

Photo Description



This image shows an earthworm on soil and grass. Earthworms are long, tube-shaped animals with segmented bodies divided into ring-like sections. You can see the earthworm's moist, reddish-brown skin, which helps it breathe and move through soil.

Scientific Phenomena

Anchoring Phenomenon: Why do earthworms come to the surface, especially after rain?

Earthworms live underground where the soil provides moisture and food (decomposing plants and animals). When heavy rain occurs, water fills the air pockets in soil, reducing the oxygen available for the worm to breathe through its skin. Earthworms move to the surface to access fresh air. Additionally, the loose, wet soil makes it easier for worms to move horizontally on the ground rather than tunnel downward. This behavior demonstrates how organisms respond to environmental changes to meet their basic needs for survival.

Core Science Concepts

- * **Organism Adaptation:** Earthworms have special physical features suited to their environment—a moist skin for breathing, segmented body for flexible movement, and no eyes but light-sensitive cells for sensing danger.
- * **Habitat and Environment:** Earthworms depend on specific soil conditions (moisture, darkness, organic matter) to survive. Changes in their habitat trigger behavioral responses.
- * **Decomposition and Food Chains:** Earthworms break down dead plant material, returning nutrients to soil and supporting plant growth. They are a crucial part of the ecosystem's nutrient cycle.
- * **Animal Behavior and Survival:** Earthworms exhibit instinctive behaviors (moving toward moisture, avoiding light) that increase their chances of survival.

Pedagogical Tip:

When teaching about earthworms, create a "worm hotel" (clear container with alternating layers of soil and sand) so students can observe tunneling behavior over weeks. This concrete, visual experience helps fifth graders understand abstract concepts like habitat requirements and organism behavior far better than pictures alone. Allow students to make predictions before observations and record what they notice daily in a science journal.

UDL Suggestions:

To support diverse learners: (1) **Representation:** Provide both visual diagrams and tactile models of earthworm anatomy; include a video showing earthworm movement to support visual learners. (2) **Action & Expression:** Allow students to draw, build models with clay, or write descriptions of earthworms based on their observations—not just answer written questions. (3) **Engagement:** Connect earthworms to student interests (gardening, composting, pets) and allow choice in how they demonstrate learning (poster, comic strip, video, presentation).

Zoom In / Zoom Out

Zoom In: Cellular Respiration Through Earthworm Skin

Earthworms don't have lungs like humans do. Instead, oxygen enters directly through their moist skin in a process called cutaneous respiration. At the cellular level, oxygen molecules pass through the thin, damp outer layer of the earthworm's skin and into tiny blood vessels just beneath the surface. The oxygen then travels through the worm's blood to individual cells throughout its body, where it powers the chemical reactions that give the worm energy to move and survive. This is why earthworms must stay moist—dry skin blocks oxygen from entering! Students can think of the earthworm's skin like a living, breathing filter that works only when wet.

Zoom Out: Earthworms in the Global Nutrient Cycle

When we zoom out from a single earthworm to the entire planet, we see that earthworms play a critical role in Earth's nutrient cycling. Dead plants and animals fall to the soil every day across forests, grasslands, gardens, and farms worldwide. Earthworms and other decomposers break down this dead material, releasing nutrients (nitrogen, phosphorus, and potassium) back into the soil. These nutrients are then absorbed by plant roots and used to grow new plants. Those plants feed herbivores, which feed carnivores, and when all organisms die, the cycle begins again. Without earthworms and decomposers, dead material would pile up, nutrients would become locked away, and new plant growth would slow dramatically—affecting food chains and ecosystems across the globe.

Discussion Questions

1. "What do you think the earthworm needs from the soil to survive, and how might rain change what it finds there?" (Bloom's: Analyze | DOK: 3)
2. "How is an earthworm's body special or different from yours, and what do you think each part helps it do?" (Bloom's: Understand | DOK: 2)
3. "If all the earthworms disappeared from a garden, what might happen to the plants growing there? Why?" (Bloom's: Evaluate | DOK: 3)
4. "Earthworms move away from light even in the dark. How might this behavior help them stay safe?" (Bloom's: Apply | DOK: 2)

Potential Student Misconceptions

Misconception 1: "Earthworms are insects."

Clarification: Earthworms are not insects—they are annelids (a different group of invertebrates). Insects have six legs, antennae, and three body sections (head, thorax, abdomen), while earthworms have no legs, no antennae, and a body made of many identical ring-like segments. Both are invertebrates (animals without backbones), but they belong to different animal groups with different body structures.

Misconception 2: "Earthworms breathe through a mouth like we do."

Clarification: Earthworms don't have lungs or a mouth for breathing. They breathe through their entire skin, which must stay moist for oxygen to pass through. This is why earthworms die if they dry out—not because they're thirsty, but because their skin can no longer absorb oxygen from the air.

Misconception 3: "If you cut an earthworm in half, you get two earthworms."

Clarification: This is a common myth! If an earthworm is cut, it cannot regenerate into two complete worms. While some species can regrow a lost tail segment, the front part of the worm cannot grow a new head, and the back part cannot survive without the front. A cut earthworm is injured and likely won't survive. Students should handle earthworms gently and respectfully.

Extension Activities

1. Design a Worm Habitat Experiment: Students construct a clear "worm hotel" using a clear container, soil, sand, and live earthworms (if permitted by school policy and handled respectfully). Over 2-3 weeks, students observe and sketch tunnel patterns, measure worm movement, and test variables (Does a worm prefer wet or dry soil? Does it move toward or away from light?). Students create a poster or digital presentation of their findings.
2. Decomposition Investigation: Students place dead leaves in a clear container with earthworms and soil, and another container without worms. Over 4-6 weeks, they compare how quickly the leaves break down in each container, drawing conclusions about the earthworm's role in decomposition. This connects to nutrient cycling and food webs.
3. Earthworm Observation Walk & Data Collection: Take students on a supervised outdoor walk after rain to safely observe earthworms in their natural habitat. Students collect data on location (grass, concrete, soil), ground conditions (wet, dry), and time of day. Back in class, students create graphs or charts showing patterns and discuss why earthworms appear in certain places.

Cross-Curricular Ideas

Mathematics: Data Collection and Graphing

After an outdoor observation walk or classroom worm hotel experiment, students collect numerical data (number of worms found in different locations, soil moisture levels measured with a meter, days it takes for leaves to decompose, tunnel depth measurements). Students then create bar graphs, line graphs, or pictographs to display their findings and practice skills like scaling, labeling axes, and interpreting data patterns.

English Language Arts: Informative Writing and Research

Students research and write an informative paragraph or short report answering questions like "Why are earthworms important?" or "How do earthworms help gardens grow?" They can use provided texts, videos, and observations as sources. Alternatively, students write a creative narrative from an earthworm's perspective (like the "Diary of a Worm" approach), describing a day in the life of an earthworm, combining scientific accuracy with storytelling.

Social Studies: Human Impact on Soil and Agriculture

Connect earthworms to farming and food production. Discuss how farmers and gardeners depend on healthy soil with plenty of earthworms to grow crops that feed people. Explore how human activities (pollution, construction, pesticides) harm earthworm populations and damage soil health. Students can research and present on sustainable farming practices that protect earthworms and soil, or create a poster about "Composting and Community Gardens" as a way to support earthworm habitats.

Visual Arts: Scientific Illustration and Model Building

Students create detailed, labeled drawings of earthworm anatomy from observation or reference images, practicing scientific illustration skills. Alternatively, students sculpt earthworms from clay, focusing on accurate segment representation and body shape. Advanced option: students design and construct a three-dimensional "cutaway" model of a worm habitat (using a shoebox or poster board) showing soil layers, earthworms in different positions, and decomposing matter, then add labels explaining what's happening at each level.

STEM Career Connection

Soil Scientist (Pedologist)

Soil scientists study what's in soil—including earthworms and other organisms—to understand how soil forms, what makes it healthy, and how it supports plant growth. They work in laboratories, gardens, farms, and forests, testing soil samples and sometimes even digging to observe soil layers in the ground. Their work helps farmers grow better crops, helps engineers build on safe ground, and helps protect the environment. Soil scientists often work for universities, government agencies, or environmental companies.

Average Annual Salary: \$63,000–\$75,000 USD

Ecologist or Environmental Biologist

Ecologists study how living things (like earthworms) interact with each other and their environments. They investigate how changes in nature—like pollution, climate, or habitat loss—affect animal and plant populations. Some ecologists focus specifically on decomposers and nutrient cycling in ecosystems. They work outdoors collecting samples and data, and in offices analyzing results. Their findings help protect endangered species and restore damaged environments.

Average Annual Salary: \$68,000–\$85,000 USD

Composting or Waste Management Specialist

These professionals design and manage composting systems that use earthworms and other decomposers to turn food scraps, yard waste, and other materials into rich soil. They work for cities, waste management companies, farms, and schools, setting up and maintaining compost bins and monitoring earthworm populations. Their work reduces trash going to landfills and creates valuable soil for gardening and farming. If you enjoy gardening and helping the environment, this could be your career!

Average Annual Salary: \$55,000–\$72,000 USD

NGSS Connections

Performance Expectation:

5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.

Disciplinary Core Ideas:

- 5-LS1.A - Structure and Function (organisms have specific body structures that support survival)
- 5-LS1.C - Organization for Matter and Energy Flow in Organisms (decomposers break down dead matter)
- 3-LS4.C - Adaptation (organisms have inherited traits that help them survive)

Crosscutting Concepts:

- Patterns - Earthworm behavior patterns emerge in response to environmental changes (moisture, light)
- Cause and Effect - Rain causes soil changes, which cause earthworms to move to the surface
- Systems and System Models - Earthworms are part of a soil ecosystem where decomposition supports other organisms

Science Vocabulary

- * Segment: One of the ring-like sections that makes up an earthworm's body; segmentation allows the worm to bend and move.
- * Decompose: To break down dead plants and animals into smaller pieces that return nutrients to soil.
- * Habitat: The place where an animal or plant naturally lives and finds everything it needs to survive.
- * Adaptation: A special body part or behavior that helps an organism survive in its environment.

- * Organism: Any living thing, such as an animal, plant, or fungus.
- * Nutrient: Substances in soil or food that help plants and animals grow and stay healthy.

External Resources

Children's Books:

- Wonderful Worms by Linda Glaser (simple, colorful introduction to earthworm biology and ecology)
- An Earthworm's Life by John Micklethwait (National Geographic Little Kids series; engaging photos and facts)
- Diary of a Worm by Doreen Cronin (engaging fictional narrative that builds interest and introduces worm characteristics)

Teacher Note: This lesson leverages students' natural curiosity about the visible, living world around them. Earthworms provide a concrete entry point into abstract concepts like decomposition, ecosystems, and organism adaptation. Hands-on observation is essential for fifth-grade learners and creates memorable learning experiences that support long-term retention.