

Photo Description



This image shows a large rock sitting on soil and moss-covered ground. The rock has visible cracks, holes, and discolored spots on its surface. You can see moss and small plants growing around the rock, and the rock's surface looks rough and broken down in some areas.

Scientific Phenomena

Anchoring Phenomenon: Rock weathering and biological erosion in action.

This rock demonstrates weathering—the slow breakdown of rock into smaller pieces over time. The visible cracks, holes, and surface deterioration occur when plants (like the moss growing around it) and water work together to break apart the rock. Plant roots can grow into tiny cracks and push the rock apart, while water seeps into cracks, freezes, and expands, widening the breaks. This happens naturally over many years as rocks interact with their environment. The moss indicates moisture and suggests the rock is being broken down by both physical forces (water, temperature changes) and biological forces (living organisms).

Core Science Concepts

- * **Weathering:** The natural process where rocks break down into smaller pieces due to water, ice, wind, and living things working over time.
- * **Erosion and Earth's Surface:** Weathering is one of the ways Earth's surface slowly changes—rocks don't stay in one form forever, but gradually transform.
- * **Interactions Between Living and Non-Living Things:** Plants (moss) and water are breaking down this non-living rock, showing how organisms and their environment affect each other.
- * **Evidence of Change:** The cracks, holes, and discoloration on the rock's surface are observable evidence that this rock has been weathered, even though the process happens slowly.

Pedagogical Tip:

When teaching weathering to Fourth Graders, use the term "breaking down slowly" rather than "erosion" initially, since young students may confuse weathering (breaking rock in place) with erosion (moving broken pieces away). Have students touch real rocks to describe texture before and after exposure to water or frost cycles—this sensory experience makes the abstract concept concrete.

UDL Suggestions:

To support diverse learners: (1) Provide multiple means of representation by showing close-up photos AND allowing students to handle similar rocks to examine textures firsthand; (2) Offer choices in demonstrating understanding—students could draw the weathering process, build a model, or dictate observations; (3) Use tactile exploration (feeling rough vs. smooth rock surfaces) to engage kinesthetic learners alongside visual and verbal explanations.

Zoom In / Zoom Out

Zoom In: The Microscopic Level

At a scale invisible to the naked eye, water molecules seep into tiny cracks in the rock. When the temperature drops, water freezes and expands, exerting enormous pressure that widens the crack—like ice cubes pushing outward in a freezer. Plant root cells release acids that slowly dissolve the rock's minerals, grain by grain. Over many years, billions of these microscopic actions accumulate to create the visible damage you see in the photo.

Zoom Out: The Landscape and Ecosystem Level

This single weathering rock is part of a larger earth system. As rocks weather and break down, they eventually become soil. This soil supports plants and moss (like those in the photo), which in turn support animals. Weathered rock pieces get carried by water into streams and rivers, shaping valleys and canyons over millions of years. The nutrients released from weathering rock feed the entire ecosystem. This single rock's gradual breakdown connects to soil formation, plant growth, water cycles, and landscape evolution.

Discussion Questions

1. What do you observe on the rock's surface, and what do you think caused those cracks and holes? (Bloom's: Analyze | DOK: 2)
2. Why do you think moss and plants are growing around this rock? How might the plant roots affect the rock over many years? (Bloom's: Evaluate | DOK: 3)
3. If we came back to look at this same rock in 50 years, what do you predict might be different about it, and why? (Bloom's: Evaluate | DOK: 3)
4. How might rocks that are wet and exposed to freezing temperatures weather differently than rocks in a hot, dry desert? (Bloom's: Analyze | DOK: 2)

Potential Student Misconceptions

* Misconception: "Rocks are permanent and never change."

Clarification: Rocks DO change over time, but the process is very, very slow (taking years, decades, or centuries). Students should understand that even though we don't see rocks "falling apart" in front of us, weathering is constantly happening. Show time-lapse or before-and-after photos of the same location separated by many years.

* Misconception: "Only water breaks down rocks, and only through melting or dissolving them."

Clarification: While water is important, rocks are also broken by plant roots pushing into cracks, ice expanding, and temperature changes causing the rock to shrink and expand. It's not just one process but several working together.

* Misconception: "Moss and plants grow ON rocks but don't affect them."

Clarification: Plants actually help break down rocks! Their roots push into cracks, they release acids, and they trap moisture—all of which speeds up weathering. Living things and rocks interact directly.

Extension Activities

1. Rock Weathering Simulation Experiment: Provide students with chalk (soft rock) and water. Have them place chalk in water overnight, then attempt to scratch or crumble it. Compare the treated chalk to untreated chalk. This demonstrates how water weakens rock. Students can document changes with drawings and measurements.

2. Create a Weathering Timeline Poster: Students research and illustrate the stages of how a boulder breaks down over hundreds of years. They draw the initial rock, intermediate stages with cracks and moss, and final stages as soil. Include labels for each weathering factor (water, ice, plant roots, temperature).
3. Investigate Local Rocks and Weathering: Take students on a nature walk to observe rocks in your area. Have them sketch rocks with visible weathering, note what organisms are growing on/around them, and hypothesize about what weathered them. Create a classroom display of rubbings or photos organized by weathering type.

Cross-Curricular Ideas

- * Math: Measure and graph the sizes of rocks and rock fragments found in a local area. Create bar graphs showing small, medium, and large rock sizes to understand how weathering breaks rocks into progressively smaller pieces.
- * ELA - Writing: Write a narrative story from the rock's perspective, describing its "life" over thousands of years as it slowly weathers. Include sensory details about water, freezing, plant growth, and eventually becoming soil.
- * Social Studies: Research how weathering shapes landscapes that people live in or visit. Discuss how canyon formations (like the Grand Canyon) are created by weathering and erosion over millions of years. Connect to local geography.
- * Art: Create mixed-media artwork representing weathering. Students could paint rocks, glue on moss or leaves, carve lines to show cracks, and label the weathering processes. Display as a 3D model of weathering in action.

STEM Career Connection

1. Geologist: Geologists study rocks and minerals to understand Earth's history and structure. They observe rocks like the one in this photo to learn how weathering changes landscapes and to find valuable resources like metals or fossil fuels. Average Annual Salary: \$92,000 USD
2. Environmental Engineer: Environmental engineers design solutions to protect soil, water, and landscapes from erosion and weathering damage. They might build terraces on hillsides or plant vegetation to prevent erosion, using knowledge of weathering processes. Average Annual Salary: \$88,000 USD
3. Soil Scientist: Soil scientists study how rocks break down into soil and how soil supports plants. They understand weathering because it's the first step in creating the fertile soil that grows our food. Average Annual Salary: \$70,000 USD

NGSS Connections

Performance Expectation:

3-ESS2-1: Represent data in tables and pictographs to show that Earth's materials have different properties.

Disciplinary Core Ideas:

- 3-ESS2.A - Earth Materials and Systems (rocks have different properties and can be broken down over time)

Crosscutting Concepts:

- Cause and Effect - Identify that water, temperature, and living organisms cause rocks to break down over time
- Stability and Change - Recognize that Earth's materials appear stable in human timescales but change continuously
- Systems and System Models - Understand weathering as one component of Earth's larger rock cycle system

Science Vocabulary

- * Weathering: The slow breaking down of rocks into smaller pieces by water, ice, wind, plants, and temperature changes.

- * Erosion: The movement of broken rock pieces and soil from one place to another by water, wind, or ice.
- * Moss: A small, soft, green plant without roots that grows on rocks, soil, and tree bark and needs moisture to survive.
- * Crack: A thin break or split in a rock's surface caused by weathering or stress.
- * Mineral: A solid, non-living natural material that makes up rocks (like quartz, feldspar, or mica).

External Resources

- * Rocks and Minerals by Steve Tomecek (illustrated by Nancy Woodman)
- * The Rock Factory: A Story About the Rock Cycle by Kaite Dijkstra and Kristin Earhart
- * Erosion: How Land Shapes Up by Rebecca L. Johnson