

Hi everyone, today we are going to learn about one of our most important natural resources, the soil. To help us dig into our soil education, I have invited an expert on the subject. Let's give him a worm welcome...Applause!

Hello, worm lovers and soil supporters!

It is I S.K. Worm. The S.K. stands for "Scientific Knowledge." I am the official annelid, or worm for you non-soil dwellers, of the U.S. Department of Agriculture's Natural Resources Conservation Service. Today we are going to learn about my favorite thing in the world...soil! It's a dirty job but someworm has to do it!

Make sure you pay close attention today because I will be giving a short quiz to test your new soil knowledge.

Before we get started, let's talk a little bit about what soil is. Soil is commonly referred to as dirt, but that's not what soil is.

To explain the differences between dirt and soil I would like all of you to play an imagination game with me. Everyone close your eyes and imagine that it has just stopped raining and you are in your backyard playing in the mud, squishing the mud between your fingers.

Hey! Make sure you're not squishing any worms.

Now imagine that it's really hot, and all that mud squishing has made you thirsty. So you walk up to your home, open the door, step into the house and to the kitchen, open the fridge door, pour a large cup of cold water and take a drink...everyone say aaaaaa!

As you are enjoying your water you realize that you forgot to take off your shoes and wash your hands. You tracked dirt across the kitchen floor and left dirty hand marks on the fridge door. Quick open your eyes before your mom finds the mess you have made.

So you see soil is not dirt but can become dirt if it is moved from a place it is supposed to be, like the mud puddle to a place it is not supposed to be like the kitchen.

I need four volunteers to help me further explain what dirt is.

I made up an acronym for **D.I.R.T.** it's **D**isplaced **I**mportant **R**esource **T**reasure. It's a good way to remember what dirt is.

So SK, now that we know what dirt is, can you tell us what soil is?

Let's give you the "dirt" on soil! Soil is different things to different people. For me it is where I live and eat. But for you soil is where you grow your food or build your house.

So SK, soil is different things to different people depending on how it is used?

That's correct, let's dig a little deeper into what soil is, and how it is made.

Do any of you like to bake?

What do you like to make?

Pick several.

Cookies and cakes both have similar ingredients like milk, flour, sugar, and eggs but they do not look the same after they are cooked.

Depending on how much of what ingredients you use you will end up with different baked goods.

Hey, soil is the same way, there are four basic ingredients or components that make up soil and depending on how much of these different soil components there are determines what type of soil you will have.

Does anyone know what the four basic components of soil are? Look at the soil SK is squirming out of for clues.

Hints: Take deep breath = Air

We drink it = Water

Dead and living things = Organic matter

Small Rocks = Minerals

Can someone name all four components?

Great job you got them all you kids really do know your soil.

Did you know that there are more than 70,000 different kinds of soil in the United States.

Now let's talk about the minerals that are found in the soil. Minerals are not mini rolls you might eat for breakfast but rather teeny tiny rocks that I might eat for my breakfast.

There are 3 different size minerals that are found in the soil.

Can you guess what these three minerals are?

Here are some clues.

The largest size mineral can be found at the beach. SAND

The smallest size mineral can be found in art class you can mold it and it gets very hard when dry. CLAY

The middle sized one is called silt. It feels kind of like flour.

You can see a grain of sand with your eye but you would need a very powerful microscope to see clay size minerals.

To show the relative size of these three minerals imagine you are looking through a microscope at a grain of sand and it looked like the size of a basketball.

Compared to that silt would be the size of a tennis ball and clay would be about the size of a pin head.

These minerals are created when weather and plants break down larger rock to form these tiny rocks, or minerals.

That's a great description of minerals, now let's learn a little about soil organic matter, and why it matters to soil. Can anyone name an animal that lives in the soil, like me?

Pick three or four. See list of possible answers.

Those are all great examples of soil dwellers. Along with animals, there are also fungi, bacteria, and many other organisms that make their home in the soil. In fact one shovel full of soil has more organisms in it than there are people on the planet. Many of the medicines we use to fight off colds and flu come from the soil.

As you look at the soil SK is in you will notice the soil is darker near the surface, this is because when plants die they decompose making the soil at the surface darker.

Yep, soil provides a place for plants to anchor themselves. It also provides the food, water and air plants need to survive. Of course my soil home provides me with the food, water and air I need as well. It's true the soil helps plants, but the plants also help the soil. They leave pores in the soil allowing water and air to move in for soil life. Animals like me are also important pore makers.

Soil is very important part of SK's life but it is equally important to each of you.

Who likes cheeseburgers?

Is there any part of a cheeseburger that we don't need soil for?

Remind children that everything in a cheeseburger initially comes from plants that grow in the soil.

People also use plants for their clothing. Plants, like cotton, provide fibers that are made into cloth. Sheep eat plants and people also make fabric using their wool.

We use plants to build our homes and beautify our homes.

People have also learned how to turn plants corn and soybeans into energy like ethanol and biodiesel for cars and trucks.

Plants also help keep the soil in its place.

That's right! Plant roots hold the soil and protect it from washing or blowing away in a process called soil erosion.

Farmers and developers have found ways to use grass and trees to keep soil from eroding away. When soil erodes, it moves into streams, rivers, and lakes polluting them. Over six billion tons of soil erode off land in the United States every year.

My friends at the Natural Resources Conservation Service and the Soil and Water Conservation Districts can help you be naturally resourceful about natural resources.

I need four volunteers to help me explain who pays for soil erosion.

1. Farmer – Grows food for everyone to eat. Erosion causes loss of crops, loss of top soil, loss of nutrients, and loss of pesticides. So farmers pay for soil erosion.
 2. Ditch Maintenance Supervisor – Maintain county drainage systems. Eroded soil plugs up ditches and causes flooding and more erosion. The Ditch Maintenance Supervisor can't afford pay to have all the ditches cleaned so he charges tax for those who use the ditch.
 3. City Water Development Supervisor – Provides clean water to drink. Eroded soil often ends up in the rivers and lakes we get our water from. The water needs to be cleaned so we can use it. The City Water Department Supervisor can't afford to pay to have the water cleaned so we can use it. He charges everyone who uses the water.
 4. Marina Owner – Provides a place for people to park boats. Sediment eroded soils can plug marinas so boats can't come and go. Marina owners need to remove the sediment so boats can use their docks. The marina owner will need to pay to have the sediment removed, but then he will have to charge the people who use his marina more to offset his expense.
- So we all pay for soil erosion. Let's thank our four volunteers for their help.

Thanks for your help! I'm glad I'm a soil dweller and don't have to pay for all that stuff. Most soils like the soil me, has layers, which are called horizons. Soils typically have topsoil, subsoil and parent material. You can see all three right here.

The top soil has a high concentration of organic matter and is found at the soil surface. It is typically darker than the subsoil.

The subsoil is the layer that has been broken down (weathered) by water soaking in to the soil. It is used by plants to grow deep roots to anchor the plants in the soil. The parent material is mineral deposits or the bedrock the soil formed from.

Many soils have bedrock that is often found in layers. Sometimes those rock layers have fossils in them. See if you can find the *Isotelus trilobite* fossil in the bedrock below me. It happens to be the Ohio State fossil.

Trash can sometimes also be found in the soil like plastic bags or pop cans. These may someday break down and become part of the soil but for now they are soil pollution. Can you help your instructor find two items that don't belong in the soil?

Water bottle and Arrow head. The Arrow head was lost by an Indian many years ago and is made of flint the Ohio state stone. It just goes to show some litter can last for a very, very long time.

Speaking of Ohio stuff did you know Ohio has a state soil? It's Miamian and is the most extensive soil in the state occurring on over 750,000 acres.

SK what are those colors in the subsoil?

Those are soil water colors. Those yellow and gray stains in the subsoil are made by water oxidizing and reducing the iron in the soil. The same way metal rusts if it is not protected.

I know it's not polite to ask how old you are but could you tell us how old soil is?

It can take anywhere from just a few years to over thousand years to produce just one inch of soil.

SK what are the factors that influence how fast soil forms?

The four factors are climate, organisms, parent material, and topography.

We have learned the soil provides us food, shelter, fuel, and even medicine, but is soil good for anything else?

Soil is really "cool" stuff. Did you know that a lot of people use soil to help cool and heat their homes? This form of energy is called geothermal.

The word Geothermal comes from two Greek words Geo-Earth and Therme-Heat.

The Earth's surface is heated from the sun's energy and from the Earth's hot core. While temperatures above ground change a lot from day to day and season to season, temperatures in the upper 10 feet of the Earth's surface hold nearly constant between 50 and 60 degrees Fahrenheit.

For most areas, this means that soil temperatures are usually warmer than the air in winter and cooler than the air in summer. Geothermal heat pumps transfer heat from the ground into buildings in winter and reverse the process in the summer.

That's interesting, I also use the soil to warm and cool off. If the temperature gets too cool, I can dig deeper to find a warm place to slither and snooze. But when the temperature is too hot, I don't feel so hot. In fact, if I get too hot, I'll dry up like a piece of old beef jerky. So, on really hot days, I look for a cool spot in the soil and coil myself up to keep cool and stay moist. I know all us worms could not survive if it were not for geothermal energy.