

## Photo Description



This image shows a warning sign at the beach that says "CAUTION DROP OFF." Behind the sign, we can see the ocean with waves, sand, and water. The sign is there to warn people that the ground drops down suddenly near the water's edge—this happens because waves and water are always moving and changing the beach.

## Scientific Phenomena

Anchoring Phenomenon: Coastal erosion and the dynamic nature of shorelines.

This image captures an important earth and space science concept: water shapes Earth's land. The "drop off" warning exists because ocean waves continuously move sand and soil away from the shore. Water is a powerful force that breaks rocks into smaller pieces, carries sediment, and reshapes land over time. This process, called erosion, is a natural part of how Earth's surface changes. First graders can observe that water is not static—it moves, and as it moves, it changes the land it touches.

## Core Science Concepts

1. Water as a Shaping Force: Ocean waves and currents physically move sand and erode shorelines, demonstrating how water changes Earth's surface over time.
2. Landform Changes: Beaches and coastal areas are constantly changing due to natural processes like erosion. The warning sign indicates that the land structure itself has been altered by water movement.
3. Observable Patterns in Nature: Students can observe that water behaves in predictable patterns (waves, tides) and that these patterns have real effects on the physical landscape.
4. Safety and Earth Hazards: Natural processes can create unsafe conditions for people, teaching students that understanding Earth systems helps keep us safe.

### Pedagogical Tip:

Use this image to make erosion tangible for first graders. Rather than abstract definitions, ask students to imagine: "What happens when you pour water on sand in a sandbox? Where does the sand go?" This concrete analogy helps them understand that ocean waves do something similar on a much larger scale, making the warning sign's purpose clear and meaningful.

### UDL Suggestions:

**Multiple Means of Representation:** Pair this beach photo with a sensory demonstration using a sandbox, water table, or tray of sand and water so students can physically see erosion happening. This multimodal approach supports kinesthetic learners and makes the abstract concept concrete.

**Multiple Means of Action & Expression:** Allow students to show their understanding through drawing pictures of how water moves sand, building sand structures and testing water's effects, or verbally explaining why the warning sign is there—offering choices in how they demonstrate learning.

## Zoom In / Zoom Out

### ### Zoom In: Microscopic Scale

At the microscopic level, individual sand grains are being separated from each other by water molecules. Water seeps between grains, dissolves minerals, and creates tiny cracks. Over time, these small separations add up to big changes. Waves don't move the entire beach at once—they work grain by grain, each wave taking away a few more particles than it brings back.

### ### Zoom Out: Earth System Scale

This coastal area is part of a vast water cycle and ocean system. Water evaporates from the ocean, forms clouds, returns as rain, flows into rivers, and returns to the ocean. As it moves through this system, water constantly shapes Earth's surface. The Gulf of Mexico (visible in this image's metadata) is connected to the Atlantic Ocean and global ocean currents, making coastal erosion part of Earth's larger, interconnected systems. What happens here influences sediment movement, affects habitats for sea creatures, and impacts human communities.

## Discussion Questions

1. "Why do you think someone put a warning sign right here at the beach?" (Bloom's: Remember | DOK: 1)
2. "What do you think happens to the sand when the big waves hit it? Where does it go?" (Bloom's: Understand | DOK: 2)
3. "How is the ocean like when you pour water on sand in a sandbox? How is it different?" (Bloom's: Analyze | DOK: 2)
4. "If water keeps moving sand away from the beach, what might happen to this place in the future? Why should that matter to people who live near the ocean?" (Bloom's: Evaluate | DOK: 3)

## Potential Student Misconceptions

1. Misconception: "The beach is always the same size and shape."
  - Clarification: Beaches change over time because water moves sand around. Some days the beach might be bigger, and other days smaller, depending on waves and tides. The warning sign shows us that people noticed the beach changed in this spot.
2. Misconception: "Water just sits still in the ocean."
  - Clarification: Ocean water is always moving—it makes waves, has currents, and moves back and forth. This movement is what carries sand away and changes the shoreline.
3. Misconception: "Erosion happens suddenly, like the sand just disappears."
  - Clarification: Erosion happens very slowly over a long time. Millions of tiny pieces of sand are moved by waves, one handful at a time, until eventually a big change happens (like a "drop off").

## Extension Activities

1. Sandbox Erosion Experiment: Set up a sandbox or sensory tray with damp sand. Have students pour water slowly on one end and observe where the sand moves. Ask them to predict what will happen if they pour faster. Then compare their observations to the beach erosion concept. This hands-on experience makes erosion visible and testable.

2. Beach Safety Signs Activity: Take students on a "nature walk" around your school grounds (or use photos) to find other warning or informational signs. Discuss why signs are placed where they are—what danger or natural feature do they mark? Create their own simple safety signs for areas around your school where water, wind, or other natural forces cause changes (like near a downspout, under a tree, near a puddle area).

3. Shapes and Changes of Shorelines: Provide students with blue paper (ocean), tan paper (beach), and ask them to draw what a shoreline might look like. Then, use water and sand to show how erosion might change that shoreline over time. Have them redraw or adjust their beach shape. Discuss: "How did the water change where the land and ocean meet?"

### Cross-Curricular Ideas

1. Math & Measurement: Create a simple tally chart showing "waves observed" during a beach visit or photo analysis. Count the number of waves in the image. Graph or compare: "How many waves did we count on different days?" This connects to data collection and patterns (both math and science).

2. ELA & Narrative Writing: Read a simple beach-themed picture book (see resources below) and have students draw and write/dictate sentences about "What I saw at the beach" or "Why the warning sign is important." This integrates vocabulary, narrative skills, and science observation.

3. Social Studies & Community Safety: Discuss jobs that help keep people safe at beaches (lifeguards, engineers who design seawalls, scientists who study erosion). Create a class chart titled "People Who Help at the Beach" and draw pictures of these helpers. Connect to community helpers unit.

4. Art & Observation: Use watercolors or wet sand with actual water to create art that shows erosion and water movement. Discuss how they can make sand move, mix colors, and create patterns—mimicking what water does in nature on a small scale.

### STEM Career Connection

1. Coastal Engineer: These scientists and engineers study how water changes beaches and coastlines. They design walls, barriers, and other structures to protect beaches from washing away and to keep people safe. They might visit beaches like this one to measure how much sand is being lost each year. Average Salary: \$88,000–\$105,000 USD per year.

2. Geologist or Earth Scientist: These scientists study rocks, soil, and how Earth's surface changes over time. They investigate erosion, earthquakes, and landforms. At the beach, they might collect sand samples to understand where it came from and where it's going. Average Salary: \$93,000–\$110,000 USD per year.

3. Beach/Environmental Manager: These professionals take care of beaches and coastal areas. They place warning signs, monitor erosion, protect wildlife habitats, and help communities plan for future changes. They work with visitors to keep them safe and teach people about how water shapes the land. Average Salary: \$65,000–\$95,000 USD per year.

### NGSS Connections

Note: This image most directly relates to Earth and Space Science standards focused on observable patterns and changes in Earth systems. However, the validated 1-ESS Performance Expectations provided focus on celestial patterns (sun, moon, stars) and seasonal daylight changes. While this coastal erosion image represents important ESS concepts (water's role in shaping Earth, landform changes, natural hazards), it does not align with the specific validated 1-ESS standards provided for this grade level.

Alignment Clarification: The two validated 1-ESS standards address different phenomena than coastal erosion:

- 1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted.
- 1-ESS1-2: Make observations at different times of year to relate the amount of daylight to the time of year.

Relevant Disciplinary Core Ideas (DCIs) conceptually related to this image:

- 1-ESS1.B: Patterns of the sun, moon, and stars can be observed, described, and predicted.
- K-ESS2.A: Wind and water (in the form of runoff) are major ways that land is shaped.

Relevant Crosscutting Concepts:

- Patterns: The warning sign represents a pattern—ongoing water movement that repeatedly shapes the coast.
- Cause and Effect: Water movement (cause) reshapes the beach and creates unsafe drop-offs (effect).

Teacher Note: While this image powerfully illustrates earth and space science concepts about water's role in shaping Earth's surface, Grade 1 standards in the validated list emphasize celestial observation. Consider this image as a foundation for later ESS standards in Grade 2 (2-ESS2-1) and Grade 3 (3-ESS2-1) that more explicitly address water's role in Earth's processes.

### Science Vocabulary

- \* Erosion: When water, wind, or ice slowly wears away rocks and soil and carries them to other places.
- \* Shoreline: The edge where the land meets the ocean or other large body of water.
- \* Sediment: Tiny pieces of rock and sand that are moved around by water and wind.
- \* Waves: Moving water on the surface of the ocean that is caused by wind and pushes things toward the shore.
- \* Drop-off: A sudden change where the ground goes down steeply, which can be dangerous.
- \* Landform: A natural shape or feature of Earth's surface, like a mountain, valley, or beach.

### External Resources

### Children's Books:

- \* At the Beach by Caroline Jayne Church — A colorful picture book exploring beach animals, plants, and natural features appropriate for early readers.
- \* Sand by Ellen J. Prager — An accessible introduction to sand, shells, and how beaches form and change.
- \* The Ocean Alphabet Book by Jerry Pallotta — An alphabet-based exploration of ocean features, creatures, and habitats with engaging illustrations.

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Final Teacher Note: This image provides a wonderful, real-world entry point into earth and space science for first graders. The warning sign makes the phenomenon tangible and relatable—students understand intuitively that danger and change are connected, which primes them to ask questions about why change happens. Use this as an anchor to discussions about water's power and to introduce the idea that Earth is dynamic, always changing, and shaped by natural forces like water and waves.