

Photo Description



This image shows a large rock sitting on soil and grass. The rock has cracks, holes, and rough spots on its surface. You can see moss and lichen (small green and brown plants) growing on parts of the rock. The rock is breaking apart slowly over time because of wind, water, and weather.

Scientific Phenomena

Anchoring Phenomenon: Rock weathering and erosion

This rock is breaking down into smaller pieces through weathering—a natural process where rocks are broken apart by water, ice, wind, and living things. When water gets into tiny cracks in the rock and freezes, it expands and pushes the rock apart. Plants like moss grow on the rock's surface and their roots push into cracks, widening them. Over many years, these processes slowly crumble the rock into smaller and smaller pieces, eventually becoming soil. This is how mountains become sand, and how new soil is created for plants to grow in.

Core Science Concepts

- * Weathering: The breaking down of rocks by natural forces like water, ice, wind, and living organisms over long periods of time.
- * Erosion: The movement of broken rock pieces and soil from one place to another by water, wind, or gravity.
- * Living vs. Non-Living Factors: Both non-living things (water, ice, wind) and living things (plant roots, moss, lichen) work together to break down rocks.
- * Time and Change: Rocks appear permanent and hard, but they slowly change shape and break apart—this process takes years and years.

Pedagogical Tip:

When teaching weathering to Third Graders, use the "freeze-thaw" demonstration with a wet sponge in the freezer. This concrete, observable model helps students understand how water breaks rocks without requiring them to wait years to see real weathering. Relate it back to this photo to anchor their learning.

UDL Suggestions:

Provide multiple means of representation: Show students actual rocks at different stages of weathering (fresh vs. weathered), along with this photo and magnified close-up images of lichen and moss. Offer tactile exploration—let students feel the rough texture of weathered rocks vs. smooth rocks. This addresses learners who benefit from visual, tactile, and kinesthetic input.

Zoom In / Zoom Out

Zoom In (Microscopic/Molecular Level):

At a scale we cannot see, water molecules are filling tiny cracks inside the rock. When temperature drops below freezing, these water molecules bond together and expand, pushing outward with tremendous force. This expansion-contraction cycle repeats thousands of times, gradually widening cracks from the inside out. Additionally, at the cellular level, plant roots produce acids that slowly dissolve minerals in the rock, weakening its structure from within.

Zoom Out (Ecosystem/Planetary Level):

This single weathering rock is part of a much larger rock cycle that operates across Earth over millions of years. Weathered rock pieces become sediment that travels downstream, collects in layers on the ocean floor, gets compacted into new sedimentary rock, and eventually may be pushed back up into mountains through plate tectonics. The soil created from weathered rock supports entire ecosystems—forests, grasslands, and gardens depend on this soil. At the planetary scale, weathering also plays a role in climate regulation by releasing minerals that affect ocean chemistry and removing carbon dioxide from the atmosphere.

Discussion Questions

1. "What do you see on this rock that tells you it is changing?" (Bloom's: Analyze | DOK: 2)
Students observe cracks, holes, rough spots, and moss to infer change is happening.
2. "How do you think this rock will look different in 100 years?" (Bloom's: Predict | DOK: 3)
Students must think about long time periods and how continued weathering will break it into smaller pieces.
3. "Why do you think moss and lichen grow on old rocks instead of smooth, new rocks?" (Bloom's: Evaluate | DOK: 3)
Students connect surface texture to where organisms can take root and consider cause-and-effect.
4. "If we put a wet rock in the freezer and it cracks, what does that teach us about how rocks break in nature?" (Bloom's: Apply | DOK: 2)
Students transfer a demonstration to real-world weathering processes.

Potential Student Misconceptions

Misconception 1: "Rocks never change—they stay the same forever."

- Clarification: Rocks DO change, but very slowly—over years, decades, centuries, or longer. Weathering is always happening to every rock on Earth; we just don't see big changes in our lifetime. That's why we look for clues like cracks, moss, and rough spots to prove rocks ARE changing.

Misconception 2: "Only water breaks rocks apart."

- Clarification: Water is important, but many things break rocks: freezing ice, plant roots pushing through cracks, wind blowing sand against rocks, and even living things like lichen and moss. It takes a combination of forces working together over time.

Misconception 3: "The moss and lichen are just sitting on the rock and don't hurt it."

- Clarification: Moss and lichen are actually HELPING to break the rock apart! Their roots go into cracks and push them wider. They also produce acids that dissolve part of the rock. These plants are partners with water and ice in the weathering process.

Extension Activities

Activity 1: Freeze-Thaw Weathering Simulation

Soak several small rocks or chalk pieces in water for 1 hour. Place them in a freezer overnight. Remove them and observe cracks that form. Repeat 3-4 times and compare to rocks that were NOT frozen. Have students measure cracks with a ruler and record data. This concrete model compresses time so students can observe weathering in days rather than years.

Activity 2: Lichen & Moss Observation Hunt

Take students on a nature walk around the school grounds to find rocks, tree bark, or walls with lichen and moss growing on them. Have them sketch or photograph examples and note: Where is it growing? What color is it? Is the rock it's on rough or smooth? Students can make a poster showing different places they found weathering in action.

Activity 3: Rock Sorting by Weathering Stage

Collect 8-10 rocks of different ages (some smooth and new-looking, some rough and cracked). Have students sort them from "least weathered" to "most weathered" and explain their reasoning. Students can make a chart or timeline showing how rocks change as they weather over long periods.

Cross-Curricular Ideas

Math Connection:

Measure cracks and rough spots on rocks using rulers or calipers. Create a bar graph showing "How Weathered Are Different Rocks?" Students can estimate how many years it might take weathering to break a rock completely (connecting to time and change).

ELA Connection:

Have students write a creative story from the perspective of a rock: "My Life: A 1,000-Year Journey." Include how the rock changed from smooth to cracked, what organisms lived on it, and where it traveled through erosion. This builds narrative skills while reinforcing weathering concepts.

Social Studies Connection:

Research famous landmarks affected by weathering (e.g., the Grand Canyon, Niagara Falls, or local rock formations). Discuss how weathering shaped the landscape where students live. Connect to how human communities must adapt to natural processes and plan for erosion.

Art Connection:

Create a mixed-media collage or sculpture showing layers of rock weathering. Students can use sandpaper, paint, moss (or painted yarn to represent it), and textured materials to represent rocks at different stages. Display with labels explaining each weathering stage.

STEM Career Connection

Geologist

A geologist is a scientist who studies rocks, soil, and how Earth changes over time. Geologists look at weathered rocks to understand Earth's history and predict natural hazards like erosion or landslides. They help protect communities and find valuable resources underground.

- Average Annual Salary: \$92,000

Environmental Engineer

Environmental engineers solve problems caused by erosion and weathering—like landslides or soil loss. They design systems to prevent erosion, protect buildings and roads from weathering damage, and help restore landscapes damaged by natural processes.

- Average Annual Salary: \$96,000

Soil Scientist

A soil scientist studies how soil forms from weathered rocks and what makes soil healthy for plants and ecosystems. They test soil quality and help farmers, gardeners, and communities understand how to protect soil from erosion.

- Average Annual Salary: \$68,000

NGSS Connections

Performance Expectation:

3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

Disciplinary Core Ideas:

- 3-ESS2.D — Weather and Climate (weathering occurs as part of natural processes shaped by Earth's systems)
- 3-LS4.D — Biodiversity and Humans (organisms, like moss and lichen, interact with the physical environment)

Crosscutting Concepts:

- Cause and Effect — Water, ice, wind, and living things cause rocks to break down over time
- Scale, Proportion, and Quantity — Weathering happens slowly, over long time periods that are hard for humans to observe
- Stability and Change — Rocks appear stable, but they gradually change through weathering

Science Vocabulary

- * Weathering: The slow breaking down of rocks by wind, water, ice, and living things.
- * Erosion: The movement of broken rock pieces and soil from one place to another by water or wind.
- * Lichen: Tiny living things that look like crusty green or gray patches and grow on rocks; they help break rocks apart.
- * Moss: Small soft plants without roots that grow on rocks and soil; they trap water and help weathering happen.
- * Mineral: Natural material that makes up rocks (like quartz, feldspar, or mica).
- * Sediment: Small pieces of broken rock and soil that are carried by water or wind.

External Resources

Children's Books:

- * Rocks and Soil by Henry Arthur Pluckrose (Let's Explore series) — An accessible introduction to rocks, weathering, and soil formation with photographs and simple explanations.
- * The Rock Cycle by Rebecca Olien (Exploring Earth's Resources) — Explains how rocks break down, move, and form again through weathering, erosion, and other natural processes.
- * Stones: Foundations of Our Earth by William A. Atkins — A beautifully illustrated book showing different types of rocks and how they change over time.

Teacher Note: This lesson builds foundational understanding of Earth's dynamic systems. By observing a single weathered rock, Third Graders engage with concepts they'll revisit in deeper detail during middle and high school earth science. The combination of hands-on observation, modeling, and discussion supports all learners in recognizing that slow, invisible processes shape our planet.