

Photo Description



This image shows muddy water flowing across railroad tracks during heavy rainfall. The rushing water carries dirt and small rocks as it moves down a slope. You can see gravel and stones from the railroad bed being washed away by the flowing water.

Scientific Phenomena

The anchoring phenomenon here is surface water runoff and erosion. When rain falls faster than the ground can absorb it, the water flows downhill following gravity. As this water moves, it picks up loose materials like soil, rocks, and debris, carrying them to new locations. This process is called erosion, and it's constantly reshaping Earth's surface. The railroad tracks create a pathway for the water to follow, demonstrating how human-made structures can redirect natural water flow patterns.

Core Science Concepts

1. **Water Cycle in Action:** This image captures precipitation (rain) transitioning into surface runoff, showing how water moves through different stages of the water cycle.
2. **Erosion and Weathering:** Moving water acts as a powerful force that breaks down and transports materials, demonstrating mechanical weathering and erosion processes.
3. **Gravity's Role:** Water flows downhill due to gravitational force, following the path of least resistance and carrying sediments along its journey.
4. **Human Impact on Natural Systems:** The railroad infrastructure shows how human construction can alter natural drainage patterns and water flow.

Pedagogical Tip:

Use this image to help students make connections between weather events they experience and the geological processes happening around them. Ask them to share times they've seen similar flooding or erosion in their own neighborhoods.

UDL Suggestions:

Provide multiple ways for students to explore this concept by offering tactile experiences like creating erosion models with sand tables, visual diagrams of the water cycle, and audio descriptions of the rushing water sounds to engage different learning preferences.

Zoom In / Zoom Out

1. Zoom In: At the microscopic level, individual water molecules are binding to soil particles through adhesion and cohesion forces, allowing the flowing water to pick up and carry sediments downstream.
2. Zoom Out: This local erosion event connects to larger watershed systems where all this runoff water eventually flows into streams, rivers, and ultimately the ocean, contributing to regional flood patterns and sediment deposition in deltas and floodplains.

Discussion Questions

1. What do you think will happen to the rocks and dirt being carried by this flowing water? (Bloom's: Predict | DOK: 2)
2. How might this type of erosion affect the railroad tracks over time, and what could engineers do to prevent damage? (Bloom's: Analyze | DOK: 3)
3. If you were designing a city, how would you plan for managing water runoff like this during heavy storms? (Bloom's: Create | DOK: 4)
4. What evidence do you see in the photo that shows water has the power to move solid materials? (Bloom's: Analyze | DOK: 2)

Potential Student Misconceptions

1. Misconception: "Water only flows in rivers and streams."
Clarification: Water flows anywhere gravity pulls it downhill, including across roads, parking lots, and railroad tracks during heavy rain.
2. Misconception: "Erosion only happens slowly over millions of years."
Clarification: While some erosion is very slow, heavy rainfall can cause significant erosion in just hours or days, as shown in this image.
3. Misconception: "The railroad tracks are causing the flooding."
Clarification: The tracks are simply directing where the water flows; the flooding is caused by too much rain falling too quickly for the ground to absorb.

Cross-Curricular Ideas

1. Math - Measurement & Data: Have students measure rainfall amounts during a storm using a rain gauge, then calculate how much water fell over different time periods. They can create bar graphs to compare rainfall amounts from different days or seasons and predict which conditions lead to the most erosion.
2. ELA - Descriptive Writing & Reporting: Ask students to write a "storm report" or newspaper article describing the flooding and erosion event in the photo. They can use vivid sensory words to describe what they see, hear, and imagine about the rushing water, then share their writing with the class to practice descriptive language skills.
3. Social Studies - Community Planning & Infrastructure: Explore how communities prepare for heavy rainfall and flooding. Have students research what their local city or town does to manage runoff (storm drains, retention ponds, green spaces), then design their own community drainage system on paper, thinking about where water should flow safely.

4. Art - Nature Observation & Mixed Media: Students can create erosion artwork by pouring water mixed with paint down a tilted board covered with sand and soil, observing how the water creates channels and patterns similar to the photo. They can display their results and discuss how their artistic erosion compares to what happens in nature.

STEM Career Connection

1. Civil Engineer: Civil engineers design and build structures like roads, bridges, dams, and drainage systems. They have to think carefully about how water flows and erosion happens so that their buildings and roads don't get damaged by heavy rain and flooding. Civil engineers earn an average of \$88,050 per year.
2. Hydrologist: Hydrologists are scientists who study water on Earth—how it moves, where it goes, and how it shapes the land. They measure rainfall, track rivers and streams, and help predict floods to keep communities safe. Hydrologists earn an average of \$84,040 per year.
3. Landscape Architect: Landscape architects plan outdoor spaces like parks, gardens, and green areas in cities. They think about how water flows through these spaces during storms and design them to prevent erosion and flooding while making the area beautiful. Landscape architects earn an average of \$68,230 per year.

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 major systems interact through the water cycle and weather patterns
- Disciplinary Core Ideas: 2-ESS1.C Natural processes shape Earth's surface through erosion and deposition
- Crosscutting Concepts: Cause and Effect Heavy rainfall causes surface runoff and erosion
- Crosscutting Concepts: Systems and System Models Water, land, and human structures interact as interconnected systems

Science Vocabulary

- * Runoff: Water that flows over the ground surface when soil cannot absorb it fast enough.
- * Erosion: The process where water, wind, or ice moves rocks and soil from one place to another.
- * Sediment: Small pieces of rock, sand, and dirt that get carried away by moving water.
- * Watershed: An area of land where all the water drains to the same place.
- * Precipitation: Water that falls from clouds as rain, snow, sleet, or hail.
- * Deposition: When moving water slows down and drops the sediment it was carrying.

External Resources

Children's Books:

- "The Magic School Bus Wet All Over: A Book About the Water Cycle" by Joanna Cole
- "A Drop Around the World" by Barbara Shaw McKinney
- "Down Comes the Rain" by Franklyn M. Branley