



We All Need Soil!

Purpose

- To introduce students to the importance of soil and help students understand how soil is used by living things.

Overview

Each student will explore three activities that promote understanding of and respect for soil. They will generate responses to the questions: “What makes up soil?” and “What lives in the soil?” and create their own soil connection sentences.

Student Outcomes

After completing this activity, students will understand the function of soil as it pertains to animals, plants, and humans.

Next Generation Science Standards

- DCI ESS-2A: Earth Materials and Systems
- DCI LS-1C: Organization for Matter and Energy Flow in Organisms
- Science Practice 2 Developing and Using Models
- Crosscutting Concept 2 Cause and Effect
- Crosscutting Concept 5 Energy and Matter

CCSS.ELA Anchor Standards

- W.2 Write informative/explanatory texts...

Time

- Part 1: One 30-minute class period
- Part 2: One 45- to 60-minute class period

Level

Elementary (most appropriate for grades K-4)

Materials

Part 1:

- *Elementary GLOBE* storybook: *The Scoop on Soils*
- Chart paper
- Markers

Part 2:

- Chart Paper
- Markers
- Activity Cards from the *We All Need Soil! Activity Cards Sheets 1-6* (one set of cards for each group of 2-4 students)
- Copies of *We All Need Soil! Student Activity Sheet* (one per student)



Preparation

- Read the *Elementary GLOBE* book *The Scoop on Soils* – either read it to the class or have students read it to themselves. The book can be downloaded from www.globe.gov/elementaryglobe.
- Make two charts with the titles “What makes up soil?” and “What lives in soil?” and place them on a bulletin board.
- Make one chart with the title “How Soil is Used by Living Things” and divide the chart into three sections with the headings: “Plants,” “Animals,” and “Humans,” and place the chart on a bulletin board.
- Cut the activity cards and laminate if you wish. (You’ll need one set of cards for each group of 2-4 students.)

Teacher’s Notes

Soils are essential natural resources, yet they are often taken for granted. Most people do not realize soils are a living, breathing world, supporting nearly all terrestrial life. Soils vary greatly from one location to another as a result of many factors, including differences in climate, the parent material of soil, and the location of the soil on the landscape.

How Soil Is Used by Living Things		
Plants	Animals	Humans

Scientists, engineers, farmers, developers and other professionals consider a soil’s physical and chemical characteristics, moisture content, and temperature to make decisions such as:

- Where is the best place to build a building?
- What types of crops will grow best in a particular field?
- Will the basement of a house flood when it rains?
- What is the quality of the ground water in the area?

Soils exist as natural ecosystems on the surface of the Earth made up of macro and microorganisms, minerals, organic matter, air, and water. Soils are living systems that provide many of the most fundamental functions needed for life. Important functions of soil include:

- Providing the fertile medium in which we grow our food and fiber
- Producing and storing gases such as carbon dioxide
- Storing heat and water
- Providing a home for billions of plants, animals and microorganisms
- Filtering water and wastes
- Providing the source material for construction, medicine, art, makeup, etc.
- Decomposing wastes
- Providing a snapshot of geologic, climatic, biological, and human history

Soil forms very slowly and comprises only about 10 or 11% of Earth’s surface. It is composed of minerals of different sizes (sand, silt, and clay). How much water a soil will hold, how easily water passes through the soil, and what happens to the soil as it dries depends on the combination of these materials in a particular soil. Soil rich in clay may crack as it dries, as demonstrated by ground with huge cracks or the cracking at the top of a mud puddle when larger, heavier particles have settled to the bottom. Soil rich in sand may not hold together or be strong enough as a building material. Soil has been used as a building material for thousands of years, and is still one of our most important building materials. In dry regions houses built of adobe bricks last hundreds of years. Concrete and



bricks are common everywhere. Whether you are making concrete or adobe blocks, it is essential to understand the importance of having the right elements in your soil mix.

Soil can be characterized by its structure, color, consistence, texture, and abundance of roots, rocks, and carbonates. These characteristics allow scientists to interpret how the ecosystem functions and make recommendations for soil use that have a minimal impact on the ecosystem. For example, soil characterization data can help determine whether a garden should be planted or a school should be built. Soil characterization data can help scientists predict the likelihood of flooding and drought. It can help them to determine the types of vegetation and land use best suited to a location.

What To Do and How To Do It

Part 1:

1. Place the two charts titled "What Makes Up Soil?" and "What Lives In Soil?" on the bulletin board.
2. As a large group, have the students report their ideas and record their thoughts on the charts provided.
3. After all ideas have been recorded, review the students' findings with the whole group.

Part 2:

1. Gather students into a large group and fill out the chart "How Soil is Used by Living Things." As students report their ideas, record them on the chart. Complete each section (plants, animals, and humans) separately and compare them at the end of the session. Discuss with the students the connections between how each group uses soil to survive. *Note: "Humans" are listed in a separate column than "Animals" - make sure students realize that humans are animals but are discussed separately because they often use soil in different ways than other animals do.*

2. Lay all of the cards out in their groups so the students can see all of them. Review all of the cards with the students so they are familiar with the pictures and the vocabulary. Demonstrate the process that students will use to make soil connections, speaking out loud about the connection. Then collect a card from each pile. Place the items on a table or the floor and lay them out in a sequence that leads to the connection. See Figure 1 below.

GROUP 1 + GROUP 2 + SOIL = FOOD/HOME
 (plants/animals) (action)

Rabbit + Dig + Soil = Burrow
"The rabbit digs in the soil to make a burrow for its home."

OR

Seeds + Plant + Soil = Garden
"Seeds planted in the ground grow in the soil and become a garden."

Figure 1: Soil connection samples.

3. Divide the class into 4-5 groups. Give each group a set of cards. Explain to the students that they are going to make "soil connections." As a small group, they need to decide what their connection will be and gather all the materials to complete the connection. Have each group designate a runner to collect the materials.
4. After all of the small groups have arranged their connections, have them share their soil connection with the rest of the class. Then have the runners return the materials to the appropriate places and repeat the process to make a new connection. Continue this process as time allows.
5. Provide a copy of the recording sheet from the *We All Need Soil! Student Activity Sheet* for each student so the students can document their connections. The students will first illustrate the connection in the boxes under the appropriate boxes and then write the connection using words. Younger students can illustrate the connection and then dictate their thoughts to an adult.



6. See Figure 2 below for a list of potential soil connections. Students may come up with many other possibilities. Note that these connections focus on how animals and plants use soil and some of their needs (water, Sun, food chain) and the role of microbes in soil have been omitted.

- Rabbit + Dig + Soil = Burrow (Home)**
- Worm + Dig + Soil = Tunnels (Home)**
- Mole + Dig + Soil = Burrow (Home)**
- Seeds + Plant + Soil = Plants (Food)**
- Ants + Dig + Soil = Ant Colony (Home)**
- Prairie Dog + Dig + Soil = Burrow (Home)**
- Termites + Dig + Soil = Termite Nest (Home)**
- Chipmunk + Dig + Soil = Burrow (Home)**

Figure 2: List of soil connections.

7. Once students have completed making their soil connections, add in Humans as an additional part of the equation. Use the Human cards from Group 3. See Figure 3 below for an example.

- GROUP 3 + GROUP 2 + GROUP 1 + SOIL =FOOD/HOME**
- Human + Plant + Corn Kernels + Soil = Corn Crop (Food)**
"A human takes corn kernels and plants them in soil to grow corn for food."
- Human + Mix + Water + Soil (Clay) =Bricks for House (Home)**
"A human mixes water and clay (soil) to make bricks to use when building a home."

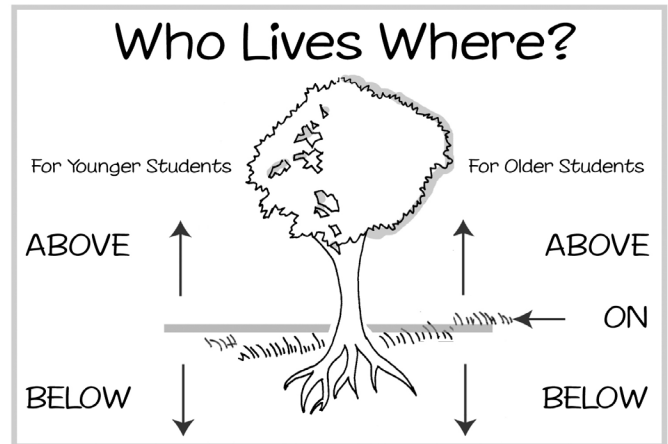
Figure 3: Human/Soil connections.

Adaptations for Younger and Older Students

(See the "Who Lives Where?" diagram below)

Younger students: Discuss with the students which animals live above the ground and which live below the ground. Next, have the students illustrate a scene with soil and a tree. Then they can draw or cut out and glue on animals that live above and below the ground.

Older students: Discuss with the students that animals live above the ground, on the ground, and below the ground. Next, have the students illustrate a scene with soil and a tree. Then they can draw or cut out and glue on animals that live above, on, and below the ground. Have students make connections to the types of animals that live in your local area.



After students have discussed what soil is made of and what lives in the soil, demonstrate *Part 3* of the *Why Study Soils?* Learning Activity from the GLOBE website (www.globe.gov) (*How much soil is there on Earth?*) with your students.

Further Investigations

- **Soil Comparison:** Find out which kind of soil is best for growing plants. Gather the following materials: four clear plastic cups, potting soil, sand, soil from an outside garden site, and clay, large bean seeds, and water. Have students fill each cup three-fourths full with the four different types of soil. Plant 2-3 bean seeds in each cup. Instruct students to plant the seeds closer to the side of the cup for better viewing as the seeds grow. Add a measured amount of water to each cup. Allow time for the seeds to grow. Have students predict what they think will happen for each cup of soil on a chart and save the chart for a future discussion when the experiment is completed. Have students make their own recording sheet by drawing the four cups of soil and then record what happens in each cup.



We All Need Soil! Activity Cards Sheet 1

Teachers: Cut out the cards on all of the activity sheets and laminate if possible. Then use the cards for Part 2 of *We All Need Soil!* with your students.

Title Cards

Group 1
Plants, animals,
and other things

Group 2
Actions

Group 3
Humans

Soil

Home/Food

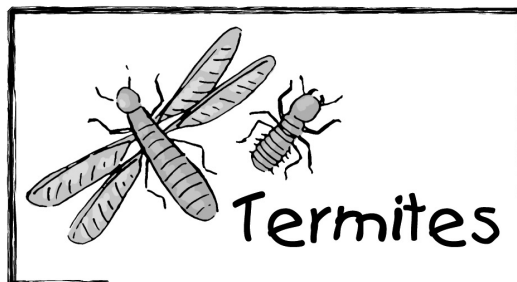
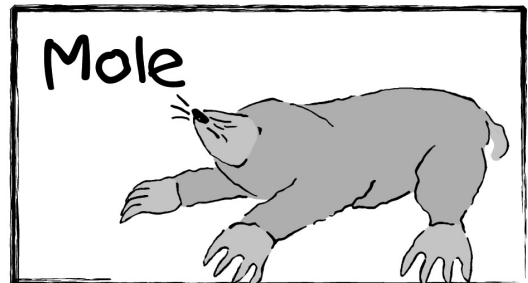
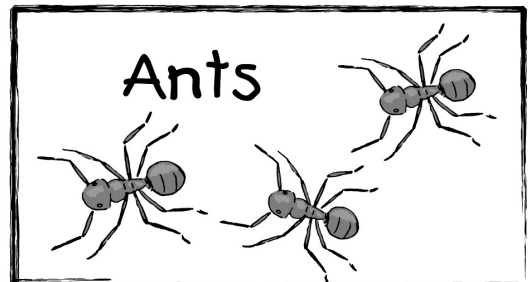
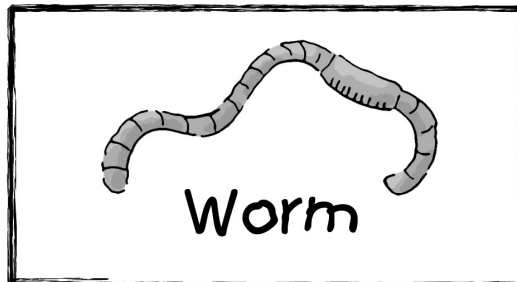
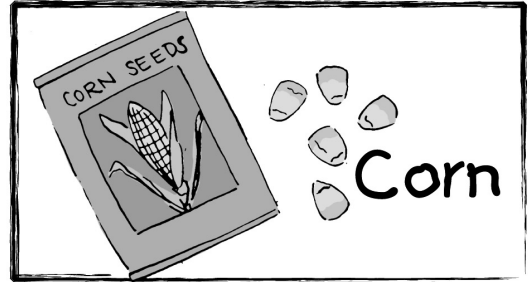
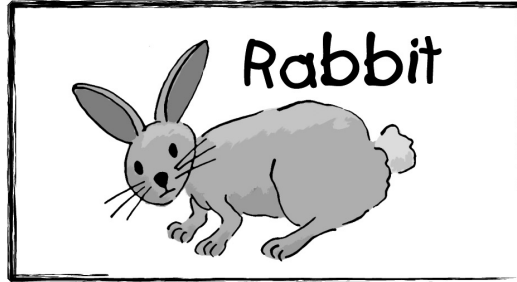
Group 3

Human

Human

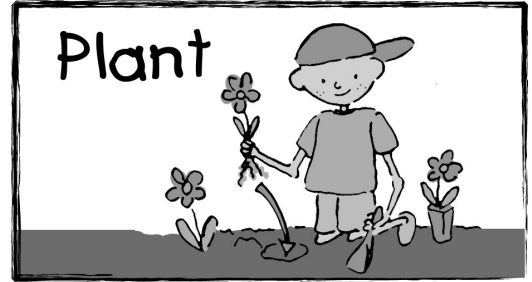
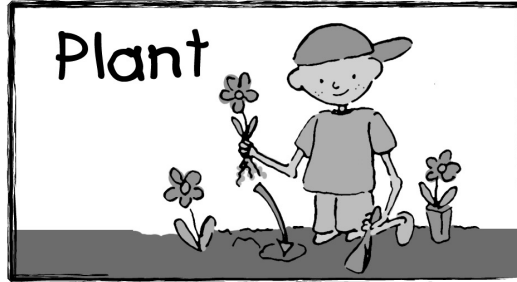
We All Need Soil! Activity Cards Sheet 2

Group 1 Cards



We All Need Soil! Activity Cards Sheet 3

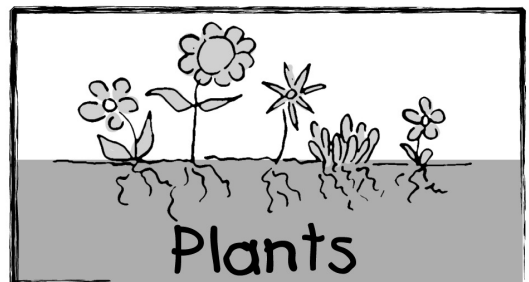
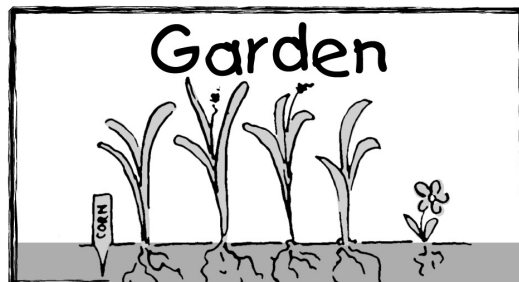
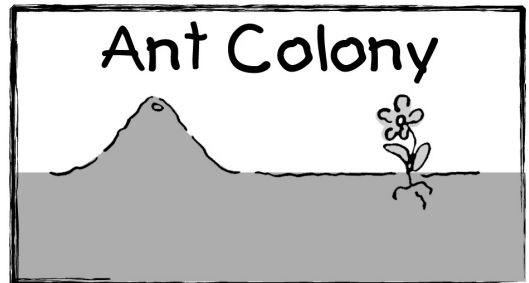
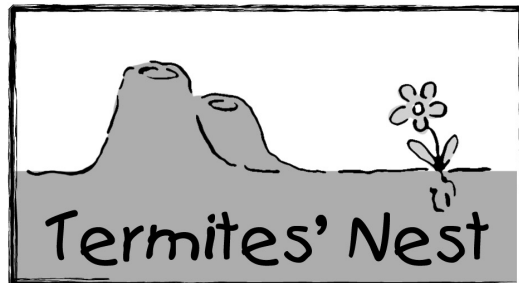
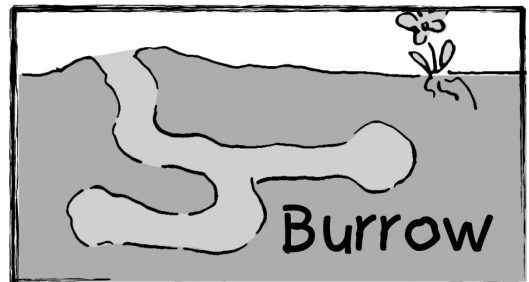
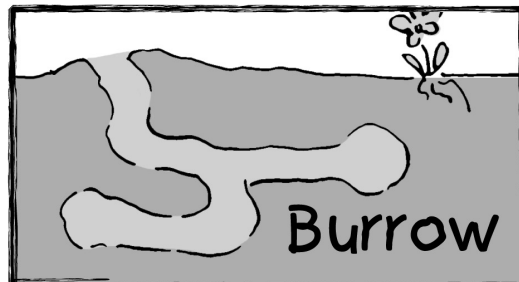
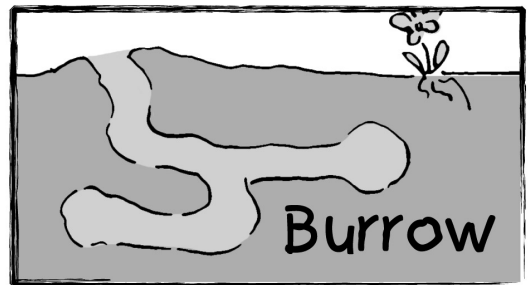
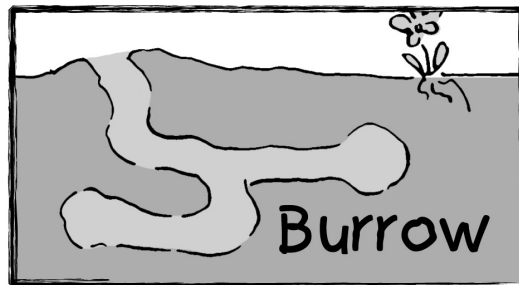
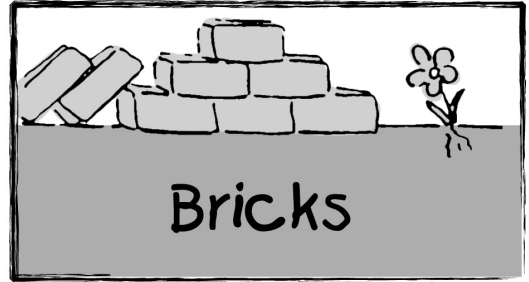
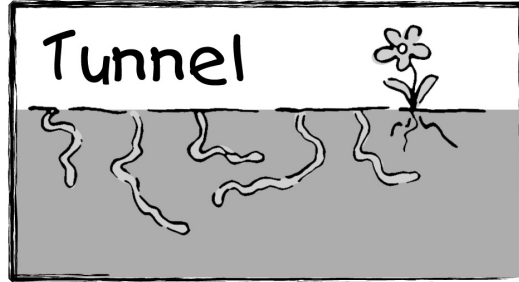
Group 2 Cards





We All Need Soil! Activity Cards Sheet 4

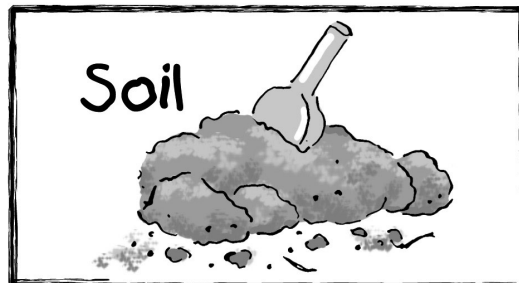
Home/Food Cards





We All Need Soil! Activity Cards Sheet 5

Soil Cards





We All Need Soil! Activity Cards Sheet 6

+/= Cards

+	+	+	=
+	+	+	=
+	+	+	=
+	+	+	=
+	+	+	=
+	+	+	=
+	+	=	=
+	+	=	=



We All Need Soil! Student Activity Sheet

Name _____ Date _____

Draw the parts of the soil connection in the boxes.

Type of Home/Food

=

Soil

+

Item from Group 2 (Actions)

+

Item from Group 1 (Plants and Animals)

Write your soil connection in a sentence.
