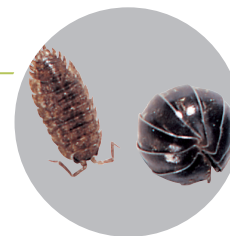


# Invertebrate Biodiversity and Abiotic Factors

## A Carolina Essentials™ Investigation

### Student Worksheet



#### Overview

Understanding the relationships between diversity and abiotic factors in an ecosystem can be a difficult task. Using the total number of invertebrate species present in a soil sample and the number of individuals within a species, calculations can be made to provide a measure of invertebrate density and biodiversity. This information can be compared to soil pH, moisture, and temperature to develop an ecosystem model. In this activity, you will be constructing a simple Berlese funnel to collect and identify soil invertebrates.

#### Essential Question

*How do abiotic factors influence the biodiversity and density of soil invertebrates?*

#### Investigation Objectives

1. Construct a Berlese funnel.
2. Collect and identify soil invertebrates.
3. Determine if a relationship exists between number of invertebrates, classes of invertebrates, and abiotic factors.

#### Safety Precautions

Use scissors properly. Take necessary precautions for those with allergies to bug bites, insect stings, plants, or pollen.

#### Procedure

##### Making the Berlese Funnel

1. Using scissors, cut the bottom off the jug.
2. Tape around the edge of the cut end.
3. Place the milk jug spout in the mouth of the jar. The jug serves as the funnel. The jar is the collection chamber.
4. Bend the mesh screen so that it fits securely in the milk jug and forms a stable platform for the soil sample. Do not let the screen fall below the handle.

##### Abiotic Soil Properties

5. Insert the soil thermometer and record the soil temperature.
6. Remove the top 1 to 2 cm of soil and leaf litter with the Berlese funnel.
7. Take a small amount of soil without any invertebrates. Add 3 to 4 drops of water, mix well, and test the mixture with the pH paper.
8. Record the pH.
9. Place 1.0 g of soil in the 50-mL beaker.
10. Weigh the soil and beaker. Record the mass.
11. Place the soil in the drying oven at 100 to 110° C or under the incandescent bulb. Allow the soil to dry to a powder.
12. Reweigh the beaker and soil. Record the mass.

*Continued on the next page.*

#### MATERIALS

Ethanol (70–95%) or isopropyl alcohol (70%), 50 to 100 mL

1 Gallon-sized plastic jug with cap

1 1000-mL beaker or 1-qt. jar

1 Square of mesh screen

1 Incandescent bulb lamp

1 Pair of scissors

1 Ruler

Tape

1 Soil sample from a plot that is 50 cm × 50 cm (1 to 2 cm deep)

1 Spade, shovel, or other digging tool

1 Invertebrate key

1 Soil thermometer

1 pH strip

1 50-mL beaker

1 Electronic balance

Drying oven or other heat source for desiccating soil sample

**Invertebrate Inventory**

13. Place the remaining top layer of soil into the funnel.
14. Pour 2 cm of alcohol into the beaker or jar.
15. Place the funnel on the jar. Tape a ruler or similar support to the handle of the funnel and to the side of the jar to ensure that the funnel remains steady.
16. Place the Berlese funnel under the incandescent lamp.
17. Adjust the lamp to direct the light onto the top of the sample from about 20 cm away.
18. Let the Berlese funnel stay under the light for several days.
19. Identify the soil invertebrates that have fallen into the alcohol. Record your data in the Invertebrates section.

**Disposal**

Return excess soil outside. Once invertebrates are identified, flush alcohol down the sink with water. Dispose of invertebrates in the trash.

**Data Tables**

**Soil Data**

Temperature (C°)	pH	Moisture Initial Mass (g)	Final Mass (g)	Water Mass (g)

**Soil Invertebrates**

Species	Class	Number (n)
Total (N)		

*Continued on the next page.*

## Analysis

1. Calculate the percentage of soil moisture.

2. Calculate invertebrate density.

3. Calculate the Simpson Index of Diversity.

$$D_s = 1 - [\sum n_i(n_i - 1)/N(N-1)]$$

4. Compare group results and discuss differences in invertebrate samples, locations, biodiversity, and abiotic factors.

5. What patterns can be established between biotic and abiotic factors?

6. How would the season of the year impact biotic and abiotic factors?