# LESSON 4: The Effects Worms Have on Soil

## LESSON'S CONCEPTS

- Red worms turn food waste into compost that can be used to improve soil.
- People and other living things depend on soil.



### PURPOSE

Students will learn how red worms improve soil and how people depend on the soil enriched by the worms.

### OVERVIEW

In this lesson students will:

- Observe, touch, and describe soil.
- Examine and describe worm castings and compare them to soil.
- Discuss the effect worms have on soil and how their actions may benefit other organisms.
- Sing a song about the importance of worms and soil to people.
- Design collages showing ways people use soil.

### CORRELATIONS TO CALIFORNIA'S CONTENT STANDARDS AND FRAMEWORKS

- Students work together as they observe soil and worms and make collages depicting people's use of and dependency on soil.
  - "Earth is made of materials that have distinct properties and provide resources for human activities. As a basis for understanding this concept, students know . . . rock, water, plants, and soil provide many resources, including food, fuel, and building materials that humans use." (*Science Content Standards, Grades K–12*; Grade 2; Earth Sciences, Standard 3e)
  - "Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept . . . students will . . . observe common objects using the five senses." (*Science Content Standards, Grades K–12*; Kindergarten; Investigation and Experimentation, Standard 4a)
  - "To participate effectively in society, students need to . . . develop group interaction skills." (*History–Social Science Framework*, page 24)
  - "To develop geographic literacy, students must . . . understand human and environmental interaction." *(History–Social Science Framework*, page 16)
- Students describe in their journals why soil is important. They also describe how soil helped to supply one of their meals.
  - Students "select a focus when writing." *(English–Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve,* page 8)
  - Students "use descriptive words when writing." *(English–Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve,* page 8)

### SCIENTIFIC THINKING PROCESSES

observing, communicating, comparing, relating

### TIME

30–45 minutes to prepare for the lesson; 60–90 minutes to implement the lesson

### VOCABULARY

worm castings, soil

## PREPARATION

___ **1.** Read the "Background Information for the Teacher" at the end of this lesson.

___ **2.** Collect worm castings from the worm bin. (If the worm bin has been operating for a couple of weeks, you should have at least a cup of worm castings.) Another place to get worm castings is from a worm supplier (see list in Lesson 1).

___ **3.** Write the words to "Soil Is Good" (page 147) on the chalkboard or piece of butcher paper.

## MATERIALS

**For "Pre-Activity Questions"**

___ 2 cups of garden soil
___ 2 pieces of sandstone or dirt clods
___ 1-quart transparent plastic container with lid and enough water to fill it half full

***For "Part I, Examining Worm Castings"***

___ A cup of worm castings from the worm bin (or from a worm supplier)
___ Magnifying lenses

***For "Part II, Identifying Ways People Use Soil"***

___ The transparency "Soil Is Good"
___ Assorted magazines for students to locate pictures showing ways people use soil
___ One sheet of construction or butcher paper for each group for the collages
___ Nontoxic glue
___ Scissors

***For "Application"***

___ A resealable plastic sandwich bag for each group

## PRE-ACTIVITY QUESTIONS

**A.** Ask students to describe soil, as you write their responses on the chalkboard or on a piece of butcher paper.

**B.** The following activity can be done outdoors or indoors. If going outdoors, bring the two cups of garden soil. Ask students to stand or sit in a circle.

- Tell students that you will be giving some students handfuls of garden soil and that they should pass the soil to the persons on their left until all soil samples have been passed all the way around the circle. If you are worried about students spilling the soil, place the soil in several small containers for them to pass around.
- Give several students handfuls of soil or containers of soil.
- As they are passing the soil around, ask students to feel the soil and to say words that describe this soil.
- After all students have passed around the soil, if it is not already in a container, gather the soil in a container.
- If outdoors, go back to the classroom and have students add to the list which describes soil. They should describe the soil they passed around.

***Note:*** The reason that several handfuls of soil were passed around is that students might become more observant as they see several soil samples and hear other students describe them.

**C.** Ask students what is in soil. *Dirt, pieces of plants, small rocks, water.* Write down students' responses under the heading "What Is in Soil?" on the chalkboard or a piece of butcher paper and save for later in the lesson. Discuss how students think soil is made. (Students might not know the answer at this time.)

- Tell students that they will simulate how water begins to make soil.
- Show two pieces of sandstone (or dirt clods). Place one in a plastic container of water and ask ten students to shake it ten times.
- Have students notice the particles of rock that are on the bottom of the container. Explain that particles of rock are in soil.
- Discuss some ways that rocks break down into smaller particles (e.g., wind, rain, sunlight, ice). Have students use the other piece of sandstone or dirt clod to demonstrate another way that rock breaks down into particles of soil.
- Can there be parts of plants and animals in soil? *Yes.* Ask students to explain. *When parts of plants or animals fall to the ground, they become part of soil. When plants and animals die, parts of them become soil.*

## PROCEDURE

### Part I, Examining Worm Castings

**A.** This activity can be done outdoors or indoors. Ask students to stand or sit in a circle. Bring a cup of worm castings (but do not tell students what they are).

- Tell students that you will be giving them a mystery soil. They should keep passing the mystery soil to the person on their left until all students have had a chance to inspect it. If you are worried about students spilling the mystery soil, especially if they guess what it is, leave it in the container for them to feel as they pass it around.
- Give a student a handful or a container of mystery soil.
- Ask the student to feel the mystery soil and then to pass it to the student on his or her left.
- As students are passing the mystery soil around, ask them to say words that describe this mystery soil.
- After all students have passed around the handful of mystery soil, if it is not already in a container, place the mystery soil back in a container.
- If outdoors, go back to the classroom and compile, on the chalkboard, a list of words that describe the mystery soil.

**B.** Ask students how they think their mystery soil is similar to the garden soil they examined during the "Pre-Activity Questions" part of this lesson. *The soil is dark, crumbly.* Ask students how it is different. *It seems fluffier and darker in color.*

**C.** Ask students to describe how they think this mystery soil was formed. Students' answers should relate to what they discussed about where soil comes from in the discussion in "Pre-Activity Questions."

**D.** Have students guess where this mystery soil came from. Record students' responses. *The garden, from someone's yard.* Reveal to students, if they have not already guessed, the source of the mystery soil, which was their worm bin.

**E.** Discuss with students how the worm castings were formed. Have students examine the worm bin's contents as you discuss this. *The worms ate the paper and food waste and produced worm castings*. You might want to have students revisit their thoughts on where their mystery soil came from and their comparisons to garden soil.

**F.** Provide magnifying lenses for students to observe worm castings.

*Note:* Make certain that the children wash their hands after handling the worm castings.

### Part II, Identifying Ways People Use Soil

**A.** Have students sing "Soil Is Good" sung to the tune of "Doe, a Deer."

**B.** Brainstorm what things people get from soil. *Food, building materials for homes, water from wells, materials for clothes.*

**C.** Provide each group with several magazines. Allow approximately ten minutes for students to locate pictures of people using soil or of things that people need that they get from soil. Each student should cut out three or four pictures.

*Optional*
After groups have acquired pictures, ask students to categorize these items according to the different ways people use them. Have students explain these categories orally as you circulate among the groups. *Growing food, making clothing.*

**D.** Ask students to make a collage out of the different ways that people use soil or items that come from soil. Provide a large piece of construction paper or butcher paper for group collages, scissors, and white nontoxic glue.

**E.** Encourage groups to share their collages with the class.

## DISCUSSION/QUESTIONS

**A.** Discuss with students:

- Based upon what you have learned about the worms in the worm bin, how do you think worms might help the soil? *They make castings.* Remind students what they learned about nutrients in Lesson 3. When worms


Students in Lynda Mooney's first-grade class at Las Palmas Elementary School make a collage of ways people use soil.

deposit castings in the soil, the castings become nutrients in the soil. Plants use these nutrients to live and grow. Worm castings are excellent soil enrichers.

- Why is soil important to living things? *It provides them with food and shelter; plants grow in soil; animals walk on soil.*
- How do people use soil? *To grow fruits and vegetables, to build on, to walk on, to live on.*
- How does soil provide you with lunch? *Farmers grow food in soil, and I eat the food.*
- What would the world be like if all soil was like the sand from the beach? *Many plants could not grow. Not all animals could live in the sand. It would be hard to build on.*
- How do worms help improve the soil for people? *Worms add nutrients to the soil so people can grow food.*

**B.** Ask students to review their responses at the beginning of the lesson about their descriptions of soil and "What Is in Soil?" Ask whether they think that everything on these lists is correct. If not, what would they change? What should be added? Ask students to explain their answers.

**C.** Ask students to describe in their journals why soil is important. Encourage them to use descriptive words in the paragraphs that they write.

## APPLICATION

***Homework Assignment:*** Assign students to draw or write how soil helped to supply one of their meals (e.g., milk and pancakes—milk, cow, grass, soil; pancakes, wheat, soil; and syrup, maple tree, soil).

**A.** Ask students to share their homework assignment by drawing on the chalkboard the steps from soil to one of their meals. Have students describe their drawings.

**B.** Have students work in groups, and have each group find something to put into a resealable plastic sandwich bag that represents how soil is used by people or other living things. This could be a piece of wood or paper (to represent that trees grow in soil and that people use wood or paper), an apple core (food), an illustration like a

(Use the school's letterhead.)

Dear Parent or Guardian,

Please read the following information with your child:

As part of our vermicomposting unit, we are learning about the importance of soil and have discussed how our food comes from soil. Please assist your child in selecting a meal and then have your child illustrate with drawings and labels the role of soil in producing that meal. For example, if your child picked breakfast and had milk and pancakes, he or she would probably draw and label the following:

- Milk, cow, grass, soil
- Pancakes, wheat, soil
- Syrup, maple tree, soil

Thank you,

house (people build houses on soil or make parts of houses from materials found in soil), or a burrow (animals use soil for shelter). Then have groups switch their bags with another group and have each group describe what is in the bag they received and what the connection of the item in the bag is to soil.

**C.** Ask students to write a sentence or two in their journals about what they have learned in this lesson. They can also draw a picture. Have them share their journal entries in small groups. Check each student's writing.

***Project Idea:*** Have students plant flowers in planters on the school grounds or develop a school garden.

## EXTENSIONS

**A.** For an in-depth study of soil, implement Unit 2, "Protecting Soil," from *A Child's Place in the Environment* series.

**B.** Sing "Dirt Made My Lunch" by the Banana Slug String Band (see "Resources, Audiotape").

## RESOURCES

### Video

*Soil and Decomposition*. New York: BFA Educational Media, 1986 (16 minutes).

Shows how plant fertilizer is made by nature and how it is manufactured by people. Time-lapse photography shows the decomposition process of dead leaves changing to fertilizer.

### Books

Bourgeois-Addison, Paulette. *The Amazing Dirt Book*. Illustrated by Craig Terlson. Reading, Mass.: Addison–Wesley Publishing Company, 1990.

Contains activities to do with dirt.

Burke-Weiner, Kimberly. *The Maybe Garden*. Hillsboro, Ore.: Beyond Words Publishing Co., 1992.

A woman with a beautiful garden encourages her child to plant various plants. The child imagines things which could be done with each plant.

### Curricular Guide

Clymire, Olga. *Protecting Soil*. Unit 2 of A Child's Place in the Environment series. Sacramento: California Department of Education, 1997.

Contains 20 interdisciplinary lessons that focus on the importance of soil and culminates in a soil-enriching project. The lessons integrate science, history–social science, and English–language arts.

### Audiotape

*Dirt Made My Lunch*, recorded by the Banana Slug String Band, includes the song "Dirt Made My Lunch" by Steve Van Zandt. Music for Little People, 1989.

A tape and booklet with the words to this and other environmentally-oriented songs.



## SOIL IS GOOD

(Sung to the tune of "Doe, a Deer")

When you dig in the moist, brown earth,
You will find bugs, plants, and worms.
Soil is home for squirmy worms,
Ants and slugs and also germs.
Soil needs air to make life thrive,
So the underground world will stay alive.
We need soil to grow our food.
Soil is life;
It feeds us good! good! good! good!

Submitted by Gayle MacDonald-Gura's third-grade class, Lower Lake Elementary School, Konocti Unified School District.

In this lesson, students will be learning about soil and its importance to living things, including people.

Soil is made up of various sizes of rock (mineral) particles (e.g., sand, silt, clay), water, air, liv-

ing organisms, and parts of decomposing dead plants and animals. Soil provides a place for terrestrial (land) plants to live. The plants obtain water and nutrients from the soil and use it for anchoring their roots. Many animals also use soil. Some obtain nourishment from dead plant and animal matter; others feed on soil organisms. Some animals (e.g., ground squirrels and burrowing owls) might use soil as shelter from predators and extreme temperatures.

People use soil to grow plants for food (e.g., corn), fiber (e.g., cotton), and shelter (e.g., Douglas fir tree). People mine, from soil and rocks, a variety of minerals (e.g., iron, copper) for building and manufacturing products. People also build many things on top of soil, including homes, stores and other businesses, and roads.

Almost everything people eat comes either directly or indirectly from the soil. Most vegetables, fruits, and grains for bread and cereals are grown in soil. The animals some people eat, like chickens or cows, get their nutrition from plants that grow in the soil. Milk products come from cattle that feed on grass grown in soil.

People depend on healthy soil. An effective method for improving soil is by adding compost or vermicompost, both of which are full of nutrients that plants need in order to live and grow.

Vermicomposting has many benefits to people and the environment. Not only does it produce nutrient-rich castings, but it is also an effective recycling option. The worms eat organic material, such as paper and food waste, and turn it into a rich organic soil amendment. This eliminates the need to dispose of organic material in a landfill. For more information on organic materials, see "Appendix C–VI, Organic Materials," and "Appendix D–II, Maintaining a Vermicomposting System."