

# Edible Soil Profile

***Earth Science, Social Studies, History, Economics, Technology***

### **Materials**

3 large mixing bowls  
2 small mixing bowls  
Clear, plastic 4-6 oz. cups,  
1 per student  
1 pair food service gloves  
2, 1/4-cup measuring cups  
2 measuring tablespoons  
Worksheet A and B, one  
for each student  
Toasty O's/Cheerios cereal,  
1/4 cup per student

Coco Roo's/Cocoa Puffs  
cereal, 1/4 cup per  
student  
Mini marshmallows, 2  
tablespoons per  
student  
M&M's, 2 tablespoons per  
student  
Gummy worms, 2 per  
student

**Grade Level: 4**

**Time: 40 minutes**

**Standards:**  
Earth Science

### **Overview**

Student will create an Edible Soil Profile using cereal, marshmallows, M&M's and gummy worms.

### **Objectives**

1. Students will identify the three layers of soil.
2. Students will define five factors that affect soil quality.
3. Students will recognize two types of soil erosion.
4. Students will recognize four methods Kansas farmers use to protect against erosion.

### **Instant Expert**

*Exploring Kansas Natural Resources Educator's Guide. Unit 3—Cropland (33-37). Kansas Foundation for Agriculture in the Classroom. To order, visit [www.ksagclassroom.org](http://www.ksagclassroom.org).*

### **Background Information**

Soil is composed of inorganic and organic components: minerals, air, water and plant and animal material. About 50% of the volume of soil is mineral elements and organic particles. The rest of the volume is space. These small spaces, or capillaries, transfer and hold water in soil. Oxygen and other gases also move through these spaces. This combination allows small animals, such as insects or worms, and plant roots to move through soil to collect the water and nutrients. There are five soil forming factors which shape the quality of soil — climate, living organisms, parent material (bedrock), topography (lay of the land) and time.

Soils are classified according to their texture. Soil texture is determined by the amount of sand, silt or clay in the soil. These components vary in size with sand particles being the largest and

## Edible Soil Profile

clay particles the smallest. All soil needs is some clay to hold moisture in the soil. Sand helps keep soil from being too compact or solid. Soils with a medium texture and a relatively equal ratio of all particle sizes are ideal for Kansas crops.

If you were to slice through soil, you could see that it has three layers: bedrock, subsoil and topsoil. Each layer can be various depths and plays an important role in growing crops. Bedrock, also called parent material, is the deepest layer of soil. In some parts of the world, the bedrock layer is exposed, such as in mountains or other rocky areas. The roots of plants cannot penetrate this layer, although air and water do. They create a weathering effect on the bedrock and break it down into smaller pieces. Over a long period of time this mineral-based, solid layer breaks down to form subsoil. Subsoil is the layer of soil directly above bedrock. Deep-rooted plants such as sunflowers and soybeans can grow deep into the subsoil to retrieve moisture and nutrients. The amount of organic matter in the subsoil layer is less than that in the topsoil. Fertile topsoil contains organic matter and nutrients and supports many forms of life, from bacteria to worms. Topsoil is the layer that farmers till and plant their crops in. Plants with branching root systems, such as wheat, grain sorghum and corn, depend on this layer for moisture and nutrients. Scientists estimate that it takes 300 to 500 years to form one inch of topsoil!

Erosion occurs when soil is moved by water, wind or gravity. Conservation practices and responsible land management can help protect the soil from erosion. Several methods that help prevent soil erosion include: slowing the speed of the wind with trees, securing topsoil with plant roots, and carrying run-off water safely away from bare topsoil. There are many methods farmers and conservationists have utilized to protect the fertile, productive soil in Kansas. They include reducing the frequency of tillage, planting cover crops during dormant seasons, farming along the contour of the land (contour farming), planting crops in a strip cropping pattern, utilizing crop rotations, planting and maintaining shelterbelts (windbreaks), and planting grass waterways and terraces.

### **Preparation**

1. Read background information, lesson plan and student worksheet in their entirety.
2. Make copies of Worksheets A and B.
3. Purchase ingredients (cereal, marshmallows, M&M's and gummy worms) and supplies for edible soil profile.
4. Pour cereals and marshmallows into the three large bowls; pour M&M's and gummy worms into the two small bowls.
5. Place 1/4-cup measuring cups in the large bowls and tablespoons in the small bowls. Provide food service gloves for the person serving gummy worms.
6. Arrange ingredients on a table buffet-style in the following order:

## **Edible Soil Profile**

Marshmallows, Toasty O's/Cheerios, Coco Roo's/Cocoa Puffs, M&M's, gummy worms

### **Instructional Format**

1. Share background information with students.
2. Students create an Edible Soil Profile using cereal, marshmallows, M&M's candies and gummy worms.
3. While enjoying Edible Soil Profiles, discuss the background information, answer conclusion questions and complete Worksheets A and B.

### **Procedures**

1. Students should wash their hands.
2. Each student will receive one cup.
3. Have students layer the ingredients in the cup, allowing them to have different amounts of each layer to show how soil layers differ.
  - Marshmallows (Bedrock/parent material)
  - Toasty O's/Cheerios (subsoil)
  - Coco Roo's/Cocoa Puffs (topsoil)
  - M&M's (organic matter)
  - Gummy worms (decomposers)
4. Hand out Worksheets A and B. Discuss the layers of a soil profile, particle size and factors that build soil while the students enjoy their Edible Soil Profile.

### **Conclusion Questions (Assessment)**

1. Which soil layer is represented by the marshmallows?  
*Bedrock/parent material*
2. Which soil layer is represented by the Toasty O's/Cheerios?  
*Subsoil*
3. Which soil layer is represented by the Coco Roo's/Cocoa Puffs?  
*Topsoil*
4. Name five factors that affect soil quality.  
*Climate, living organisms, parent material (bedrock), topography (lay of the land) and time*
5. How might erosion be prevented?  
*Reducing the frequency of tillage; planting cover crops during dormant seasons; farming along the contour of the land (contour farming); planting crops in a strip cropping pattern; utilizing crop rotations; planting and maintaining shelterbelts (windbreaks); and planting grass waterways and terraces*

### **Resources**

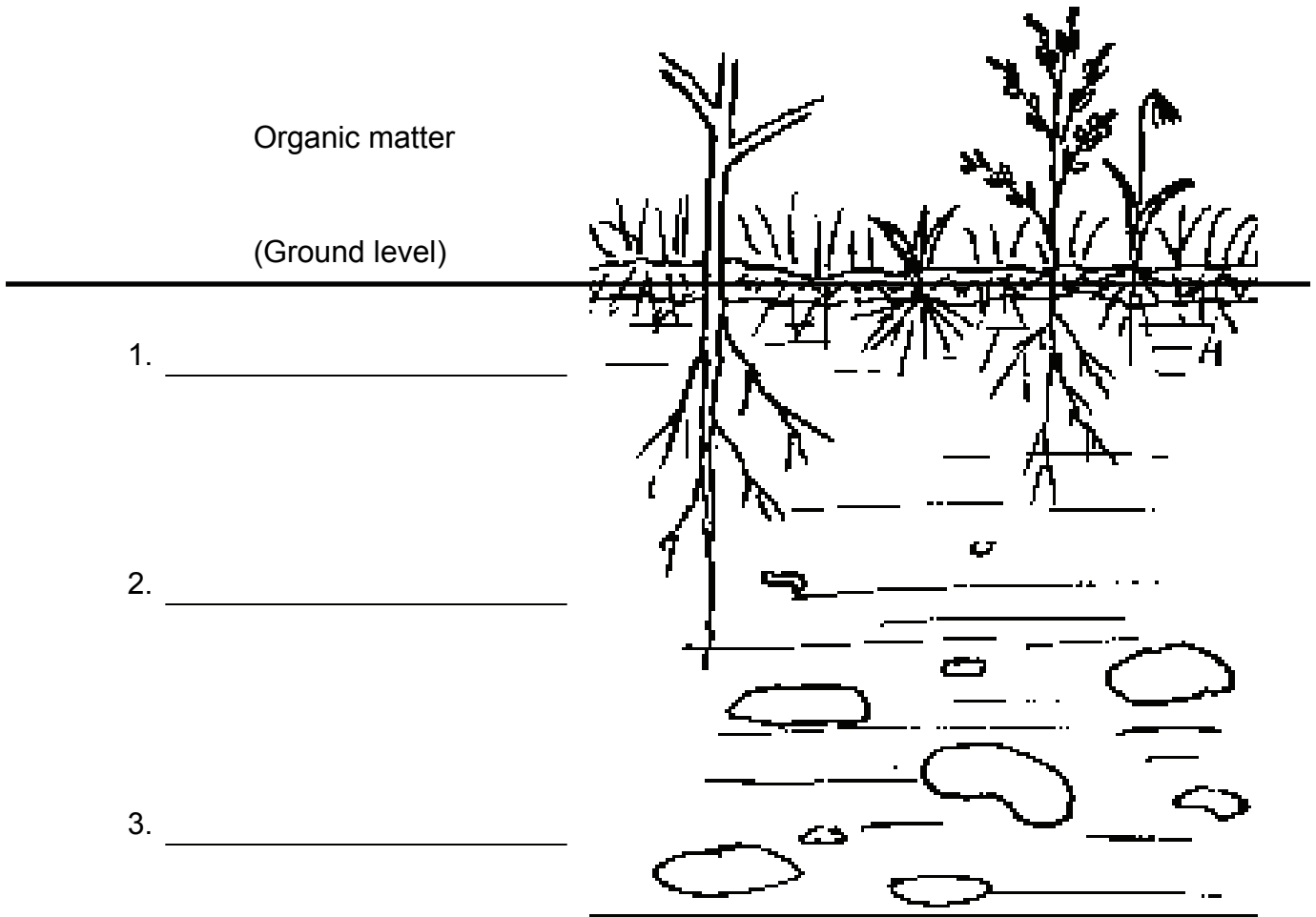
*Exploring Kansas Natural Resources Educator's Guide*. Unit 3—Cropland (33-37). Kansas Foundation for Agriculture in the Classroom. To order, visit [www.ksagclassroom.org](http://www.ksagclassroom.org).

Name:

**Edible Soil Profile:**  
Soil Layers

**Directions**

Label the three layers of soil using the words from the word bank.



From <http://www.funsci.com>

**Word Bank**

Subsoil  
Bedrock  
Topsoil



Name: \_\_\_\_\_

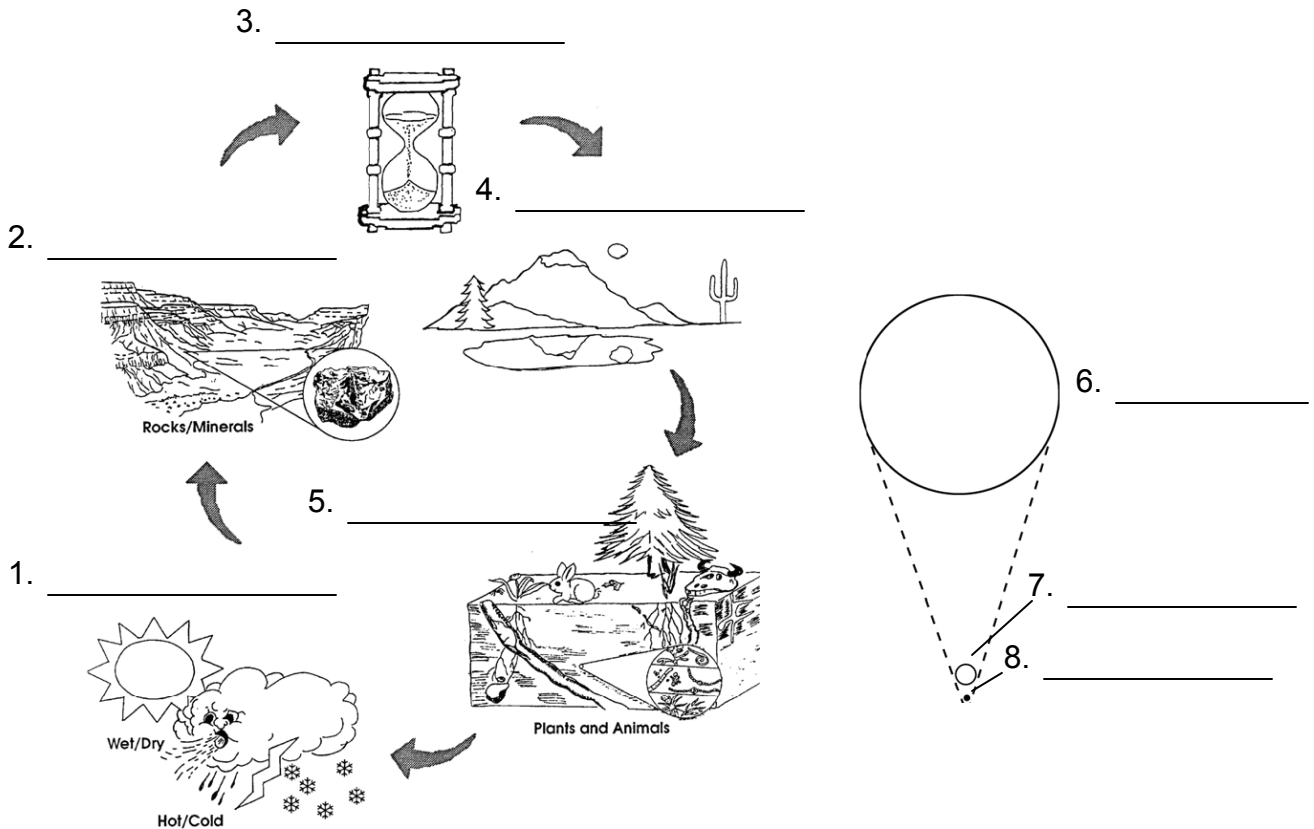
**Edible Soil Profile:  
Factors That Build Soil**

**Directions**

Fill in the blanks using words in the word bank.

**Climate** refers to general weather including temperature and rainfall. **Living organisms** such as microbes, plants, insects, animals, and humans exert considerable influence on the formation of soil. Bacteria help break down plant and animal residues in the soil. **Parent material** is the layer of unconsolidated material from which a soil develops. Fertility, which affects the ability to grow crops, is greatly influenced by the parent material of a soil. **Topography** affects how soil moves across the surface of the land. The slope, hills and valleys affect the way that water drains and carries soil particles. The amount of water held in soil due to the topography causes the soil to form slower or faster. Soil forms from the chemical and physical weathering of parent material over **time**, as affected by climate. Some soils form faster than others.

Particle size: remember, individual **silt** and **clay** particles cannot be seen unless they are magnified. **Sand** particles can be seen by the naked eye.



**Word Bank**

Climate	Parent material	Time	Clay
Living organisms	Topography	Sand	Silt