the Oreo. This represents the **parent material**.
3. Spoon in a layer of luscious chocolate pudding as the **subsoil**.
4. On top of that goes a layer of crushed up Oreos, as the **topsoil**.
5. Because **humus** contains lots of living organic material, stick some gummy worms in there and sprinkle your green coconut or candy on top.
6. Before you *dig* in, use sticky notes or labels to make note of each layer.

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A Closer Look at the Soil Layers

All soil is made up of different amounts of three types of particles: sand, silt, and clay. Let's take a closer look.

SAND **SILT** **CLAY**

Sand is the largest particle found in soil. When you rub it, it feels rough and gritty. Sand does not have many nutrients, but it is good for drainage, which means it lets water flow through easily. If these particles are larger, they're called **gravel**.

Silt is the medium-sized particles found in soil. Silt feels smooth and powdery when dry, and it feels slippery when wet. Silt can get packed down into a crust that makes it harder for water and air to pass through it, but it is also full of important minerals.

Clay is the smallest particle found in soil. Clay feels smooth and hard as stone when dry, and it feels sticky when wet. While clay can hold many nutrients, it does not allow much air or water to pass through. Too much clay can make the soil heavy and not good for growing plants.

What soil type is best for my garden?

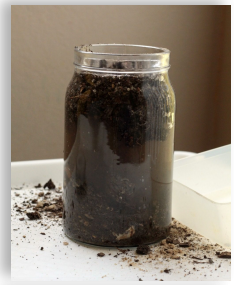
A well-balanced soil is called **loam** and will have an almost even balance between the three particles. Loam is the best soil for your garden. It has 20% clay, 40% silt, and 40% sand. Loam is structured with just enough of each particle to let water drain so the roots don't rot (sand), but not drain so quickly that the roots dry out (clay). It also requires a variety of nutrients (silt) to feed the plant. Loam provides pore spaces that allow effective water flow, root growth, earthworm movement, and oxygen. The next pages provides a simple experiment you can do to find out what percentage of sand, silt, and clay your garden currently has.

What percentages of clay, silt, and sand makes loam and is best for your soil to contain?

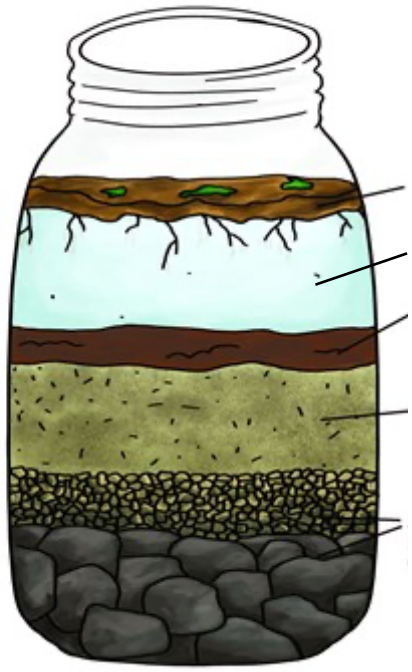
Clay ____ % Silt ____ % Sand ____ %

Soil Types

Let's get our hands dirty! You have learned about the three types of soil, but how do you know how much sand, silt, or clay is in your soil? All you need is a clear jar or bottle with a lid, a handful of your soil, and water.



1. Dig down about six inches into your soil and grab a couple handfuls. Put the soil into your clear jar or bottle. You should have enough soil to fill the jar or bottle about 3/4 full.
2. Fill the jar almost to the top with water, leaving and inch of air, and close the lid tightly.
3. Now, you get to shake it up for a few minutes. Make sure all clumps have broken up.
4. Set the jar aside, undisturbed, overnight.
5. The next day, you will be able to see the different layers of soil in your jar.



Humus - Any organic matter will float to the top.

Water

Clay - The smallest particle, so it traps water.

Silt - Medium-sized particle; contains important minerals.

Sand and Gravel - Provides drainage but no nutrients.

If your jar shows that you do not have the ideal loam mixture of 20% clay, 40% silt, and 40% sand, you can mix in the other types to achieve it. Different parts of your yard will likely have different types of soil mixtures, so you can repeat this test with soil from different areas to find your best dirt (I mean, soil)!