**KEY CONCEPT**

Moving water shapes land.

**Sunshine State STANDARDS**

SC.D.1.3.1: The student knows that mechanical and chemical activities shape and reshape the Earth's land surface by eroding rock and soil in some areas and depositing them in other areas, sometimes in seasonal layers.

**BEFORE, you learned**

- Erosion is the movement of rock and soil
- Gravity causes mass movements of rock and soil

**NOW, you will learn**

- How moving water shapes Earth's surface
- How water moving underground forms caves and other features

**EXPLORE Divides**

*How do divides work?*

**PROCEDURE**

1. Fold the sheet of paper in thirds and tape it as shown to make a "ridge."
2. Drop the paper clips one at a time directly on top of the ridge from a height of about 30 cm. Observe what happens and record your observations.

**MATERIALS**

- sheet of paper
- tape
- paper clips

**WHAT DO YOU THINK?**

How might the paper clips be similar to water falling on a ridge?

**VOCABULARY**

- drainage basin p. 267
- divide p. 267
- floodplain p. 268
- alluvial fan p. 269
- delta p. 269
- sinkhole p. 271

**Streams shape Earth's surface.**

If you look at a river or stream, you may be able to notice something about the land around it. The land is higher than the river. If a river is running through a steep valley, you can easily see that the river is the low point. But even in very flat places, the land is sloping down to the river, which is itself running downhill in a low path through the land.

Running water is the major force shaping the landscape over most of Earth. From the broad, flat land around the lower Mississippi River to the steep mountain valleys of the Himalayas, water running downhill changes the land. Running water shapes a variety of landforms by moving sediment in the processes of erosion and deposition. In this section, you will learn how water flows on land in systems of streams and rivers and how water shapes and changes landscapes. You also will learn that water can even carve out new features underground.
Drainage Basins and Divides

When water falls or ice melts on a slope, some of the water soaks into the ground and some of it flows down the slope in thin sheets. But within a short distance this water becomes part of a channel that forms a stream. A stream is any body of water—large or small—that flows down a slope along a channel.

Streams flow into one another to form complex drainage systems, with small streams flowing into larger ones. The area of land in which water drains into a stream system is called a drainage basin. In most drainage basins, the water eventually drains into a lake or an ocean. For example, in the Mississippi River drainage basin, water flows into the Mississippi, and then drains into the Gulf of Mexico, which is part of the ocean.

Drainage basins are separated by ridges called divides, which are like continuous lines of high land. A divide is a ridge from which water drains to one side or the other. Divides can run along high mountains. On flatter ground, a divide can simply be the highest line of land and can be hard to see.

Divides are the borders of drainage basins. A basin can be just a few kilometers wide or can drain water from a large portion of a continent. The Continental Divide runs from Alaska to Mexico. Most water that falls west of the Continental Divide ends up draining into the Pacific Ocean. Most water that falls east of it drains into the Gulf of Mexico and Atlantic Ocean.

Divides are ridges that form the borders of drainage basins.

Denver, Colorado, sits just east of the Rocky Mountains and the Continental Divide.
Valleys and Floodplains

As streams flow and carry sediment from the surface of the land, they form valleys. In high mountains, streams often cut V-shaped valleys that are narrow and steep walled. In lower areas, streams may form broad valleys that include floodplains. A floodplain is an area of land on either side of a stream that is underwater when the stream floods. The floodplain of a large river may be many kilometers wide.

When a stream floods, it deposits much of the sediment that it carries onto its floodplain. This sediment can make the floodplain very fertile—or able to support a lot of plant growth. In the United States, the floodplains of the Mississippi River are some of the best places for growing crops.

**CHECK YOUR READING** Why is fertile land often found on flat land around rivers?

Stream Channels

As a stream flows through a valley, its channel may run straight in some parts and curve around in other parts. Curves and bends that form a twisting, looping pattern in a stream channel are called meanders (mee-AN-duhrz). The moving water erodes the outside banks and deposits sediment along the inside banks. Over many years, meanders shift position.

During a flood, the stream may cut a new channel that bypasses a meander. The cut-off meander forms a crescent-shaped lake, which is called an oxbow lake. This term comes from the name of a U-shaped piece of wood that fits under the neck of an ox and is attached to its yoke.
Alluvial Fans and Deltas

Besides shaping valleys and forming oxbow lakes, streams also create landforms called alluvial fans and deltas. Both of these landforms are formed by the deposition of sediment.

An alluvial fan (uh-LOO-vee-uhl) is a fan-shaped deposit of sediment at the base of a mountain. It forms where a stream leaves a steep valley and enters a flatter plain. The stream slows down and spreads out on the flatter ground. As it slows down, it can carry less sediment. The slower-moving water drops some of its sediment, leaving it at the base of the slope.

A delta is an area of land formed by the buildup of sediment at the end, or mouth, of a river. When a river enters the ocean, the river’s water slows down, and the river drops much of its sediment. This sediment gradually builds up to form a plain. Like alluvial fans, deltas tend to be fan-shaped. Over a very long time, a river may build up its delta far out into the sea. A large river, such as the Mississippi, can build up a huge delta. Like many other large rivers on Earth, the Mississippi has been building up its delta out into the sea for many thousands of years.

From Divide to Delta

On their path to the ocean, streams and rivers slow down and flatten out.

1. Rainwater falls, or snow and ice melt. Streams form.
2. In high areas, streams flow through V-shaped valleys and are narrow and somewhat straight.
3. As land flattens, streams and rivers widen and take curvier paths.
4. Rivers form deltas as they empty into the ocean and deposit sediment.

Where does the illustration show meanders?
Water moving underground forms caverns.

Not all rainwater runs off the land and flows into surface streams. Some of it evaporates, some is absorbed by plants, and some soaks into the ground and becomes groundwater. At a certain depth below the surface, the spaces in soil and rock become completely filled with water. The top of this water-filled region is called the water table. The water below the water table is called groundwater.

The water table is at different distances below the surface in different places. Its level also can change over time in the same location, depending on changes in rainfall. Below the water table, groundwater flows slowly through underground beds of rock and soil, where it causes erosion to take place.

You have read that chemicals in water and air can break down rock. As you read in Chapter 7, rainwater is slightly acidic. This acidic water can dissolve certain rocks, such as limestone. In some areas, where the underground rock consists of limestone, the groundwater can dissolve some of the limestone and carry it away. Over time, this
process produces open spaces, or caves. Large caves are called caverns. If the water table drops, a cavern may fill with air.

Some caverns have huge networks of rooms and passageways. Mammoth Cave in Kentucky, for example, is part of a cavern system that has more than 560 kilometers (about 350 mi) of explored passageways. Within the cavern are lakes and streams.

A surface feature that often occurs in areas with caverns is a sinkhole. A sinkhole is a basin that forms when the roof of a cave becomes so thin that it suddenly falls in. Sometimes it falls in because water that supported the roof has drained away. Landscapes with many sinkholes can be found in southern Indiana, south central Kentucky, and central Tennessee. In Florida, the collapse of shallow underground caverns has produced large sinkholes that have destroyed whole city blocks.

Why do caverns form in areas with limestone?