

## SOIL LIFE Teaching Tips



### LEARNING OBJECTIVES

Youth will be able to:

- \* Describe the diversity of living things in soil.
- \* Describe how different soil organisms help create healthy soil for growing plants.
- \* Explain how to promote the growth of soil organisms.
- \* Compare the numbers and kinds of living things found in different soils.



### HOW TO USE THE SOIL LIFE SCIENCE PAGE

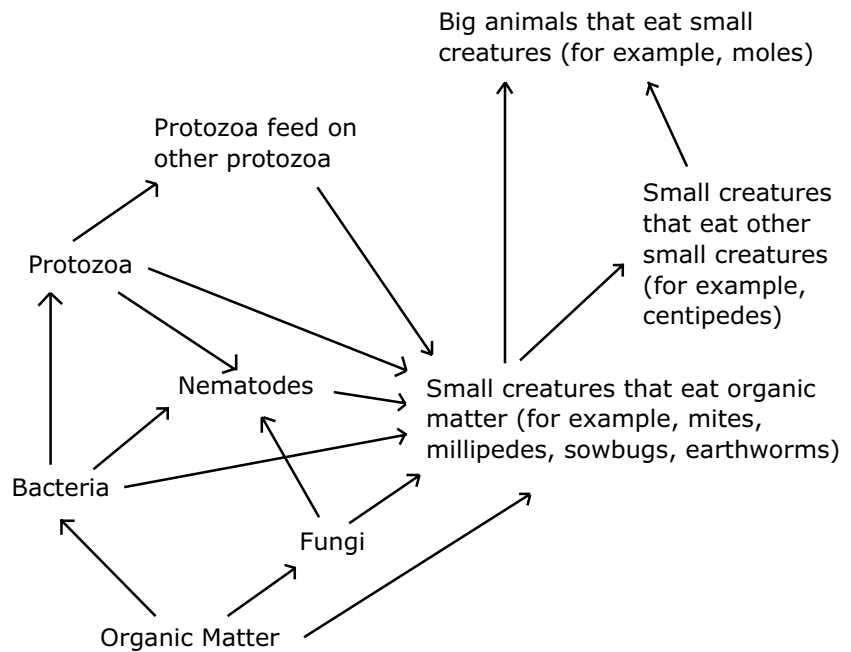
Give youth some time to read the front of the Soil Life Science Page. Explain that the Science Page will tell them about the different kinds of living things found in soil. They can also learn about what each kind of organism does to help keep the soil healthy for growing plants.

Show youth a paper clip, and explain that it weighs about one gram. You can make a simple balance to measure a gram of soil by tying a string to the middle of a craft stick. Attach a small dish made of aluminum foil to each end of the stick. Adjust the string so that the stick is level when held by the string. Put a paper clip in one dish, and enough soil to balance the clip in the other dish. Ask: How many organisms do you think are in a gram of soil? (Answer: It varies a great deal, depending on the type of soil, but on average, there are about 250 million microbes, such as bacteria, protozoa, and yeast [a type of fungus], in a gram of soil! In addition, the soil contains other creatures not much bigger than the head of a pin, such as mites and nematodes.)

Ask youth if they are familiar with the concept of a food web. Explain that a soil food web is different from a food web above

ground, which includes the sun's energy being converted to food by green plants, which are eaten by herbivores, which in turn are eaten by predators. The energy source for the soil food web is organic matter in plant and animal remains, leaves and excrement. A soil food web, like the one below, shows how food energy moves from dead plant and animal matter to different living things in the soil.

### A SOIL FOOD WEB



Explain that soil organisms act like a digestive system that breaks down nutrients in organic matter so that they can be taken up and used by plants. A healthy soil contains bacteria, as well as other microscopic organisms such as protozoa and nematodes, which feed on bacteria. Invertebrates, such as sowbugs and earthworms, next feed on the nematodes and protozoa. Larger animals then feed on the invertebrates. The soil food web is intricate, with many different kinds of microbes, invertebrates, and animals involved. If this food web is disrupted, for example by the soil getting too compacted, the soil's digestive system does not work

properly, and plants do not get enough nutrients.

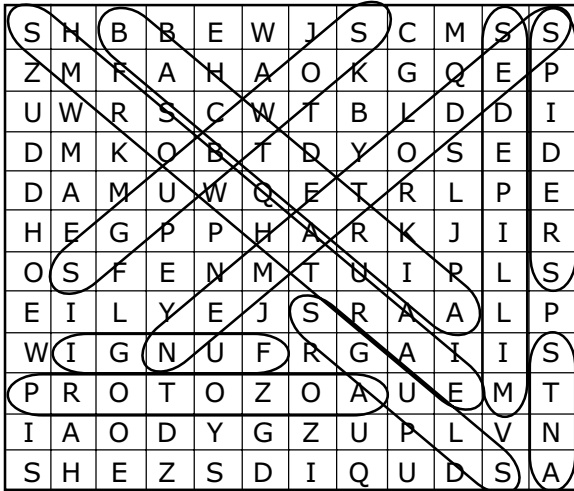
Discuss what you can do to help meet the needs of soil life. Ask: How can you provide food for soil life? (Answer: Add lots of organic matter to the soil and use organic mulch.) Ask: How can you make sure the soil life has enough water and air? (Answer: You can:

- improve the soil structure by not compacting it and by adding organic matter;
- increase the water holding capacity by adding organic matter;
- prevent water loss from the soil by adding organic matter and mulch.)



## WORD SEARCH

## Answers



## TRY THIS

Make sure that at least one of the soil samples is from a spot where there are live plants and where the soil is high in organic matter. Youth should discover that soil high in organic matter has more living things than soil that is compacted or devoid of plant life.

As students discover organisms in their soil samples, have them record their observations on the chart. Besides naming or describing and counting

each type of organism, they should consider how the organism might help improve the soil for growing plants. For example, burrowing creatures such as

earthworms help mix soil, and make it more porous.

Tell youth that if they examine soil very closely with the magnifying lens, they may be able to spot nematodes swimming in a thin film of water around soil particles, especially in soil that was very close to plant roots. Remind youth that nematodes are no bigger than the head of a pin, so they are very difficult to spot.

The youth also may be able to see fine, light-colored threads in the soil. These are fungi, which unlike plants, do not produce their own food. Ask the youth: How might fungi get carbohydrates? (Answer: Some fungi get carbohydrates by breaking down dead wood and other organic matter. Others, called mycorrhizae, attach to roots and get carbohydrates from plants. Mycorrhizae act like an extended root system, providing nutrients and water to plants. Thus, the fungus and plant form a "symbiotic

relationship." It has been estimated that more than four-fifths of all plants have mycorrhizae.)

Remind youth that most of the living organisms in soil are invisible to the naked eye. You may wish to prepare slides to observe soil microbes under a compound microscope. Put a drop of water on a microscope slide and mix in some soil high in organic matter. Stir and add a cover slip. Observe under low power, and then high power.



## SPOTLIGHT ON RESEARCH

The research results are drawn from:

Alban, D. and Berry, E. 1994. Effect of earthworm invasion on morphology, carbon, and nitrogen of a forest soil. *Applied Soil Ecology* 1:243-249.

Nixon, W. 1995. As the worm turns. *American Forests*. Autumn 1995:34-36.

Steinberg, D., R. Pouyat, R. Parmelee, and P. Groffman. 1997. Earthworm abundance and nitrogen mineralization rates along an urban-rural land use gradient. *Soil Biology and Biochemistry* 29:427-430.