

Photo Description



This image shows a large rock covered with moss and lichen sitting on bare ground surrounded by grass and small plants. The rock's surface is uneven and shows visible patches of different colors—browns, reds, yellows, and grays—that indicate the rock is slowly breaking down and changing. You can see cracks and rough textures where the rock is being worn away by weather, water, and living organisms over time.

Scientific Phenomena

Anchoring Phenomenon: This rock is undergoing weathering—the natural process of rocks breaking down into smaller pieces and soil.

Why It's Happening: Rocks break down through two main processes. Physical weathering occurs when water gets into tiny cracks, freezes and expands, pushing the rock apart—like how potholes form in roads. Chemical weathering happens when water and air chemically react with the rock's minerals, causing rust-like discoloration (the browns and reds you see). Biological weathering occurs when plants and microorganisms like moss and lichen (visible on this rock) grow on the surface, producing acids that slowly dissolve the rock. Over many years, these processes turn massive rocks into sand and soil.

Core Science Concepts

1. **Weathering and Erosion:** Rocks are constantly broken down into smaller pieces through physical, chemical, and biological processes. This is the first step in the rock cycle.
2. **The Rock Cycle:** Rocks are recycled over geological time—weathered rocks become sediment, sediment becomes new rock, and the cycle continues.
3. **Biotic and Abiotic Factors:** Living things (moss, lichen, plant roots) and nonliving things (water, ice, temperature changes) work together to break down rocks.
4. **Evidence of Change Over Time:** The discoloration and texture of this rock provide observable evidence that matter changes slowly through natural processes.

Pedagogical Tip:

Students often think weathering happens quickly. Use the analogy of a penny smoothed by a river or their family's driveway developing cracks—processes they can relate to that took years to develop. This helps them understand geological timescales and patience in observation.

UDL Suggestions:

For varied learning modalities: Provide students with actual rock samples to examine with hand lenses (tactile/kinesthetic). Use close-up photos projected on the board (visual). Have students describe what they observe aloud before writing (auditory/verbal processing). Consider pairing students with different strengths so they can teach each other what they discover.

Zoom In / Zoom Out

Zoom In — Microscopic Level:

At the microscopic scale, chemical weathering involves individual water molecules penetrating the rock's mineral structure. Water acts as a solvent, bonding with minerals and breaking chemical bonds that hold the rock together. Simultaneously, microorganisms on the rock's surface (bacteria, fungi within lichen) produce weak acids as they metabolize, dissolving the rock at the molecular level—a process invisible to the naked eye but visible over years as surface discoloration and degradation.

Zoom Out — Landscape and Geological Systems:

Zoom out to see how this single rock is part of a larger mountain or hillside undergoing continuous erosion. The weathered particles from thousands of rocks like this one are carried downslope by water, eventually reaching streams, rivers, and deltas where they settle as sediment. Over millions of years, these sediments compress and cement together to form new sedimentary rocks, continuing the rock cycle. This rock is also part of an ecosystem—it provides habitat for moss and lichen, which stabilize soil and prevent erosion while simultaneously breaking down the rock itself.

Discussion Questions

1. "What clues on this rock tell us that it has been changing over time?" (Bloom's: Analyze | DOK: 2)
 - Guide students to notice color patches, cracks, uneven surfaces, and moss growth as evidence of weathering.
2. "How do you think this rock will look 100 years from now, and what evidence do you have to support your prediction?" (Bloom's: Evaluate | DOK: 3)
 - Encourage students to use observations from the photo to make data-based predictions about weathering rates.
3. "Why do you think moss and lichen grow on rocks, and how might they change the rock while living there?" (Bloom's: Analyze | DOK: 3)
 - Connects biological and physical processes; promotes systems thinking about how living and nonliving things interact.
4. "If rocks break down into soil over a very long time, where do the rocks in the mountains come from originally?" (Bloom's: Understand | DOK: 2)
 - Introduces the rock cycle concept; helps students see Earth as a dynamic, changing system.

Potential Student Misconceptions

1. Misconception: "Rocks never change. They're permanent."
 - Clarification: Rocks do change, but extremely slowly—over years, decades, or even millions of years. Weathering is always happening, but we usually don't notice it unless we look carefully or wait a very long time.
2. Misconception: "Only water breaks down rocks."
 - Clarification: While water is important, living things (plants, fungi, lichen, bacteria) and temperature changes also weather rocks. It's a combination of physical, chemical, and biological processes.
3. Misconception: "Weathering and erosion are the same thing."
 - Clarification: Weathering breaks down rocks in place. Erosion moves the broken pieces away to a new location. Both are important, but they're different processes.

Extension Activities

1. "Weathering in a Cup" Experiment:

Students place pieces of chalk (a soft rock) in cups with water and observe how the chalk dissolves, softens, and breaks apart over several days. Have them predict outcomes, record observations daily, and draw conclusions about how water causes chemical weathering. This makes an invisible geological process visible on a classroom timescale.

2. Rock Weathering Hunt:

Take students on a walking field trip around the school grounds to find evidence of weathering: cracked sidewalks, rocks with lichen or moss, eroded path edges, or potholes. Have them photograph or sketch examples and label the type of weathering visible (physical, chemical, or biological). Create a classroom poster showing their discoveries.

3. Soil Composition Analysis:

Collect soil samples from near rocks and decompose them into components (sand, clay, organic matter, small pebbles). Discuss where the rock fragments came from—weathered rocks! Students can estimate the percentage of each component and discuss how long it took to create this soil from larger rocks.

Cross-Curricular Ideas

1. Math — Data Collection and Graphing:

Students measure and track the size of a rock sample over weeks, graph their measurements, and calculate the rate of weathering. This introduces data analysis and proportional reasoning.

2. ELA — Descriptive Writing and Observation Journals:

Have students write detailed descriptive paragraphs about the rock's appearance, using sensory language and scientific vocabulary. Create an observation journal where they sketch and describe rocks they find, building vocabulary and encouraging careful observation skills.

3. Social Studies — Landscape History and Human Impact:

Discuss how weathering shapes landscapes and affects human communities (eroding hillsides, damaged roads, quarries for building stone). Connect to local geography—what rocks or soil does your region have, and how did weathering create them?

4. Art — Texture Rubbing and Collage:

Students make rubbings of weathered rocks with paper and crayons to capture texture, then create mixed-media collages combining their rubbings with drawings of the weathering processes. This reinforces observation and makes science concepts visible in creative form.

STEM Career Connection

1. Geologist: Geologists study rocks, soil, and Earth's structure to understand how our planet changes over time. They examine rocks like the one in this photo to learn about Earth's history, find valuable resources like metals and gemstones, and predict natural hazards like landslides. Average Annual Salary: \$95,000 USD

2. Civil Engineer: Civil engineers design roads, buildings, and bridges. They must understand how rocks and soil weather and erode so they can build structures that last a long time and won't crack or fail. They study weathering to protect human-made structures from damage. Average Annual Salary: \$109,000 USD

3. Environmental Scientist: Environmental scientists study how living things interact with rocks, soil, and water—exactly what you see in this photo with the moss and lichen on the rock. They work to protect ecosystems and understand how nature recycles materials through processes like weathering. Average Annual Salary: \$75,000 USD

NGSS Connections

Performance Expectation:

5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

Disciplinary Core Ideas:

- 5-ESS2.A — Earth's Materials and Systems (weathering as part of Earth's processes)
- 5-ESS3.C — Human Impacts on Earth Systems (understanding natural processes helps us understand landscape change)

Crosscutting Concepts:

- Cause and Effect — Physical conditions (water, ice, temperature) and biological activity (moss, lichen) cause rocks to break down
- Stability and Change — Rocks appear stable, but slow, continuous weathering changes their structure over time
- Systems and System Models — The rock cycle is a system where weathering connects to erosion, deposition, and new rock formation

Science Vocabulary

- * Weathering: The slow breaking down of rocks into smaller pieces by water, ice, wind, and living things.
- * Erosion: The movement of broken rock pieces and soil from one place to another, usually by water or wind.
- * Lichen: A living thing made of a fungus and algae together that grows on rocks and slowly breaks them down.
- * Sediment: Small pieces of rock and soil that are moved and deposited by water, wind, or ice.
- * Rock Cycle: The continuous process in which rocks are broken down, moved, and reformed into new rocks over millions of years.
- * Chemical Weathering: The breaking down of rocks when water or air chemically reacts with the rock's minerals, causing rust and discoloration.

External Resources

Children's Books:

- * "The Rock Cycle" by Rebecca Faulkner — A clear, illustrated explanation of how rocks change and recycle over geological time, perfect for Fifth Grade readers.
- * "Rocks and Soil" by Richard Spilsbury — An accessible exploration of different rock types, how soil forms through weathering, and the role of living organisms in breaking down rocks.
- * "What Happens to a Hamburger?" by Paul Showers — While focused on digestion, this book excellently models how materials break down, providing a useful analogy for how weathering breaks down rocks into smaller particles.

Teacher Note: This lesson anchors abstract geological processes in a concrete, observable object. The rock in your photo is an excellent "anchor" for understanding the rock cycle and Earth's constant, quiet transformation. Consider inviting students to bring weathered rocks from home or their own yards to build a classroom collection and increase engagement!