



Because you will be able to find insects wherever you live, they are perfect for study in the classroom. By taking soil samples in several different habitat types, collecting the small insects which live there, and examining the diversity of insects found in each habitat, you can help your students understand the concepts of ecosystems and biodiversity.

Objective: learn about ecosystems and biodiversity.

Ages: Primary, Intermediate and Advanced

Materials:

- garden trowel
- 3 plastic bags
- 3 glass jars
- 3 funnels
- a piece of window screen
- 3 low wattage electric lamps
- rubbing alcohol (optional)
- dissecting microscope, hand lense or magnifying glass

Additional teacher guide - *Exploring Rainforests* available from CES.

Subject: Science

Insects

Insects are everywhere. In fact, there are more insects than any other type of animal on earth. This is true no matter how you measure their numbers - in terms of individuals or species. One scientist calculated that for every person on earth, there are about 200 million insects alive at any one time. More than 75% of all the named animal species are insects and there are millions of insects yet to be discovered, named and classified.

About 90,000 described insect species occur in the United States and Canada. No one knows how many species of insects there are in the tropics. In a single leguminous tree (a relative to beans and peas) in Peru, 43 species of ants belonging to 26 genera were found, about equal to the ant fauna of the British Isles. In a single square mile of tropical forest in Peru or Brazil, there may be 1,500 or more species of butterflies - twice the total number found in the United States and Canada combined.

When biologist Terry Erwin did extensive sampling in the canopy of a Peruvian rainforest, he found so many insects that had never before been described that he estimated the total number of insect species on earth to be around 30 million! That is compared to a total of about 750,000 species which have been described so far.

Ecosystems

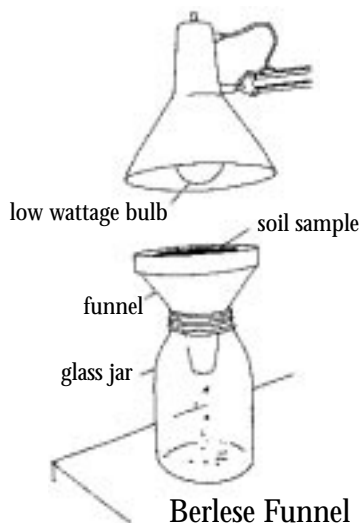
An ecosystem is a grouping of plants, animals, and other organisms interacting with each other and with their environment in such a way as to perpetuate the grouping more or less indefinitely. Ecosystems have characteristic forms such as deserts, grassland, tundra, deciduous forests, and tropical rainforests.

Rainforests are the most biologically diverse ecosystems on earth. Just 200 years ago, rainforests circled the globe in a green belt. 20% of the earth was rainforest. Today, rainforests cover only about 7% of the earth's surface but in this small area live more than half of all described species on earth.

Berlese Funnel Insect Activity

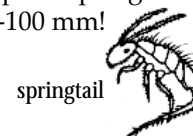
The following activity is a fun way to learn about soil insects and other arthropods as well as a good starting point for talk about ecosystems

1. Locate three different ecosystems near your school or in a local park. Try to find areas with different types of soil. For instance, sandy soil (not from the beach), soil full of dead, moist leaves (leaf litter), and rich dark humus. Which habitat do you think will have the most insects living there?
2. Take soil samples from three habitat types. Scoop several trowels full of soil into some plastic bags. (Try to get about the same amount of soil from each location but don't pack the soil down.) Close the bags tight and note where you collected each sample.
3. Make 3 Berlese funnels - put a piece of screening in the bottom of three funnels and make sure they fit snugly into the mouths of your jars. If you would like to use a microscope to see the insects, partly fill the three jars with alcohol. (The alcohol will preserve the insects and make them easier to see under the scope.) The end of each funnel should be just above the alcohol when you place them into the mouths of the jars.
4. Put your soil samples from the three habitat types into three separate funnels. Put a light about six inches over the soil (not too close as this could cause a fire). Wait for a day. The insects will move away from the hot drying light and fall through the screen into the jar (and alcohol, if you are using it).

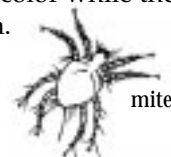


What you might find:

The most common types of insects found in soil samples are **springtails** (order Collembola). There may be up to 100,000 collembolans per meter cubed of soil or leaf litter! They feed on decaying plant material, fungi and bacteria. If you have a strong scope or magnifying glass you can see how they got their name. Some species have a "furcula" on their underside - a sort of forked "spring" which they use to push themselves off of the ground into a jump. A springtail 3-6 mm. in length can leap 75-100 mm!



Small oval **mites** are also very common in the soil. While these are arthropods, they are not insects. How can you tell? Mites, like spiders, have eight legs while insects have only six. (Note: when mites first hatch from their eggs, they only have 6 legs. They will get 8 legs after their first molt) Mites often look a lot darker in color while the springtails often look whitish.



Also look for small beetles, beetle larvae, sow bugs and millipedes.

How Insects Fit In:

- Kingdom: Animalia
- Phylum: Arthropoda
 - Class: Arachnidia (mites, spiders, ticks scorpions)
 - Class: Crustacea (crabs, lobsters, shrimp, sow bugs...)
 - Class: Diplopoda (millipedes)
 - Class: Insecta (insects including springtails and beetles)
 - Class: Chilopoda (centipedes)
- Phylum: Chordata
 - Class: Mammalia (humans...)

5. Now you can compare the insects from each different type of habitat. Which ecosystem had the widest variety of insects? Why do you think this is so? How do the numbers of insects you found here compare to the numbers you might have found in the tropics? Older students may wish to count how many of each type of insect has been collected from the different habitats and compare these numbers.

An insect field guide will help you identify the major types of insects (and other **arthropods**) although this isn't necessary. Just looking at the various types/body forms will give your students a good idea of the variety of insect life.

References:

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 Biodiversity. E.O. Wilson, editor. National Academy Press, Washington, D.C. 1988.
 Insect Biology, 49 Science Fair Projects. H. Steven Dashefsky. TAB Books, McGraw-Hill, Inc. 1992.