



“Eww, Aah, Ick”: Drawing Students into Nature with Worms

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Metamorphosis: Nature Transforming Lives Transforming Nature

A FEW FACTS ABOUT EARTHWORMS

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Why are earthworms important?

Charles Darwin was the first scientist to recognize the importance of earthworms which he described as “nature's plough”.

Today the beneficial effect of earthworms on the physical and chemical nature of soils is well established.

Through their burrowing activities earthworms increase rainfall infiltration rates, improve soil aeration and allow greater root development.

Casting increases the proportion of water stable aggregates, improving soil water holding capacity and developing more friable topsoil.

The incorporation of organic matter through casting and surface removal of litter, and its mixing with the mineral soil also leads to enhanced nutrient availability.

The role of earthworms in soil fertility has led to their introduction by man, with varying degrees of success, into areas of land often lacking earthworms in attempts to increase plant production in agricultural land, and enhance soil amelioration in degraded land.

How many species of earthworm are there?

Worldwide there are approximately 3000 species of earthworm. Different sources name different numbers of species!

Each species can be ascribed to one of three major groupings.

The first group (litter dwellers) encompasses those species that inhabit the surface organic layers of the soil and may also occur within compost heaps. These include common species such as *Eisenia fetida* and *Lumbricus rubellus*.

Earthworms which fall within the other two ecological groups (deep burrowers and shallow workers) do not require such a high level of organic matter and thrive within mineral soils. However their life cycle, although passing through the same 3 stages (...adult - cocoon - hatchling...), is less prolific than that of litter dwelling worms. Deep burrowing species such as *Lumbricus terrestris* usually require a deep, mature soil with a supply of surface organic matter. Smaller shallow working species such as *Allolobophora chlorotica* or *Aporrectodea caliginosa* need less depth of soil and require a soil with a mixture of organic and inorganic components.

The earthworm belongs to the annelid class Oligochaeta (few bristles), species of this class are predominantly freshwater and terrestrial with no appendages.

What do earthworms eat?

In terrestrial ecosystems the main source of food (organic matter) is litter from above ground plants. However, dead roots and rhizodeposition (material transfer from roots to soil) are also important food resources and earthworms have been observed ingesting living roots.

Within farming systems animal dung may also form an important, but localized, food source for several, usually litter dwelling, species and result in their aggregation under dung pats.

The worms that are most advantageous to classroom explorations dine on vegetables (including peels and tops), fruits – especially melons (including peels and flesh), coffee grounds and filters, breads, rice, cornmeal, pasta, cakes, muffins, biscuits, brown sugar, egg shells, cereal, and pizza crusts.

They DO NOT eat citrus fruits, meat, dairy, oils, salt, and garlic. These items are potential hazardous to your worm's health!

Can earthworms see?

Earthworms do not possess eyes, but they do have sensory cells with a lens like structure located in regions of the skin that respond to light stimuli.

How do earthworms move?

Earthworms burrow through the soil by coordinating contractions of the longitudinal and circular muscle bands that lie in the body wall. These contractions are made possible by the segments being kept turgid by the coelomic fluid. This coordination allows the earthworm to pass contraction from segment to segment in a wave effect thrusting the earthworm forward.

How big can an earthworm grow?

Earthworm size varies with species type; however the largest earthworm species is the Gippsland earthworm from Australia that has an average length of 80 cm and a diameter of 2 cm.

How do earthworms reproduce?

Even though hermaphrodites (male and female organs are present in the same individual) most earthworm species reproduce by cross-fertilization, although some are parthenogenetic (Reproduction in which the ova develops without being fertilized by a spermatozoa, hence it involves only one parent).

Do earthworms live in groups? What is the collective noun for a group of earthworms?

Certain earthworm species tend to be associated with one another and usually such associations result from some characteristic of the habitat (e.g. availability of food resources). Individual earthworm species also have relationships with many other organisms including, micro-organisms, invertebrates and vertebrates.

As far as I am aware there is no collective noun for a group of earthworms.

What is the life span of an earthworm ?

Researchers have estimated that the potential life-span of earthworms (Lumbricids) under field conditions is 4-8 years. Under laboratory conditions the black headed worm (*Aporrectodea longa*) has been kept for over 10 years, the brandling/tiger worm (*Eisenia fetida*) for 4.5 years and the lobworm/nightcrawler (*Lumbricus terrestris*) for 6 years (Korschelt, 1914).

If I cut an earthworm in half do both bits survive?

Usually if you cut an adult earthworm in half the head end (the bit with the saddle) may survive but the tail end eventually dies when food resources are exhausted (It may continue to wiggle for some time).

Why do earthworms come to the surface when it rains – are they drowning?

Earthworms respire through their skin and as a result need to be in contact with moist substrate. It has been suggested that earthworms utilize the moist conditions during periods of rain to migrate over the soil surface.

Can earthworms survive in the human gut like a tape worm?

Tapeworms belong to the class Cestoda and are endoparasites that live in the small intestine of vertebrates. As such they have numerous adaptations that allow them to survive in the hostile environment of the small intestine. Earthworms do not exhibit any such adaptations and unless they pass directly through the gut they would be broken down by digestive acids.

What type of earthworm is best suited for use in my compost bin?

Litter dwelling species are best suited for use in your compost bin. Commonly used species include the tiger worm / brandling (*Eisenia fetida*), *Eisenia veneta* another striped worm and the red worm (*Lumbricus rubellus*).

Do earthworms have any medical uses?

Research in the USA is currently looking into earthworms' anti-inflammatory properties for treating arthritis and other joint ailments and is also investigating other medical uses associated with earthworms' ability to burrow through and eat soil without being attacked by bacteria.

Earthworms have also been used in Chinese medicine as an aphrodisiac and fertility treatment.

Suggested Resources:

***The Worm Book: The Complete Guide to Gardening and Composting with Worms* by Loren Nancarrow and Janet Hogan Taylor ISBN-13:978-0-89815-994-3 ISBN 10: 0-89815-994-6**

***The Life Cycle of an Earthworm* by Bobbie Kalman ISBN 0-7787-0696-6**

***The Earth Moved: On the Remarkable Achievements of Earthworms* by Amy Stewart**

5 – 10 gallon plastic bins (must be opaque – the darker the better) – with holes drilled in the lid and around the sides.

Science as Inquiry Standards

In the vision presented by the *Standards*, inquiry is a step beyond "science as a process," in which students learn skills, such as observation, inference, and experimentation. The new vision includes the "processes of science" and requires that students combine processes and scientific knowledge as they use scientific reasoning and critical thinking to develop their understanding of science. Engaging students in inquiry helps students develop

- Understanding of scientific concepts.
- An appreciation of "how we know" what we know in science.
- Understanding of the nature of science.
- Skills necessary to become independent inquirers about the natural world.
- The dispositions to use the skills, abilities, and attitudes associated with science.

SCIENCE AS INQUIRY STANDARDS

LEVELS K-4

Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

LEVELS 5-8

Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

LEVELS 9-12

Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

CONTENT STANDARDS:

EARTH AND SPACE SCIENCE STANDARDS

LEVELS K-4

Properties of earth materials
Objects in the sky
Changes in earth and sky

LEVELS 5-8

Structure of the earth system
Earth's history
Earth in the solar system

LEVELS 9-12

Energy in the earth system
Geochemical cycles
Origin and evolution of the earth system
Origin and evolution of the universe

LIFE SCIENCE STANDARDS

LEVELS K-4

Characteristics of organisms
Life cycles of organisms
Organisms and environments

LEVELS 5-8

Structure and function in living systems
Reproduction and heredity
Regulation and behavior

Populations and ecosystems
Diversity and adaptations of organisms

LEVELS 9-12

The cell

Molecular basis of heredity
Biological evolution

Interdependence of organisms
Matter, energy, and organization in living systems
Behavior of organisms