

Investigating Invertebrate Biodiversity with Berlese Funnels

A Carolina Essentials™ Investigation



Overview

Understanding the relationships among biotic diversity and abiotic factors in an ecosystem can be a difficult task. Using soil invertebrates, students can identify both the number of species present in a soil sample and the number of individuals within a species. With some simple math, the density of invertebrates in a plot can be calculated. Students will construct a simple and inexpensive Berlese funnel to collect soil invertebrates and then identify them.

Life Sciences, Earth and Space Science

Grades: 6–12

Essential Question

How can the biodiversity and density of soil invertebrates be studied?

Investigation Objectives

1. Construct a Berlese funnel.
2. Collect and identify soil invertebrates.
3. Calculate the density of soil invertebrates.

Next Generation Science Standards* (NGSS)

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|--|--|
| <p>Constructing Explanations</p> <ul style="list-style-type: none"> • Students will collect invertebrate samples and explain the results based on abiotic soil factors. | <p>LS2 Ecosystems: Interactions, Energy, and Dynamics</p> <p>ESS2 Earth's Systems</p> <ul style="list-style-type: none"> • Students will understand the relationship between ecosystem biotic and abiotic factors | <p>Patterns</p> <ul style="list-style-type: none"> • Students will establish patterns between soil invertebrate biodiversity and density and abiotic soil factors. |

Safety Procedures and Precautions

Remind students to use scissors properly. Identify students who may have allergies to bug bites, insect stings, plants, or pollen. Take necessary precautions.

Disposal

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

Continued on the next page.

TIME REQUIREMENTS



PREP | **ACTIVITY**
30 min | 5 days, 95 min

Teacher Prep: 10 min
 Student Activity
 Funnel Construction: 20 min
 Soil Collection and Testing: 30 min
 Invertebrate Preservation: 4–5 days
 Invertebrate Identification: 45 min

MATERIALS (PER GROUP)

Ethanol (70–95%) or isopropyl alcohol (70%), 50 to 100 mL
 1 1-gallon plastic jug with cap
 1 1000-mL beaker or quart jar
 Square of mesh screen, 20 cm × 20 cm (1/4 in hardware cloth)
 1 incandescent bulb (60 or 75 watt)
 1 scissors
 1 ruler
 Tape
 1 soil sample per group from a plot that is 50 cm × 50 cm
 1 spade, shovel, or other digging tool per student
 1 or 2 invertebrate keys

HELPFUL LINKS

[Carolina LabSheets™: Biodiversity of Soil Animals](#)
[Carolina Teacher Resources](#)

REFERENCE KITS

Carolina Investigations® for AP® Environmental Science: Exploring Biodiversity Kit

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Preparation

Berlese Funnel Construction

1. Precut the screen into 20 cm × 20 cm pieces.
2. Identify different locations outside that are suitable for invertebrate collection

Student Procedure

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.
5. At the assigned location, collect about a cup of soil and leaf litter (the top 1 cm).
6. Place the top layer of soil into the funnel.
7. Pour 2 cm of alcohol into the beaker or jar.
8. 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.
9. Place the Berlese funnel under the incandescent lamp.
10. Adjust the lamp to direct light onto the top of the sample from about 20 cm away.
11. Let the Berlese funnel stay under the light for several days.
12. Identify the soil invertebrates that have fallen into the alcohol.

Teacher Preparation and Tips

Make sure that the tape is folded over the cut edge of the milk jug.

Keep the cap on the jug until the soil is added to prevent any loose soil from entering the jar.

Do not pack the soil into the funnel.

Remove the jug cap.

The incandescent bulb serves as a heat source.

There are many invertebrate keys online.

Data and Observations

Identify and record the type and number of invertebrates in the soil sample.

Typical invertebrates may include ants, mites, spiders, springtails, termites, and centipedes.

Analysis and Discussion

1. Calculate invertebrate density.
Density = total number of animals/area (50 cm × 50 cm)
2. Compare group results and discuss differences in samples and locations.
Answers will vary.

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TEACHER NOTES