

GLOBE			Type of
Sphere	Protocols	Related SDGs:	activity
Pedosphere	<ul> <li>Soil Characterization</li> <li>Soil pH</li> <li>Soil Moisture</li> <li>Bulk Density</li> </ul>	4 (Quality education) 12 (Responsible Consumption and Production)	Research

## Overview

There are several types of earthworms, the most important and well known being the Red Californian earthworm, belonging to the annelid family, with a cylindrical and segmented body; their color ranges from white to pink and dark red as an adult; when earthworms reach adulthood, they can measure from 6 to 8 cm. Their respiration is cutaneous, that is, they breathe through the skin, so their environment must be adequately humid. The activity of earthworms accelerates the decomposition of plant residues, increasing the rate of nutrient transformation, and promotes soil aggregation and porosity. In addition, earthworms also help in the straw decomposition, in the creation of nitrogen, which can be used in the soil, and in its ventilation, since they help with soil mobilization and surface air and water circulation through it, increasing water infiltration and solute transport.

By making their galleries, earthworms improve the water properties and soil structure. By feeding on organic matter, they degrade it and help its decomposition by microorganisms, which makes nutrients more assimilable by plants. The digestion of the organic matter they consume is known as "Humus". It has been determined that the distribution of earthworms globally is defined by climatic factors such as precipitation and temperature. This raises concerns about the effect that climate change could have on earthworm populations.

Back in those days, <u>Darwin Ch., in 1881,</u> gave an account of their relevance. He stated then that "it is doubtful whether there are any other animals that have played a more important part in the history of the world than these creatures of such simple organization".

Long before, the Egyptians already considered them "lesser gods" when they observed how, after the flooding of the Nile, they incorporated silt into the soil, which increased its fertility. The fact is that, without earthworms, there would be no soil as we know it, and without soil, agriculture would not have developed.

## Time

12 hours. Over the course of a semester.



**Prerequisites:** (K-6 - K-8) None.

**School level** Primary.

### Purpose

To learn about the living conditions of earthworms as an activating factor in the improvement of soil properties, their protein contributions and their importance in the associated processes.

### Student Outcomes

- To identify the processes of humus production from earthworms.
- To relate the productive improvement of organic matter with optimal soil habitat conditions.
- To make inferences after comparing soils with and without earthworm participation.

### Introduction

Determining the importance of earthworms in their interaction with the soil requires getting involved in their breeding and knowledge of their characteristics and life cycle, which is possible to do at different size and temporality scales. On this occasion we will consider the "Californian earthworm" in our research because it is the best option for an activity like ours.

In general, the Californian earthworm is a dark red or reddish purple worm species, with an antero-posterior and dorso-ventral gradient, whose body is divided into fragments or metamerisms, which are visible to the naked eye. They are about 8-10 cm long and 3-5 mm in diameter. They are photophobic. Each individual ingests an amount of organic material equivalent to its own weight daily (approximately 1 gram in adult individuals). Each worm is equipped with a male and a female genital apparatus (they are hermaphrodites). Copulation takes place every 7-10 days. After 14 to 21 days of incubation, the small worms emerge from the egg capsule, which has already acquired a darker color, producing between 2 and 21 white worms measuring approximately 1 mm in length.

## Guiding Research Questions

- What earthworm entomological characteristics favor their virtuous interaction with soils?
- How does the earthworm community contribute to the soil ecosystem configuration?

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### Scientific Concepts

- Entomology, Insects, Annelids
- Humus
- Meteorological factors influencing soil
- Proteins and Nutrients

### Materials and Tools

- A weighing scale
- Garden tools such as a small shovel and a rake
- Californian earthworms
- Materials to make worm castings according to the selected model
- Plastic pieces of 50x50 cms
- Measuring tape
- Log book and pencils

# What to Do and How to Do It

## – Beginning

In a selected study site intended for your soil measurements, set up your earthworm castings, which you should first build according to the video in reference No.1, otherwise, select some other model that is more suitable for you. Additionally, build a 100 x 50 x 15 cm. box with a few holes in the bottom, like a flower pot, and fill the box first 10 cm. with soil.

## – Development

- Research the ideal conditions for composting in the literature and begin the process with a given number of earthworms. Concurrently, start a similar process in the soil bin (also with a given number of earthworms), recording the amount of water you added, the temperature, the mass of organic matter for feeding, and any visible changes in the process.
- In the case of the box, apply the protocols for pH, humidity and bulk density at the beginning and then record all details every 15 to 20 days.
- Run a hydrogen peroxide test once a month.

## – Closing

- After taking the measurements in all instances and recording the data, organize them systematically using tables and/or graphs. Make a discussion on the gathered facts you observed, the measurements you took and the inferences you made. As a complement, concurrently start a bibliographic research. Establish evidence of the contribution of the earthworm presence to the soil properties for their agricultural use and overall improvement.
- Finally, make a presentation about your work to your immediate community.

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-How do I get earthworms?

Earthworms can be purchased at different places that are advertised online.

## Suggested Resources

• Soil investigation at (www.globe.gov)

# Bibliography:

DriloBASE (N/A). *Eisenia fetida*. DriloBASE Project. World Earthworm Database. http://taxo.drilobase.org/index.php?title=Eisenia\_fetida

## Manufacture of a bucket composter

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