

## Observing Soil Macroinvertebrates

### Objective

Discover some of the wide variety of organisms living in the soil by using two techniques to extract large and small arthropods from the soil. Students may identify the organisms, estimate numbers, or compare populations in different places.

### Background

“Arthropods” is the name for a large group of invertebrates with jointed (arthros) legs (podos). In the soil, they may be microscopic or several inches long. They include insects (springtails, beetles, and ants); crustaceans, (sowbugs); arachnids (spiders and mites); myriapods (centipedes and millipedes); and scorpions.

Arthropods are important because they stimulate microbial activity and enhance decomposition; they help control pest populations; and they improve soil structure as they burrow through the soil or excrete fecal pellets made of soil and organic matter. Good structure is important for improving water intake, drainage, and aeration, thus protecting soil from erosion, and creating a good environment for roots. A single square yard of soil may contain 500 to 200,000 individual arthropods and tens or hundreds of different species. Most live in the top few centimeters of soil. A Berlese (pronounced “bur LAY zee”) funnel can be used to collect microscopic arthropods from soil. A pitfall trap can be used to gather larger arthropods.

### **Technique #1: Berlese Funnel**

#### Time

Allow one week after setup to collect samples.

#### Materials

- Trowel and plastic bags for gathering soil.
- Large funnel (2-liter bottle, or plastic milk jug)
- 2 mm mesh screening
- Jar or cup
- Preservative (ethanol or 50:50 ethanol/water mix)
- Incandescent, 60W light bulb and fixture
- Dissecting microscope

#### Procedure

1. **Gather soil samples** Arthropods are easiest to find in soil that is rarely disturbed by tillage, not compacted by traffic, not treated with pesticides, not periodically flooded or dried out, and that has several different kinds of plants growing. Push away the surface litter and dig up about 1 liter of soil from the top few centimeters of the soil. (In another experiment, plant litter can be used in place of soil in a Berlese funnel.) Refrigerate sample if you will not use it right away.

2. **Set up the Berlese funnel.** Cut off the bottom of the bottle or milk jug to make a funnel. Cut and place the screen in the bottom of the funnel to hold the soil. It may help to tape the edges of the screen to the funnel. Half fill the funnel with soil. Set the funnel above a jar or cup with a bit of ethyl alcohol in the bottom. (Glycerol can be added to reduce evaporation.) Set up a desk lamp or hang a light bulb so the bare 60W bulb is about 4 inches over the soil.

3. **Collect the organisms.** Leave the light bulb on for 3-7 days to dry out the soil. As the soil dries, organisms will move deeper into the soil and eventually fall into the alcohol. Avoid disturbing the setup and knocking soil into the alcohol.

4. **Examine the sample.** Pour the alcohol solution into a Petri dish and examine under a microscope. Put black paper and white paper behind the sample to highlight different organisms. Identify the main groups of arthropods. An identification key is at [www.cals.ncsu.edu/course/ent591k/ident.html](http://www.cals.ncsu.edu/course/ent591k/ident.html)



## Technique #2: Pitfall Trap

### Time

Allow one week after setup to collect samples.

### Materials

A one-to-four cup sized container (i.e. yogurt container)

Trowel

Preservative (optional)

### Procedure

1. Set up the trap. Choose a location that will not be disturbed for a week. Dig a hole as large as the container. Set the container in the hole so that the rim is exactly even with the surface of the soil. If it is a bit higher, organisms will walk around the rim and not fall in. Smooth the soil up to the rim of the container.
2. Enhancements. If desired, you can fashion a roof to keep out the rain and animals that might eat the arthropods. You may add a preservative to preserve the animals and prevent them from eating one another.
3. Collect the arthropods. Leave the trap in place for a week, but check the trap daily, especially if you did not use a preservative.
4. Identify the main groups of arthropods. An identification key is available at [www.cals.ncsu.edu/course/ent591k/ident.html](http://www.cals.ncsu.edu/course/ent591k/ident.html).

#### Questions for Discussion

1. For each method, how is the sample biased? In other words, which creatures will be caught and which will be missed?
2. What role might each of the organisms play in the soil ecosystem?
3. Why do we find more arthropods in some places than in others?

