



### DESCRIPTION

Wildlife is an important contributor to a healthy ecosystem. Each member plays a crucial role from the bottom to the top of the food web. This activity is designed so that students will recognize one example of the kinds of significant contributions from wildlife. Earthworms will be the model example. These animals are not thought to play a very large role in any ecosystem. The exercise will demonstrate that they do have an important role when it comes to enriching a growing medium such as soil.

### MATERIALS

- three 30 cm x 30 cm x 30 cm containers
- enough soil from the soil from the same source to fill these containers
- earthworms
- composting material (kitchen scraps, yard leaves, etc.)

### LEARNING OUTCOMES

Students will:

- evaluate the importance of plant and animal matter as contributors to soil.
- recognize that wildlife in many forms contributes to the diversity and balance of ecosystems.

### READINESS ACTIVITIES

Teachers should:

- find an appropriate place in the lab to leave the containers. The containers should be kept away from any type of disturbances.

Students should:

- have some idea of how to catch earthworms
- become familiar with composting



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## Introduction

There are many different types of living organisms on this planet. This is a fact which is often forgotten by many humans. The truth is that humans could not survive without these other organisms. For example, plants convert solar energy into a form of energy that can be consumed by other animals. Humans consume plants or plant-eating animals to survive. Everything is connected in many different ways. Plants, human, and many organisms can all belong to the same ecosystem.

## Ecosystem

The term ecosystem is used to describe a system of plants, animals, and the physical environment in which they live. Some examples of ecosystems are lakes, woodlots, estuaries, farm fields, or even cities. An ecosystem can be of any size, depending on what is going to be studied. They can range in size from the water in a plant, to a tropical rain forest system. Ecologists are scientists who often study ecosystems. They commonly view an ecosystem in terms of energy flow, carbon flow, or nutrient cycles.

## Soil

A part of any terrestrial ecosystem is the soil in which the plants grow. To an ecologist, soil represents a thin layer of the earth's crust that has been remade by life and weather. Different ecosystems have different soils, with their own mixtures of organic matter and their own layering. Soil, to an ecosystem is a nutrient delivery system, a recycling system, and a waste-disposal system. For plants, soils are sites of germination, support, and decay. For animals, soils are a shelter, a sewer, or an whole habitat. Soils are a resource for decomposers.



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## Worms

Although many people rarely think of worms as more than fish bait, they are actually very valuable to soil. But the earthworm has all but been forgotten in modern agriculture. So much of what the earthworm used to do for free is now done by tractors and chemicals. Many of these modern farming practices decrease the abundance of earthworms. Cultivation of the land, as well as pesticide and fertilizer applications can adversely affect earthworm populations. If soil does not have a high number of earthworms, they can return if conditions are improved. They are certainly a valuable component of any soil. Here are some of the advantages of having earthworms:

- Earthworms churn the soil and make it porous for maximum plant growth.
- The maze of tunnels created by earthworms increases the soils ability to absorb water.
- Earthworms neutralize soil pH with their castings, or manure. Soil that comes out of an earthworm in this form is closer to neutral pH, regardless of whether the existing soil is above or below pH 7.
- Earthworms bring up minerals and make plant nutrients more available.
- Earthworm burrows stimulate the growth of nitrogen fixing bacteria, which are very important for plant growth.
- The gut of an earthworm mixes, conditions, and inoculates plant residues, turning it into free manure.
- Earthworms are a good indicator of healthy soil. Soil with earthworms tends to have less plant-eating invertebrates than soil without earthworms.

It is obvious that earthworms are always working to make the soil better. They do this not only for their own survival, but for the healthy survival of their primary food source, the residues from crops. *They are truly a farmer's best friend.*

In this lab exercise, students will gather soil and combine it with some type of organic matter. Worms are then added to this mixture. Analysis will be done on the soil before the worms are added and after they have had a chance to work the soil. This will give students an idea of the valuable role that worms play in an ecosystem.



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## First a Word on Worms

Worms can live in a plastic bin or wooden box, with plenty of air holes punched in the sides and top. Don't make the holes too big or the small ones will get out. Loam or black topsoil is good material for the containers. This is available at local garden centres. A mixture of sawdust, peat, shredded leaves, and soil would also be good. The organic material will be mixed into this material.

The kind of worms available for fishing bait would be the most appropriate for this experiment. Field worms are better at digesting organic materials that are already well decomposed and aren't likely to survive in a worm bin on a diet of kitchen scraps. If field worms are the only type available, the ones that die will have to be replaced by new ones.

Coffee ground, vegetables, and fruit are good worm food. A varied diet is important. Avoid using bones, dairy products, meats, garlic, and potato peelings. Eggshells are important for preventing the mixture from becoming too acidic for the worms.

Worms can survive at temperatures from 4 to 32 °C, but prefer a temperature at or above room temperature. The worm bins should also be placed in an area that is free from disturbances. Most importantly, **keep the worms out of the light.**





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## Procedure

1. Try to select a poor quality soil. This type of soil might be heavily compacted and found by a roadside or in an area where there has been a lot of erosion. Remember to take a large enough sample of soil to be able to fill the three containers (30x30x30cm).
2. Analyze the soil quality by performing a few simple tests. Record your results.
  - Try testing the acidity or alkalinity with a pH meter or litmus paper
  - Look for signs of plant or animal matter in the soil. Count the number of species you can identify. You could also try examining a sample under a microscope. See if you can find any small organisms.
  - Check porosity by determining how fast water will run through it.
  - Conduct a settling test by simply combining the soil with water in a vial. This will indicate the general proportions of soil components which are present (sand, silt, clay, or organic matter).
3. Divide the soil into the three containers. One of these will be the control. The second will contain soil and compost only. The third is for soil, compost and earthworms.
4. Add the composting materials like table scraps, grass clipping, leaves, or whatever to the second and third containers. Now add earthworms to the third container.
5. Water the soil occasionally, but very lightly. You can do this to each box to simulate a rainstorm. Do nothing else to the first box of soil.
6. You will need to keep adding food and other composting material to the second and third containers. It would be good to add materials once a week for three weeks. All the containers have to be watered lightly about once a week. Record any observations during this time.
7. After three weeks, perform the same soil test again. Conduct each test on all three boxes.



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- You could also try planting seeds in the containers. Plant the same number of seeds in each container. Record the date of planting, as well as watering procedures and any observations. After three weeks, compare and discuss the results.

## Questions

1. Discuss the finding from the earthworm experiment. What are the differences between the three soil samples?
2. Describe the importance of plant and animal matter as contributors to soil.
3. List three ways that earthworms have a positive effect on soil.
4. Name three other types of wildlife, and describe briefly how each contributes to improving or maintaining soil.

## Notes

- To speed up the entire process, use a larger number of earthworms with a larger soil box.
- Some of the earthworms may die during the course of the experiment. You may have to add new worms in case this does happen.

## References

Dr. Lynn Crosby. Nova Scotia Agricultural College.

Colinvaux, P. 1986. Ecology. John Wiley & Sons, Inc., Toronto.

Cooper, E.L. 1997. Agriscience: Fundamentals & Applications. Delmar Publishers, New York.