

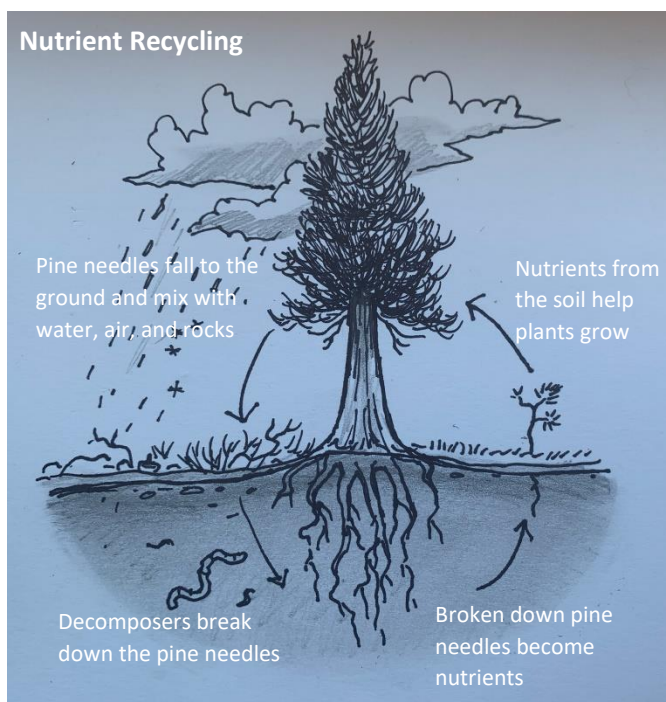


# TaHome Nature Education: Soils

## Grades 3-5

### Reading: Dirt, Mud, and Sand

What is dirt made of? Dirt, or soil, can include many different things, like rocks, sand, clay, fossils, and **organic matter**, such as fallen leaves and other dead plant and animal materials. The things that make up soil are different depending on the kind of environment and climate the soil is in.



In Tahoe, our soil is made up of the things in our environment, like fallen pine needles. But the soil can be different from one Tahoe hill to the next. Soil on a ridgetop may be sandier than soil next to a creek. A hill that faces north and doesn't get much sun has snow for longer. This makes the soil different from the other side of the same hill, which faces south and gets lots of sun and has snow for a shorter time each year. The amount of water in soil from snow and rain affects how quickly things like rocks or dead plants break down into smaller pieces and become dirt.

After plants and animals die, they break down into their smallest pieces called **nutrients**. Those nutrients can then help new plants grow in that soil. This is called nutrient recycling and it works similarly to when you recycle your plastic milk jug. When you and your family recycle a milk jug, it goes to a factory where workers break down the plastic into VERY small parts. Then they use those small parts of plastic to make all

kinds of new things like carpet, t-shirts, or new milk jugs. Farmers and gardeners know this process well. They use old or dead organic matter, like cow manure, leaves raked in the fall, or their orange peels from lunch, to make their soil better for planting new seeds that can grow into new trees, fruit, or food for themselves or their animals.

However, organic matter doesn't break down on its own. Soils rely on **decomposers** to help those orange peels break down. Decomposers include worms, insects, mushrooms, and tiny bacteria. These decomposers are like the factory workers who work to recycle your milk jug. And just like factory workers get paid to work, decomposers benefit from their work because they get to feed on the dead organic matter. In forests, fungi are the only organisms that can break down wood from logs and dead trees into its smallest parts. Our forests are filled with fungi hidden in the soil that are always feeding on dead plants. The mushrooms that we find poking out of soil are only a small part of larger fungi underground.



Fly agaric

Look for these mushrooms under Lodgepole Pines.

Termites do not thrive at Tahoe because it is fairly dry for most of the summer, but in the spring, they can be easy to find by flipping over logs. Most of our termites are quite small and look like tiny, cream-colored ants. Many other insects help break down dead wood into slightly smaller pieces by nesting in logs, snags, and stumps. At Tahoe these include carpenter ants, carpenter bees, long-horned beetles, and even a few clear-winged moths that look just like wasps!



This is one of the largest beetles in North America. It feeds on dead Jeffrey Pine roots.



Does this moth look like other moths you know? What other insect does it resemble?



These tiny decomposers eat wood and are easy to find in Tahoe in the spring.



Sagebrush growing in sandy soil

Different kinds of plants grow in different kinds of soil because different soils have different nutrients and ability to hold water. Soils that are made up of larger **grains**, like sand, hold less water. Because of this, plants that grow in sandy soil have to be able to survive with less water, like sagebrush. Soils that are made up of tiny grains, like clay, hold more water. Plants that grow in soil with a lot of clay in it may need lots of water. However, too much clay can hold too much water for certain plants, making it hard for their roots to breathe. Much of Tahoe's soil is very sandy, especially where there are very few plants growing. Aspen groves and meadows, however, have dark, rich soils with finer grains and lots of organic matter. These environments tend to have plants whose leaves fall every year and break down into the soil quickly. By contrast, our conifer forests have durable and long-lasting leaves, the conifer

needles, which may not fall off the tree for three or more years. Different plant species grow in these different types of soils, but the different plants influence those soil types too. However, water and air play a larger role than soil in providing the things needed for plant growth, such as sunlight.

Sometimes organic matter doesn't break down for millions of years. Instead, it turns into body fossils, like dinosaur bones or teeth. After the softer parts of a dinosaur body break down, the hard parts are left. Those parts can turn to rock a few different ways. They can be hardened into rocks when they are buried by heavy soil and rocks and preserved by minerals in water, tree resin, ice, or volcanic ash. Many years later, the soils and rocks that buried the fossils may be **eroded** away to reveal the hidden fossil underneath.

All creatures on earth depend on soil and decomposers to bring new life into the world. Soil allows nutrients to be used over and over again and new plants to grow and provide food for all living things.

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Fossilized sea creatures



## Activities for Grades 3-5

### Dig in the Dirt

Did you know getting dirt on your hands makes your brain happy? What can you find hidden in the dirt near your home? Put on some clothes that are okay to get dirty. Pick three spots to dig in the dirt near your home. These spots should be at least 10 feet away from each other and a foot away from plants. At each spot follow these instructions:



1. Before you touch or dig in the spot, look at what you can see on the surface of the soil. On paper, draw what you see on top of the soil and label the things you find, like pine needles, rocks, or insects.
2. Use a shovel, your hands, or a stick to dig down until you can fit your fist in the hole. Observe the soil at the bottom of the hole. Is it warm and dry, or cool and moist? Draw what you find there and write your observations of this soil. Are there worms, roots, or broken-down leaves?
3. Dig at least two inches further down to observe the soil there. Draw what you find there and write your observations of this soil. What color is the soil? Is there more or less plant matter this deep down? Have you found any big rocks or plant roots?
4. Fill your hole back up so that it looks like you never dug there.
5. Repeat your digging and observations in two other spots.

Now, discuss your answers to these questions with a family member:

1. Was there anything you found on top of the soil that you didn't see once you began to dig? What was it? What did you see that was under the soil and not on top?
2. How did the color and texture of the soil change as you dug?
3. Which spot had the most other materials (rocks, insects, etc.) in the dirt? Why do you think this is? Is there anything around that spot that could help you know where those materials came from?
4. Did you notice any patterns between spots as you dug further down?

### Your Nutrient Journey

Imagine you are a nutrient that starts out as part of a leaf on an aspen tree. Write a story about your journey through Nutrient Recycling. Look back at the reading and diagram for help to know where you will go as a nutrient. Write a story about your life that takes you all the way through the cycle until you are a new leaf. Include some of these ideas in your story:

- How and when did your leaf fall from the tree?
- How do you break down? What decomposers help you break down?
- How long does it take you to break down?
- How long do you live in the soil?
- Do you return to the same aspen tree, or help a new plant grow?



Use what art supplies you have to paint, sculpt, draw, or build an illustration for your story. TINS wants to see your art! Have your parent post a photo of your art project to Facebook and tag [Tahoe Institute for Natural Science](#). You could also email the photo to us at [kendal@tinsweb.org](mailto:kendal@tinsweb.org).



## Mud Paint

You can use soil for more than just planting seeds. Many paints are created by combining pigments and minerals from the soil, and you can make your own mud paint with these supplies:



- A bowl for each color
- A handful of soil for each bowl from different places for different colors.
- Food coloring (if you want different colors)
- Water
- Spoon
- Dish soap
- Paint brushes (or just do finger painting!)
- Thick paper (you could use the inside of a paper grocery bag) or the inside of an old cereal box to paint on.

To make your paint:

1. In a bowl, mix together a handful of dirt and 15 drops of food coloring,
2. Next, add a squirt of dish soap, and 3-4 spoonfulls of water. Mix everything up.
3. Repeat for all of your colors.
4. Paint something that you have found in the dirt, such as a mushroom, worm, or rocks.



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## Worm Observation

In this experiment, see how hidden decomposers move around the soil, creating channels for air and water to flow and breaking down nutrients for new plants to use as they grow. You will need:

- 1 large, clear container, like an old spaghetti sauce jar with the label removed
- Dark dirt
- Sandy dirt
- Dead leaves to feed the worms
- An old paper grocery bag
- Worms! You can try to find worms by digging in wet soil (on a rainy day or by watering an area of dirt), or looking under rocks and logs. You can also buy worms from the bait section of a store selling fishing supplies.

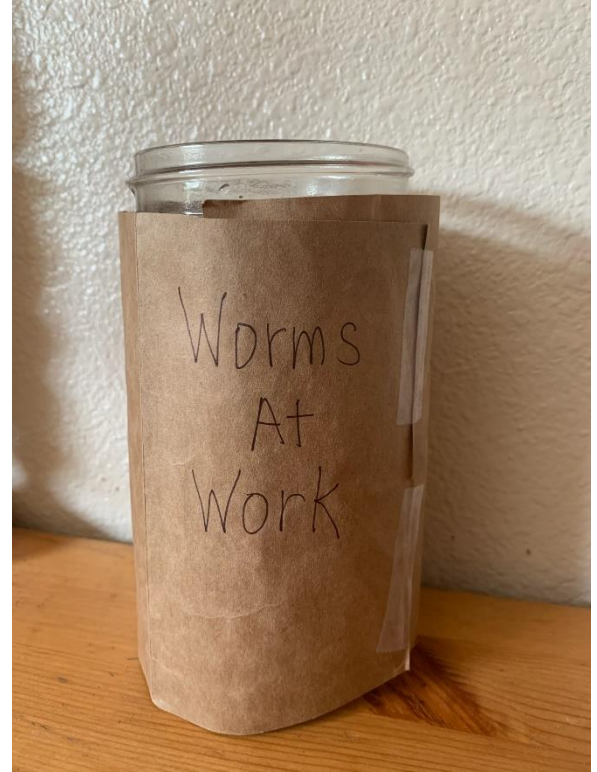
Now, follow these instructions for creating your observation jar:

1. Fill your jar with alternating layers of sand, dirt, and leaves so that you can see the different layers from the outside of your jar.
2. Place your worms on the top of your observation jar. Take a photo of the side of the jar.
3. Cut up and tape your paper bag to fit around and cover the edges of your dirt jar. This makes the worms more likely to move around where you can see them.
4. Leave the jar for the next six days. Each day take off the paper bag cover and check to see what the worms are doing. Take a photo each day of the side of the jar. Worms need water, so add a quarter cup of water to your jar each day.

Discuss these questions with a family member:

1. Did you see any paths made by the worms moving around? What did those paths look like?
2. After six days, do the layers of dirt look the same as they did at the start?
3. How have the worms affected the layers of dirt?
4. How might the worm's movement in the soil help the leaves decompose?

When you are finished with your experiment, return the dirt and the worms outside. If you have a garden, putting the worms there can help your plants!



## Words to Know

**Organic Matter:** Materials from living or once living things

**Decomposers:** An animal, bacteria, or fungus that breaks down organic matter into nutrients

**Nutrients:** A substance that provides energy and nourishment to help living things grow and survive

**Grain:** An individual piece of sand, which can vary in size.

**Eroded:** Worn away by wind, water, or other natural elements

## Palabras para conocer

**Materia orgánica:** materia elaborada de compuestos orgánicos que provienen de los restos de organismos que alguna vez estuvieron vivos

**Descomponedores:** un tipo de organismo básico y esencial a instancias de lo que llamamos la cadena alimentaria, porque son todos aquellos que se ocupan del aprovechamiento de la materia y de la energía que presentan los restos de animales y de plantas

**Nutriente:** Sustancia que asegura la conservación y crecimiento de un organism

**Granos de arena:** Los pedazos individuales de arena

**Erosionado:** Desgastado por el viento, el agua u otros elementos naturales

## Further Learning

Learn about one common decomposer in this [video about worms](#).

Learn how to [make your own compost](#) for your home.

Find your favorite [soil experiment](#).

[Conduct an experiment](#) on how much water different soils can hold.

