

# Walking on Ecosystems: Microhabitats Under Foot!

## Essential Questions:

*Who lives in the soil?*

*How can we determine the richness of soil by measuring the depth of layers in a sample?*

## At a Glance:

Learners participate in a variety of hands-on studies to understand the components of soil, as well as looking at soil profiles on their site.

## Background Information:

An ecosystem is a community of living and non-living things that work together. The soil is a thriving ecosystem comprised of a combination of materials, both living and nonliving. Soil is broken down rock and organic matter made up of decaying plants and animals. Water and air are also a part of soil.

There are horizons or layers in the soil. They are named **O, A, B,** and **C**. The top horizon is O. It is about an inch thick made up of dead stuff that breaks down and keeps the soil healthy. Horizon A is topsoil and has the highest concentration of organic matter and microorganisms. It is alive with roots, tiny microorganisms like bacteria and fungi, and other kinds of critters. Plants and animals have a tough time getting through Horizon B because it is very hard. Horizon C has less living matter in it than O. Horizon C is made up of the rock and soil that formed the layers above it. Soils vary greater from place to place. Rich Iowa farmland has an A horizon that is 3 feet thick. A typical eroded Georgia soil may have little or no A horizon.

## Procedure:

### Part A: Ant Trails

1. Locate the following three checkpoint areas on the school site.
  - a. an area that you would like to improve or plant a garden,
  - b. an area where soil is undisturbed (i.e. a wooded area or site under trees), and
  - c. an area where soil is damaged or eroded.
2. Mark the areas on your school site map.
3. Divide the class into six teams.
4. At each area, have two groups gather the information for the activity.
5. Give each group the following:
  - a. a copy of the “Walking on Ecosystems: Ant Trails (Part A)” worksheet

**Location:** Outside in an area with soil (wooded area works well)

**Objectives:** Learners will

- 1) discover the components of soil and the eco-service workers that live in the soil.
- 2) measure the depth of each soil layer.

**Skills:** observation, data collection, analysis, communication, inference

### Supplies:

- *Walking on Ecosystems* worksheet (Part A, B, & C)
- ‘Ant trails’ - six pieces of bright-colored string about nine feet long each
- hand lenses
- compasses
- ant puppet (optional)
- pencils
- blank maps – one for each learner or team
- assorted brown, red, yellow, and orange crayons to match soil colors
- ruler
- shovel or a soil auger for obtaining a soil core
- journal (optional)

**Subjects:** Science, Math

**Time:** 35 – 45 minutes

- b. hand lenses
  - c. 9 foot section of brightly colored string or flagging tape
  - d. pencil
  - e. compass
6. Explain to learners that they will pretend they are ants looking for the different components of soil as well as the many organisms (Soil Eco-service Workers) that live right under their feet.
  7. Optional: Use an ant puppet to demonstrate how ants and other insects crawl through the soil. Ask learners what the ant sees as it crawls along the forest floor.
  8. Using compasses, each group will decide to go North or South and note this on their worksheet.
  9. Each team will place the brightly colored string on the ground.
  10. A member of each team makes a check mark on their worksheet next to the objects and organisms they locate in the soil.
  11. Allow 5 minutes for exploration.
  12. Reassemble and ask teams to share what they found.
  13. Optional: If available, use magnifying bug boxes to view insects or other interesting organisms. Make sure that insects and other items found during the activity are returned to the locations where they were found.

**Variation:**

1. Describe an interpretive trail as a trail that is marked so that people can learn about the plants and animals they are looking at. Many of the trails at parks and nature centers are labeled this way.
2. Tell the learners that they will work with others to make an interpretive trail from the point of view of an ant. To do this they will need to think like an ant. Place the string on the ground and prepare a variety of ‘interpretive stops’ at interesting sites on their mini trail.
3. Once groups have designed their ant trails, they may share the trails with the other groups and interpret the trails to the other groups.

**Part B. Exploring the Soil Profile**

1. Explain to the learners that as soil breaks down and weathers, and as nutrients are washed deeper into the soil by water, the soil forms different layers, or horizons (see Background or worksheet for further information).
2. Learners may continue in the same groups and areas as in Part A.
3. Give each group the following:
  - a. worksheet “Microhabitat Under Foot: Exploring the Soil Profile (Part B)”
  - b. shovel
  - c. 12” ruler
  - d. hand lens
  - e. crayons
  - f. pencil
4. Learners are to follow the instructions on their worksheet, digging a soil core at 1, 3, 6, and 8 inch increments to examine the soil layers, or horizons. They will use the rulers for measuring the soil core depth.

5. At each layer/horizon of soil, learners are to list what they find in the space provided on their worksheet. They are then to draw what is found in each horizon in the chart. Use crayons to depict the colors of each horizon.
6. After observing the soil profiles, have learners place the soil and any organisms back where they came from.

### **Part C. Journal**

#### **Learners will write in a journal or use the Worksheet “Part C: Microhabitats Under Foot: Journaling”**

1. Gather the learners and discuss how soil is formed and the role organisms play in soil production.
2. Explain to learners that they will go outside and find a quiet place to write a journal entry titled “The day the soil workers went on strike!” Instruct them to describe: What happened? What did the world look like? What happened to the plants?
3. Instruct learners to record the date, time, and a brief description of their surroundings. Allow 10 – 15 minutes for this writing activity.
4. Gather learners and allow them to share their journal entries.

#### **Discussion/Assessment:**

Ask the learners what they found on their ant trails. Review the components of healthy soil. Discuss the differences in the soil profiles especially the differences in organic matter and topsoil in each soil sample.

What has caused these differences? Explain that organic matter greatly improves soil productivity; that is, plants grow better in soils with high organic content. There are two reasons for this. First, organic material acts as a trap for the nutrients that plants need to grow, keeping them from being washed away with rain.

Additionally, organic matter acts like a sponge, helping retain moisture in the soil, making water available to plants over a longer period of time. To further test organic matter and its affect on soil chemistry, see the Garden Earth activity, “My Soil is Better than Your Soil.”

RUI – Add Soil Colors worksheet (Publisher doc) here