Erosion

Grades K-4

Overview:

In this lesson, students model and record observations of different types of erosion. Among the types of erosion explored, large waves like tsunamis, are understood to cause more erosion than smaller waves. Students then apply their knowledge of erosion to identify examples around their community.

Targeted Alaska Grade Level Expectations:

Science

[3-4] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

[3] SA1.2 The student demonstrates an understanding of the processes of science by observing and describing the student's own world to answer simple questions.

[4] SA1.2 The student demonstrates an understanding of the processes of science by observing, measuring, and collecting data from explorations and using this information to classify, predict, and communicate.

[3] SA2.1 The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by answering "how do you know?" questions with reasonable answers.

[4] SD2.1 The student demonstrates an understanding of the forces that shape Earth by observing models of how waves, wind, water, and ice shape and reshape the Earth's surface by eroding rock and soil.

Writing

[3] 1.2.1 The student writes for a variety of purposes and audiences by choosing the appropriate organizational structure to match a purpose and audience (e.g., letters and notes, recounts, stories, and poems) (L)

[4] 2.2.2 The student writes for a variety of purposes and audiences by writing in a variety of nonfiction forms using appropriate information and structure (i.e., personal letters, recounts, descriptions or observations)

Objectives:

The student will:

- model and write observations of different forms of erosion including wave, water, glacier, and wind;
- identify larger waves, like tsunamis, as causing more erosion than smaller waves; and
- identify different types of erosion in the community.

Materials:

- Sand
- Two large rectangular pans
- Box without a top
- Tray
- A few small rocks
- Books
- Sprinkling watering can
- Water
- Cup
- Bucket
- Clay

- Ice cubes
- Riley, J. (2007). *Erosion. Early bird Earth science.* Minneapolis, MN: Lerner Publications. (optional)
- STUDENT WORKSHEET: "Erosion Journal"
- STUDENT INFORMATION SHEET: "Wave Erosion"
- STUDENT INFORMATION SHEET: "Water Erosion"
- STUDENT INFORMATION SHEET: "Wind Erosion"
- STUDENT INFORMATION SHEET: "Glacier Erosion"

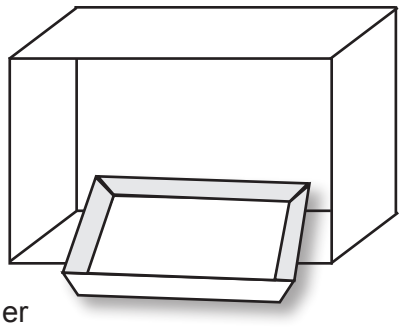
Whole Picture:

Erosion is the process through which soil and weathered rock particles are moved from one place to another. Deposition is the corresponding process by which particles are laid down in new locations. Agents of erosion include gravity, wind, water, glaciers, and waves. The surface of Earth is constantly changing as a result of erosion and deposition. As large waves, tsunamis make sudden and dramatic changes to the landscape. However, over long periods of time, the continuous nature of wind-driven waves causes much more erosion than tsunamis and ultimately shapes coastlines. In this lesson, single waves are compared (as opposed to the continuous nature of waves.)

Weathering is the breakdown of soils and rocks through interaction with Earth's atmosphere. The two main classifications of weathering include physical weathering and chemical weathering. Physical weathering includes erosion processes that result from direct contact of rock or soil with atmospheric conditions such as heat, water, ice and pressure. The activities within this lesson address physical erosion processes. Chemical weathering includes erosion processes that result from direct contact of rock or soil with atmospheric chemicals or biological chemicals, for example limestone being eroded (dissolved) by acidic rain or ground water.

Activity Preparation:

1. Make arrangements for older student or parent volunteers (one per learning center), for students in grades K-2. It may also be more appropriate to have only one or two stations for these younger students.
2. Set up learning centers with the following materials:
   - **Wave center:** Place a large rectangular pan flat on a table and elevate one end with books. Pile the sand on the high end of the pan to represent the beach and pour water into the low end of the pan to represent the ocean. Include the STUDENT INFORMATION SHEET: "Wave Erosion."
   - **Water center:** Place a large rectangular pan flat on a table, and elevate one end with books. Place a pile of sand in the pan at the high end. Include the STUDENT INFORMATION SHEET: "Water Erosion," a sprinkling watering can, water, a cup to scoop out water, extra sand, and a bucket.
   - **Wind center:** Place a cardboard box without a lid on its side. Place a tray on the bottom as shown in the diagram. Cover the bottom of the tray with sand. Include the STUDENT INFORMATION SHEET: "Wind Erosion," straws, and a few small rocks at this learning center.



   - **Glacier center:** Include the STUDENT INFORMATION SHEET: "Glacial Erosion," small piles of clay (one per group member), a supply of ice cubes (one per student), and a container of sand.
3. Scout out the local area to find potential examples of erosion that cover as many types as possible to show, or have students "discover," on a walk to find local examples of erosion.

Activity Procedure:

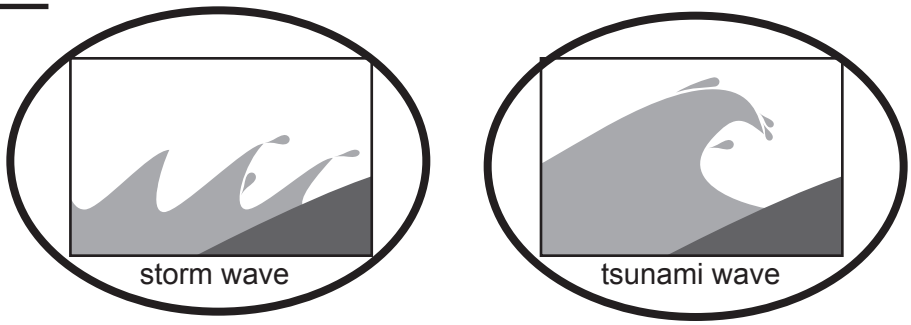
1. Write the word “erosion” on the board. Ask students to tell you all that they know about erosion. If necessary, explain erosion happens when parts of the land, like sand, soil, and rock, are moved away. There are different things that may cause erosion. They are wind, water, waves, and glaciers. Write these types of mechanical erosion on the board.
2. Explain students will model these types in stations, and then they will go on a walk to look for examples of erosion.
3. Use the Student Information Sheets to review procedures at each learning center.
4. Distribute the STUDENT WORKSHEET: “Erosion Journal” to students in grades 3-4 for student completion of Part 1 as they circulate through the learning centers.
5. After students have completed Part 1 of the STUDENT WORKSHEET: “Erosion Journal,” explain you will take them on a walk in the community to look for examples of erosion. Students will need to keep their eyes open to find examples of erosion. Guide them to the previously scouted out areas. As examples of erosion are identified, ask “How do you know?” questions.
6. On return to the classroom, ask students to complete Part 2 of the worksheet. When students are finished, call for volunteers to share their drawings with the class.
7. Have students take home their journals to share with their families.

Extension Ideas:

- Take photos or draw pictures of erosion around your community. Find images of other kinds of erosion. Have students classify the examples on a bulletin board.
- Read the following book to the class, or have it available in the classroom library. Riley, J. (2007). Erosion. Early bird Earth science. Minneapolis, MN: Lerner Publications.

Answers:

1.



2. Student sketch should show mountain affected by water, which may include streams, water surrounding mountain, canyons, deep depressions in mountain from water.
3. Student sketch should show a dune.
4. Student sketch should show a dune by the rock.
5. Student should note the ice cube is smooth from melting.
6. Student should note the sand sticks in, or melts into, the ice cube.
7. Student should note holes or marks in the clay where the ice was pushed over the sand.
8. Student drawing and writing should depict a local example of erosion.

Name:_____

Grades K-4

Erosion Journal

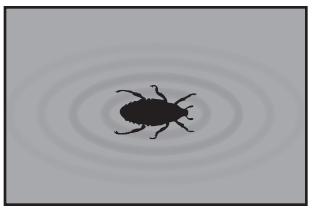
Student Worksheet, Grades 3-4 (1 of 2)

Part 1

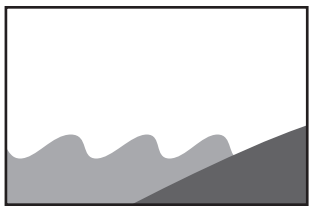
Directions: Complete each section at each learning center.

Wave Erosion

1. A wave of which two forces will cause the most erosion?



insect



ocean wave

storm wave

tsunami wave

Water Erosion

2. Make a sketch of the eroding mountain.

Wind Erosion

3. Draw and write about the sand after STEP 3.

4. Draw and write about the sand and rock after blowing.

Name:_____

Grades K-4

Erosion Journal

Student Worksheet, Grades 3-4 (2 of 2)

Glacier Erosion
5. Write an observation after STEP 1.
6. Write an observation of the ice cube after STEP 4.
7. Write an observation of the clay after STEP 7.

Part 2

8. Draw and write about an example of erosion from around your community.

Name:_____

Grades K-4

Wind Erosion

Student Worksheet

Directions:

STEP 1: Make sure the pile of sand on the bottom of the tray is flat.

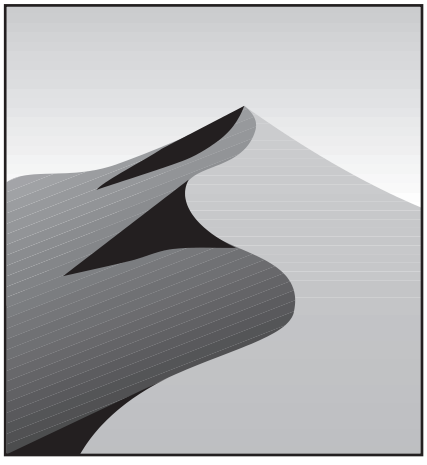
STEP 2: Take turns blowing the sand towards the back of the box from about three inches away till the total number of blows reaches 50.

STEP 3: Observe the effect of wind erosion, then record observations in your erosion journal.

STEP 4: Place a rock on the sand, and repeat steps 1-3 and record observations in your erosion journal.

STEP 5: Clean up the center, so it is ready for the next group.

Wind shapes sandy areas. When sand piles up from wind, those piles are called dunes.

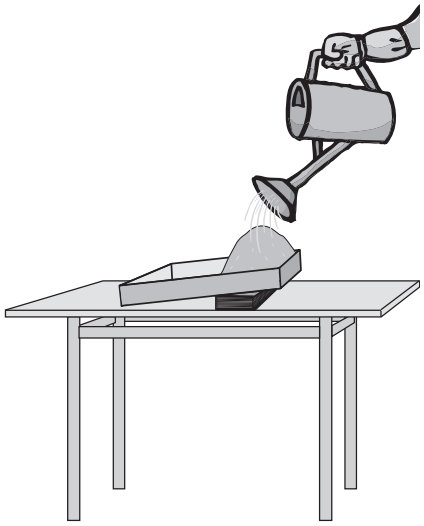


Name:_____

Grades K-4

Water Erosion

Student Worksheet



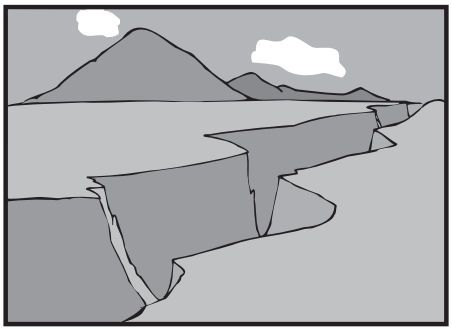
Directions:

STEP 1: Make a mountain with the sand.

STEP 2: One person uses the watering can to pour water over the mountain.

STEP 3: As the water erodes, try to find:

a canyon

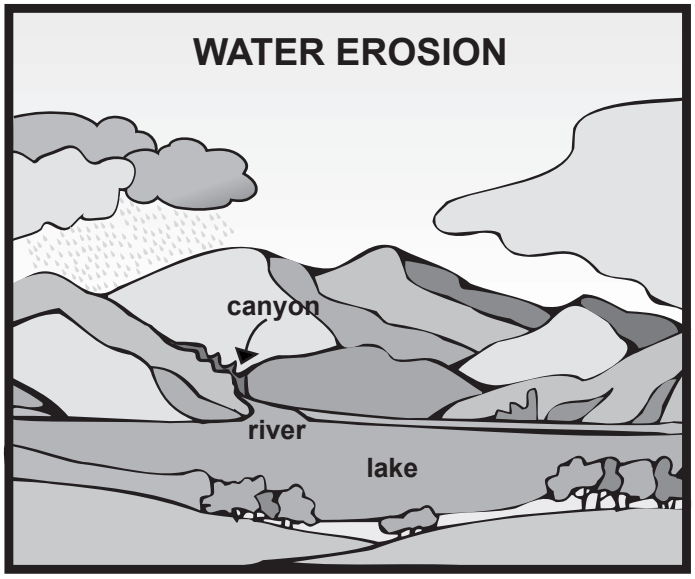


a lake

a stream

STEP 4: Make a sketch in your erosion journal.

STEP 5: Carefully pour or scoop the water into the bucket.

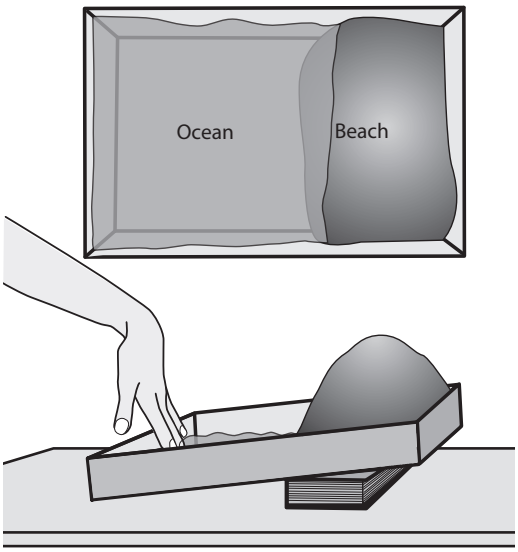


Name:_____

Grades K-4

Wave Erosion

Student Worksheet

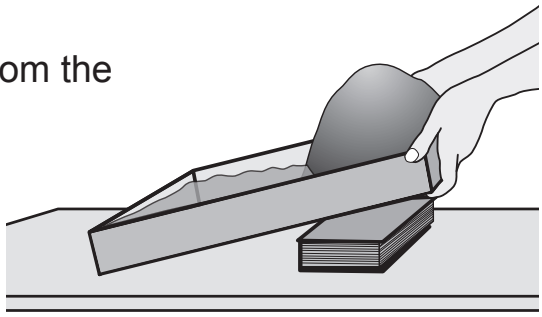


Directions:

STEP 1: Make small, gentle waves with your hand.

STEP 2: Look for sand grains that move from the small waves.

STEP 3: Make larger waves by raising and lowering the high end of the pan.



STEP 4: Point out the area where sand moves from the larger waves.

STEP 5: Change the shape of the beach and repeat steps 1-4.

STEP 6: Answer the question on wave erosion in your erosion journal.

One large wave causes more erosion than one small wave. Large ocean waves are caused by storms and tsunamis. The picture at right shows erosion after the 2004 tsunami near Phuket, Thailand.

Courtesy Dr. Anja Scheffers

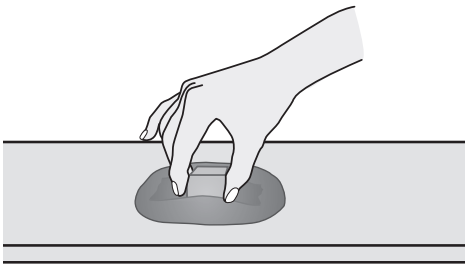
Name:_____

Grades K-4

Glacier Erosion

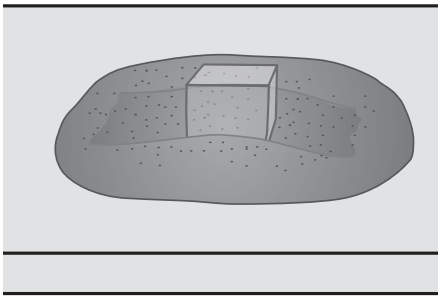
Student Worksheet

Directions:



STEP 1: Press an ice cube into a piece of clay, and move it back and forth several times.

STEP 2: Observe what happened in STEP 1.



STEP 3: Place a small layer of sand on the clay. Put the ice cube on the sand for one minute.

STEP 4: Observe the side of the ice cube that was on the sand.

STEP 5: Place the ice cube back on the sand, and rub it back and forth several times.

STEP 6: Remove the ice cube and wipe the sand from the clay.

STEP 7: Observe the clay that was under the sand.

STEP 8: Clean up the learning center for the next group.

Glaciers are large rivers of ice that move. Rocks get trapped in the ice. As they move, glaciers push rocks. This picture shows marks in rock made by glaciers.

By N.K. Huber. USGS