

## Photo Description



This image shows a deceased deer lying on the ground in a natural outdoor environment. The deer's body is beginning to return to the soil, surrounded by leaves, twigs, grass, and other natural materials. This is an example of what happens to all living organisms after they die—their bodies break down and become part of the ecosystem again.

## Scientific Phenomena

Anchoring Phenomenon: Decomposition and nutrient cycling in ecosystems

When a living organism dies, its body does not simply disappear. Instead, it undergoes decomposition—a natural process where bacteria, fungi, insects, and other decomposers break down the dead organism into smaller and smaller pieces. This process returns important nutrients (like nitrogen, carbon, and phosphorus) back into the soil and air, making them available for plants and other organisms to use again. This cycling of matter is essential for all life on Earth and demonstrates that nothing in nature goes to waste—everything is recycled and reused.

## Core Science Concepts

1. **Decomposition:** The natural breakdown of dead organisms by decomposers (bacteria, fungi, insects) into simpler materials that return to the environment.
2. **Nutrient Cycling:** The movement of essential nutrients (like nitrogen, carbon, and water) through living organisms and the non-living environment in repeating cycles. When organisms die, decomposers release these nutrients back into the soil and atmosphere for other organisms to use.
3. **Roles in Ecosystems:** Every organism has a role—producers (plants), consumers (animals), and decomposers (bacteria, fungi, worms) work together to keep ecosystems balanced and functioning.
4. **Matter Conservation:** The materials that make up a living organism do not disappear when it dies; they change form and become part of other living things and the environment.

### Pedagogical Tip:

When teaching decomposition to Fifth Graders, use concrete, relatable examples they can observe directly: apple cores turning brown, leaves breaking down in compost, or fallen logs in a forest. Avoid focusing only on the "dead" aspect; instead, emphasize the transformation and the new life it supports. This reframes decomposition as a positive, necessary process rather than something morbid. Consider starting with small-scale observations (like a classroom compost bin or a rotting log investigation) before discussing larger organisms.

### UDL Suggestions:

**Multiple Means of Representation:** Provide visual sequences showing decomposition stages (fresh organism !' skeleton !' nutrient return to soil) so students can track the process over time. Use diagrams, photographs, and real objects when possible.

**Multiple Means of Action & Expression:** Allow students to show their understanding through various modalities—drawing a cycle diagram, creating a written explanation, building a 3D model, or conducting a hands-on decomposition investigation with safe materials like vegetable scraps.

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**Multiple Means of Engagement:** Connect the concept to student interests by discussing how farmers use compost to

## Zoom In / Zoom Out

### ### Zoom In: Microscopic Level

At a microscopic level, decomposers like bacteria and fungi are breaking down the deer's cells and tissues by producing enzymes that dissolve organic materials. Individual bacteria cells are working at the cellular level, consuming proteins, fats, and carbohydrates from the dead organism and converting them into simpler chemical compounds like carbon dioxide, nitrogen compounds, and water that can be absorbed by soil and plants.

### ### Zoom Out: Ecosystem & Global Cycling

At the ecosystem level, this dead deer is part of a larger nutrient cycle that connects all living things on Earth. The nutrients from this deer's body will eventually be taken up by plant roots in the soil, eaten by herbivores, passed through food chains, and distributed across the entire ecosystem and beyond. Over geological time scales, these same atoms have cycled through countless organisms and will continue cycling for billions of years—the carbon in this deer may once have been in dinosaurs, and atoms from the soil may become part of future organisms.

## Discussion Questions

1. What do you think will happen to the deer's body over the next few months and years? (Bloom's: Analyze | DOK: 2)
2. Where do you think the nutrients from the deer's body will go, and how might they become part of a plant or another animal? (Bloom's: Evaluate | DOK: 3)
3. Why is decomposition important for forests and other ecosystems? What would happen if decomposers didn't exist? (Bloom's: Analyze | DOK: 3)
4. How is the deer in this photo similar to a tree that falls in the forest, and how is decomposition like recycling? (Bloom's: Synthesize | DOK: 3)

## Potential Student Misconceptions

1. Misconception: "When something dies and disappears, it's just gone forever."
  - Clarification: Nothing in nature truly disappears; it changes form. The materials that made up the deer's body are transformed into soil nutrients, gases, and eventually become part of new plants and animals. Matter is never created or destroyed—it only changes.
2. Misconception: "Decomposers are bad or gross and we should avoid them."
  - Clarification: Decomposers like bacteria and fungi are essential helpers in nature! Without them, dead plants and animals would pile up and ecosystems couldn't survive. Decomposers are actually heroes that keep Earth clean and healthy.
3. Misconception: "Only bacteria break down dead things; nothing else is involved in decomposition."
  - Clarification: While bacteria and fungi are important, many other organisms help decompose matter, including earthworms, insects (like beetles and flies), millipedes, and many others. It's a team effort involving many different decomposers working together.

## Extension Activities

1. Classroom Compost Investigation: Set up a small compost bin (or transparent container) with layers of leaves, vegetable scraps, and soil. Have students observe and record changes over 2-4 weeks, sketching and describing how materials break down. Students can predict what will happen next and test whether decomposition happens faster with moisture and warmth versus in dry conditions. This safe, hands-on activity directly demonstrates the concepts in the photo.

2. Nutrient Cycle Modeling: Have students create a large-scale model of the nutrient cycle using string, labels, and pictures showing how nutrients move from soil !' plants !' animals !' decomposers !' back to soil. Students can use their bodies to "become" different parts of the cycle, walking through the path and explaining each step. This kinesthetic activity reinforces systems thinking.

3. Forest Floor Investigation: Take students on a nature walk to observe a forest floor or natural area. Have them gently lift logs, leaves, and soil samples (with care for living creatures) to find decomposers at work—earthworms, millipedes, fungi, and insects. Students can use hand lenses to observe and sketch their findings, then discuss the role each organism plays in breaking down dead matter.

### Cross-Curricular Ideas

1. ELA - Informative Writing: Have students write an informative paragraph or short report explaining "What Happens to a Dead Organism?" using scientific vocabulary and the concept of nutrient cycling. They can include diagrams and organize information using a graphic organizer.

2. Math - Data Observation: Students measure and record the decomposition of organic materials (like apple pieces or leaves in jars) over time, creating a line graph showing how mass decreases as decomposition occurs. This connects data collection, graphing, and life science.

3. Social Studies - Indigenous Perspectives: Research and discuss how different cultures (including Native American and indigenous communities) view death, decomposition, and returning to the Earth as part of natural cycles. Compare these perspectives to modern Western views and discuss why understanding nutrient cycling is important for sustainable agriculture and land management.

4. Art - Life Cycles in Nature: Create a visual art piece showing the decomposition cycle through a series of paintings, drawings, or collages depicting the stages from organism !' decomposition !' nutrients returning to new life. Students could create a circular artwork emphasizing the cyclical nature of the process.

### STEM Career Connection

1. Soil Scientist (Pedologist): A soil scientist studies soil, including how decomposers and organic matter break down to create healthy, nutrient-rich soil for plants. They help farmers grow better crops and help restore damaged ecosystems. A soil scientist might work outdoors collecting samples, in a lab analyzing soil composition, or in offices writing reports. Average Salary: \$65,000 - \$75,000 per year

2. Ecologist: An ecologist studies how organisms interact with each other and their environment, including how nutrients cycle through ecosystems and how decomposers support entire food webs. Ecologists might work in forests, wetlands, or oceans, conducting research and helping protect natural areas. Average Salary: \$63,000 - \$72,000 per year

3. Microbiologist: A microbiologist studies tiny organisms like bacteria and fungi that are invisible to the naked eye. Many microbiologists study decomposers to understand how they break down waste, create compost, or clean up oil spills. Their work helps solve environmental problems. Average Salary: \$71,000 - \$85,000 per year

### NGSS Connections

### Performance Expectations:

- 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

### Disciplinary Core Ideas:

- 5-LS2.B: Food webs are models that demonstrate how matter and energy are transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transferring energy between organisms requires the use of matter.

### Crosscutting Concepts:

- Systems and System Models: Students develop models showing how decomposers function within the larger ecosystem as part of a cycling system.
- Energy and Matter: Matter cycles through ecosystems as organisms eat, die, and decompose.
- Cause and Effect: The death of an organism causes decomposition, which has the effect of returning nutrients to the environment.

### Science Vocabulary

- \* Decomposition: The process by which dead organisms break down into smaller pieces and are transformed back into soil and nutrients.
- \* Decomposer: A living organism (like bacteria, fungi, or earthworms) that breaks down dead plants and animals and helps return nutrients to the environment.
- \* Nutrient: A substance that living organisms need to grow and survive, such as nitrogen, carbon, or phosphorus, often found in soil and food.
- \* Ecosystem: A community of living organisms (plants, animals, decomposers) and the non-living parts of their environment (soil, water, air) all working together.
- \* Matter: Anything that takes up space and has weight; the material that makes up all living and non-living things (like plants, animals, rocks, and water).
- \* Cycle: A repeating pattern or process that returns to where it started, like the nutrient cycle in nature.

### External Resources

### Children's Books:

- The Worm Family by Tony Johnston (illustrated by Christy Mihaly) — A simple, engaging picture book about earthworms and their role in soil and decomposition.
- Decomposition: Nature's Recyclers by Robin Page and Steve Jenkins — A visually stunning exploration of decomposers and the decomposition process with accurate illustrations.
- Where Do They Go? by Margaret Hall — An informational book exploring what happens to fallen leaves, dead animals, and other organic matter in ecosystems.

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Teacher Reflection Tip: Before teaching this lesson, consider your own comfort level with discussing death and decomposition. This is a natural, non-threatening way to introduce Fifth Graders to the complete life cycle and help them see death not as an ending, but as a transformation that supports all life. Frame the conversation around the science and the essential role decomposers play in our world.