

Erosion

OBJECTIVES

In this activity, students are introduced to the process of erosion. They use stream tables to demonstrate the relationship between moving water and erosion.

The students

- ▶ construct a stream table
- ▶ observe erosion caused by moving water
- ▶ discuss the landforms created by erosion

SCHEDULE

About 30 minutes

VOCABULARY

alluvial fan	floodplain
base level	levee
delta	meander
erosion	sediment

MATERIALS

For each student

- 1 Activity Sheet 2

For each team of four

- 1 container, plastic, with small hole
- 2 containers, 1-L (pouring and receptacle)
- 1 grid, stream table†
- items to elevate stream table (see Preparation)*
- 1 label
- 1 pegboard

- 1 ruler, metric*
- 1 bag sand†
- 1 stream table, with grommet†

For the class

- 1 pair scissors*
- 1 roll tape, masking
- 27 ft tubing, vinyl
- water, tap*

*provided by the teacher

†in separate box

*in Sand and Soil box

PREPARATION

- 1 Make a copy of Activity Sheet 2 for each student.
- 2 Select an area where students can set up their stream tables. Each stream table will need to be placed near the edge of a level tabletop or desktop. A length of tubing will extend from the hole in one end of the stream table to a 1-L container on the floor.
- 3 Use a pair of scissors to cut the vinyl tubing into lengths of about 90 cm (3 ft) each.
- 4 Every stream table will need to be elevated at one end (the end without the hole). Have available items such as pieces of wood, small boxes, notebooks, and so on to use as props.
- 5 Each team of four will need a stream table with grommet already inserted, a grid, a label, a plastic container with a small hole in the bottom, two 1-L containers (one for pouring and the other for catching runoff), a piece of pegboard, some masking tape, a metric ruler, a length of tubing, a bag of sand, tap water, and items that can be used to elevate one end of the stream table.

BACKGROUND INFORMATION

As rain or water from melting snow forms streams and travels from higher elevations to lower elevations, the moving water causes erosion. **Erosion** is the process by which weathered materials are carried away—in this case, by moving water.

Many geographical formations are created by erosion. These landforms include meanders, floodplains, levees, deltas, and alluvial fans. **Meanders** are curves or bends in a streambed formed by slow-moving water on gently sloping land. A **floodplain** is a broad, flat area surrounding a streambed that is close enough in elevation to the streambed so that occasional flooding occurs. During flooding, **sediment** (soil, sand, rock, and anything else suspended in the water) is deposited alongside the stream banks. These deposits build up to form elevated ridges called **levees**. Beyond the levees the floodplain is lower, and the sediments are a finer texture.

A **delta** forms when a stream reaches its **base level** (the level at which the stream enters a lake or ocean) and, as the water of the stream slows, deposits its sediment at the mouth of the stream. An **alluvial fan** is similar to a delta, but instead of forming at a stream's base level, it forms upstream when deep, fast-moving water enters a shallow, wide area, slows down, and deposits its sediment in the streambed.

In this activity, students use stream tables to simulate erosion caused by moving water and identify some of the landforms that result.

▼ Activity Sheet 2

Erosion

Label the following erosion landforms on the diagram below.

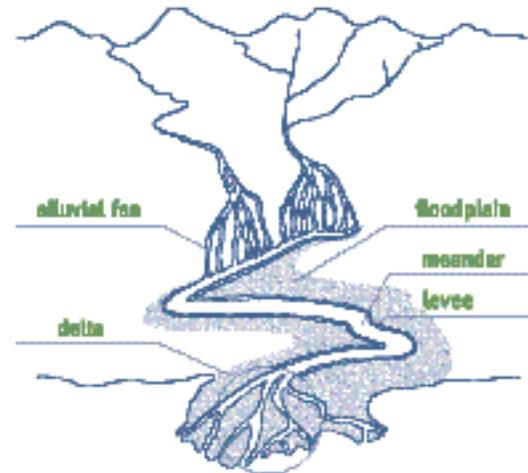
alluvial fan Shallow, flat area formed where a deep, fast-moving stream slows down, widens, and deposits its sediment.

delta Triangle-shaped area at the mouth of a river formed when the river reaches its base level, slows down, and deposits its sediment.

floodplain Broad, flat area surrounding a stream, close enough in elevation so that occasional flooding occurs.

levee A natural bank confining a stream channel.

meander A curve or bend in a streambed.



Guiding the Activity

- 1 Begin a discussion by asking, **Where does the water in a stream or river come from?**
- 2 Write the words *erosion* and *sediment* on the board. Tell students that **erosion** is the carrying away of weathered materials by wind, moving water, or glaciers. Explain that in this activity, students will investigate erosion caused by moving water.

Explain that **sediment** is earth materials, such as dirt, sand, and rocks, carried away by moving water and deposited when the water slows down.

Tell students that in this activity they will set up a stream table, simulate the process of erosion by moving water, and observe some of the landforms created by erosion.
- 3 Distribute a stream table with grommet, a grid, a bag of sand, two 1-L containers, a plastic container with a small hole in the bottom, a label, a piece of pegboard, a metric ruler, and a length of tubing to each team of four. The teams will also need items to prop up their stream tables, access to a roll of masking tape, and some tap water.

Tell students to write their names or team name on the label and to affix the label to the side of their stream table.

Have the teams place the grid in the bottom of the stream table and then pour one 6-lb bag of sand into the end of the stream table opposite the hole.

Instruct one member from each team to use his or her hand to distribute the sand so that it covers about two-thirds of the grid. The surface should be smooth and gently slope down toward the end of the stream table that contains the hole.

Additional Information

Encourage answers that involve rain or melting snow.

If you have not already inserted the grommets into the stream tables, do so now.

Collect and put aside the emptied sand bags. They will be used again later to store the sand.

Students may enjoy creating their own team names.

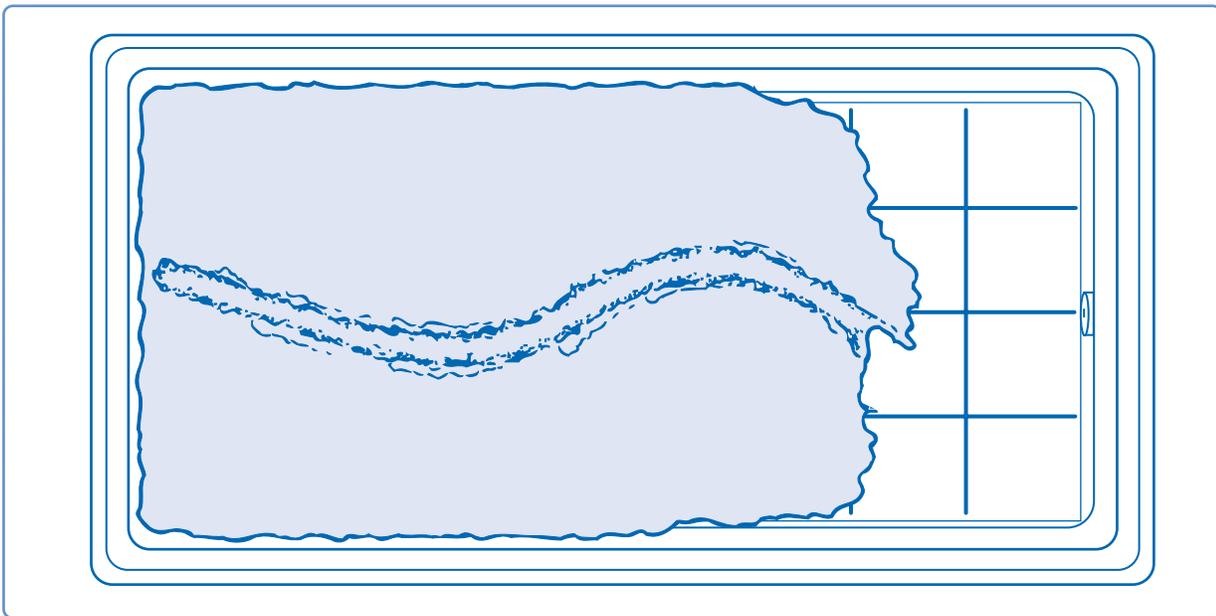
Guiding the Activity

Show students how to attach the tubing to the stream table by inserting one end of the tubing into the grommet in the stream table. This end of the tubing should be flush with the inside wall of the stream table. The other end of the tubing should hang straight down into the receptacle on the floor.

Have students fill and then slowly pour water from the 1-L pouring container onto the stream table to thoroughly moisten the sand. Tell them to smooth out the wet sand and make it slope like before. Tell students to use their fingers to form a shallow meander in the sand from the top of the slope to the bottom (see Figure 2-1).

Additional Information

Tell them that because they are going to simulate a stream in their sand, they need to give the stream a path—a streambed—to follow.



▲ *Figure 2-1. Tracing a meander in the stream table.*

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Have students tape the piece of pegboard above the sand 5–6 cm (about 2.5 in.) from the end of the stream table.

Then have each team elevate that same end of the stream table (the end opposite the hole) by about 4 cm (about 1.5 in.), using the items they selected earlier as props.

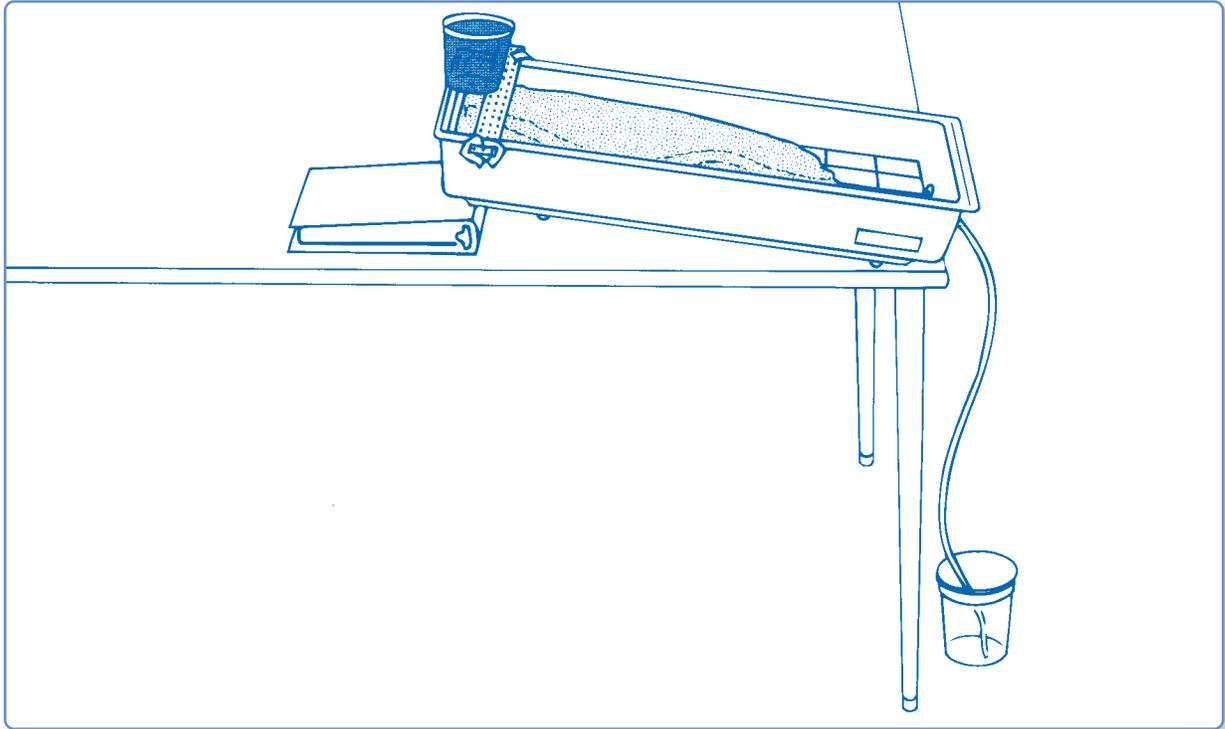
Items used to elevate the stream tables may get wet, so have students choose them accordingly.

Guiding the Activity

- 5 Have the students position the plastic container (with the small hole in the bottom) over the sand so that it is supported by the pegboard and the edge of the stream table (see Figure 2-2).

Additional Information

Make sure that the hole in the container is centered over the start of the meander.



▲ Figure 2-2. The setup.

- 6 Have the students fill the plastic container with water from the pouring container, allow it to drain into the stream table, and then observe how and where the sand erodes.

Distribute a copy of **Activity Sheet 2** to each student. Have the students use the descriptions of landforms on the activity sheet to identify and label landforms caused by erosion in their stream tables. The activity sheet describes **alluvial fan, delta, floodplain, levee, and meander**. Point out that the **base level** of a river is the level at which the river empties into the ocean.

In order to ensure equal volumes and equal rates of flow of water between groups, have a student place a finger over the hole in the container. Then others should fill it with water from their 1-L pouring container, set it between the pegboard and the edge of the stream table, and then have the student remove his or her finger from the hole.

The meander and delta should be visible. Students may also find that an alluvial fan has formed midway down their stream tables.

Guiding the Activity

Encourage students to repeat the procedure two or three more times. Remind them to fill the plastic container only once per run and to smooth and gently slope the sand and trace the meanders between runs.

Discuss which landform(s) the students observed in their stream tables.

Additional Information

REINFORCEMENT

Show students aerial views of oxbow lakes (from reference materials), and discuss how they once were very large meanders in rivers that were cut off as the rivers continued to erode.

SCIENCE JOURNALS

Have students place their completed activity sheets in their science journals.

CLEANUP

Tell students to drain the excess water from their stream tables and discard the water that has accumulated in the receptacles. The sand and the grid should remain in the stream tables. Have them remove the tubing from each table but leave the pegboard and grommet in place. Rinse and air dry the containers and tubing, and return them to the kit. Stack the stream tables at 90° angles to one another. Set them aside until they are used again in Activity 5. Be sure to save the plastic bags that the sand came in, as you will need to store the sand in the bags after all of the activities have been completed.

SCIENCE AT HOME

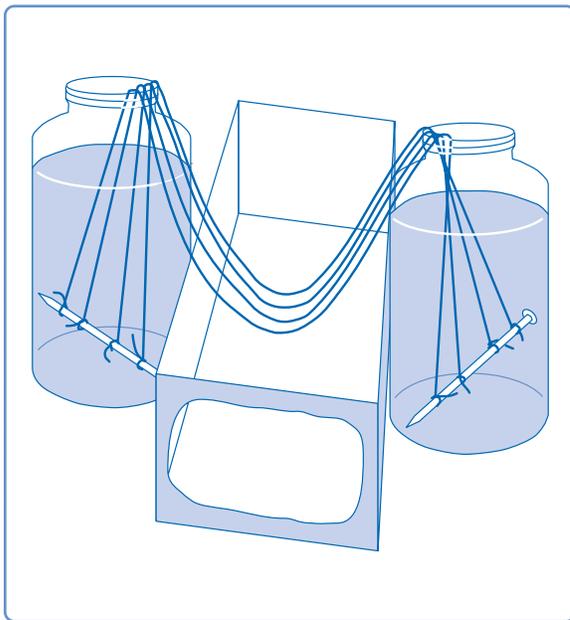
Have students discuss the purpose of rain gutters on buildings.

Connections

Science Extension

Guide students through the following procedure to model the formation of stalactites and stalagmites. Cut a large viewing hole in one end of a shoe box or other box of similar size and depth. Dissolve baking soda or Epsom salts in a large pitcher until no more will dissolve, then add a few drops of food coloring. Pour equal amounts of the solution into two tall jars, and put the jars on either side of the box. Tie four or five lengths of heavy string or yarn to two nails, and drop one nail into each jar. Make sure the strings drape freely over the open top of the box without touching the sides, the center of each hanging string is below the water level in the jars, and the strings are separated from one another.

Leave the setup in a warm place for several days, and observe what happens. (“Stalactites” will form at the center of the hanging strings, and “stalagmites” will form below them on the “cave” floor.) Ask students to explain what happened.



Science and the Arts

Suggest that students find and photograph examples of water erosion in their community. You could provide one or two inexpensive cameras for students to share. Students who have access to a video camera could tape erosion as it occurs—runoff cutting channels in an embankment after a heavy rain, for example. Tell students to look for examples of all sizes, from a tiny rivulet eroding soil at the edge of a road, to a rain-swollen river cutting away its banks. Have students display their photographs in the classroom or in an area of the school where other students will be able to view them.

Science and Social Studies

Encourage interested students to research the names and locations of famous caverns, canyons, and other unusual landforms in the United States or worldwide that were created by water erosion. Several examples are listed below. (Landforms created by wind erosion will be investigated in Activity 11.) Tell students to find out one interesting fact about each landform. As a class activity, have students locate the landforms on a U.S. or world map and share their facts.

- Alabama Hills, California
- The Badlands, South Dakota
- Blue Grotto, Italy
- Bryce Canyon, Utah
- Carlsbad Caverns, New Mexico
- Hell's Half Acre, Wyoming
- Lascaux Cave, France
- Lost River, New Hampshire
- Luray Caverns, Virginia
- Mammoth Cave, Kentucky
- Waitomo Cave, New Zealand