BUILDING A WATERSHED MODEL

OBJECTIVES
- Define a watershed and describe how it functions
- Identify that students live in a watershed within the San Antonio River Basin

TOPICS

- Watersheds
- Runoff

TEKS ALIGNMENT

Grade 7 Science:

1A, 2A, 2C, 2E, 3B, 3C, 4A, 8C

BACKGROUND MATERIAL

A watershed - also called a drainage area, catchment, or basin - is an area of land that drains surface and subsurface runoff to a common point, usually a stream, river, lake or the ocean. Every piece of land on Earth is part of a watershed, because water always moves off of land to a lower point where it collects to form a water body. Watersheds may range in size from less than an acre to thousands of square miles in area.

There are a number of features that are characteristic to all watersheds. To use a simpler analogy, a watershed is shaped somewhat like a bowl that has been cut in half. The rim around the bowl would be like the watershed divide. Watershed divides are the boundaries that define a watershed and separate adjacent watersheds. The highest point or points in the watershed are called the headwaters and are the points at which the stream or river starts. The hills along the sides of the watershed are like the sloping sides of the bowl and are called the side slopes. The relatively flat part near the bottom is called the valley floor. The lowest point in the watershed is called the base level. All the water in the watershed drains down to the base level, which is usually the mouth of the river or stream. The difference in elevation between a stream's headwaters and its base level create the stream's gradient.

All watersheds change over time. Some changes happen rapidly and some require thousands or even millions of years to occur. Many changes that take place within watersheds result from natural processes, like gravity and running water. The force of gravity causes water to erode material from higher elevations in the watershed, where the land is steeper. Eroded soil particles are transported by water until the stream flattens out and the force of water is no longer great enough to transport the soil particles; then the soil particles are deposited on the bottom of the stream or along its floodplain. Heavier particles are deposited first; the lightest particles are deposited at the river's mouth, where it meets the ocean. The build-up of sediments at the mouth of a river may eventually create a delta. Erosion and deposition eventually reach a state of equilibrium when the erosion that wears down hills and the deposition that builds up stream bottoms causes the stream gradient to become flatter.

Texas contains all or part of 23 major river basins (watersheds), of which the San Antonio River Basin is one. The San Antonio River Basin totals 4,180 square miles and includes all or parts of Bexar, Wilson, Karnes, Goliad, Kendall, Bandera, Medina, Comal, Guadalupe, DeWitt, Kerr, Kendall, Atascosa, Victoria, and Refugio counties. The tributaries of the San Antonio River are the Medina River, Cibolo Creek, Leon Creek, Medio Creek and Salado Creek.

In this activity, the students learn about a watershed by building a watershed model from everyday materials and watching how water moves on it. Students will also learn about the big picture of watersheds by learning about the San Antonio River Basin.

KEY TERMS

Acre is an area of land that is equal to 43,560 square feet. Large areas of land are often measured in acres

Base level is the lowest point in a watershed and is the point to which the water drains

Basin is another word for "watershed"

Delta is an area where a river deposits sediment near its mouth; a delta is usually located near where a river flows into the ocean

Deposition is the act of depositing sediments

Equilibrium is a state of balance due to the equal action of opposing forces

Erode is a process by which soil and rocks are worn away and removed from a location

Floodplain is the area along both sides of a stream where floodwaters deposit sediments

Gradient is a slope. The gradient is determined by dividing the vertical distance (the "rise") between two points by the horizontal distance (the "run") between two points

Headwater is the place or are the places where a stream or river starts

Runoff is water that flows over the surface of the land when rainfall is not able to infiltrate into the soil, either because the soil is already saturated with water or because the land surface is impermeable

Sediment is the material that is laid down or deposited by water, air or ice

Side Slopes are the sloping sides of hills

Tributary is a smaller stream that feeds into a larger stream

Valley floor is the relatively flat area at the lower elevations of a watershed

Water body is a stream, river or lake that receives the runoff water from a watershed

Watershed is an area of land that drains to a single point, such as a river, a lake or a stream

Watershed divide is the boundary that separates one watershed from another; the highest point between adjoining watersheds

PROCEDURES

A. The students will build their own watershed model inside of the large aluminum foil baking pan.
B. Instruct the students to cut the cups at the bottom so that they stand at different heights, and have them arrange as many of the cups in the pan as they can fit.
C. Using the aluminum foil, tell the students to cover all of the cups in the tray with one sheet. They can use their fingers to shape the aluminum foil a little bit around the cups, but do not have them push it down into all of the cracks. Ask the students to imagine the foil as being more of a drape over the cups.
D. Using the blue pen, have the students mark the path on the aluminum foil that they think that water will take when they spray water onto their watershed model.
E. Then, have the students mark the highest points on their watershed (on the tops of the cups) and connect these points with the black permanent marker.

MATERIALS

- A large aluminum foil baking pan
- About 10 foam or plastic cups
- A plastic spray bottle
- An 18" sheet of aluminum foil
- A blue and black permanent marker

F. When they are ready, instruct the students to spray water onto their watershed models to simulate rain. Ask them to note what happens to the water as it moves through, and tell them to write in their notes if the water flows along the blue line.
G. When the activity is completed, ask the students to label the vocabulary terms that refer to components of a watershed on the watershed diagram found in the student sheets.
H. Conclude the activity by presenting information on the San Antonio River Basin. For a map of the basin, please see Student Sheet 2.

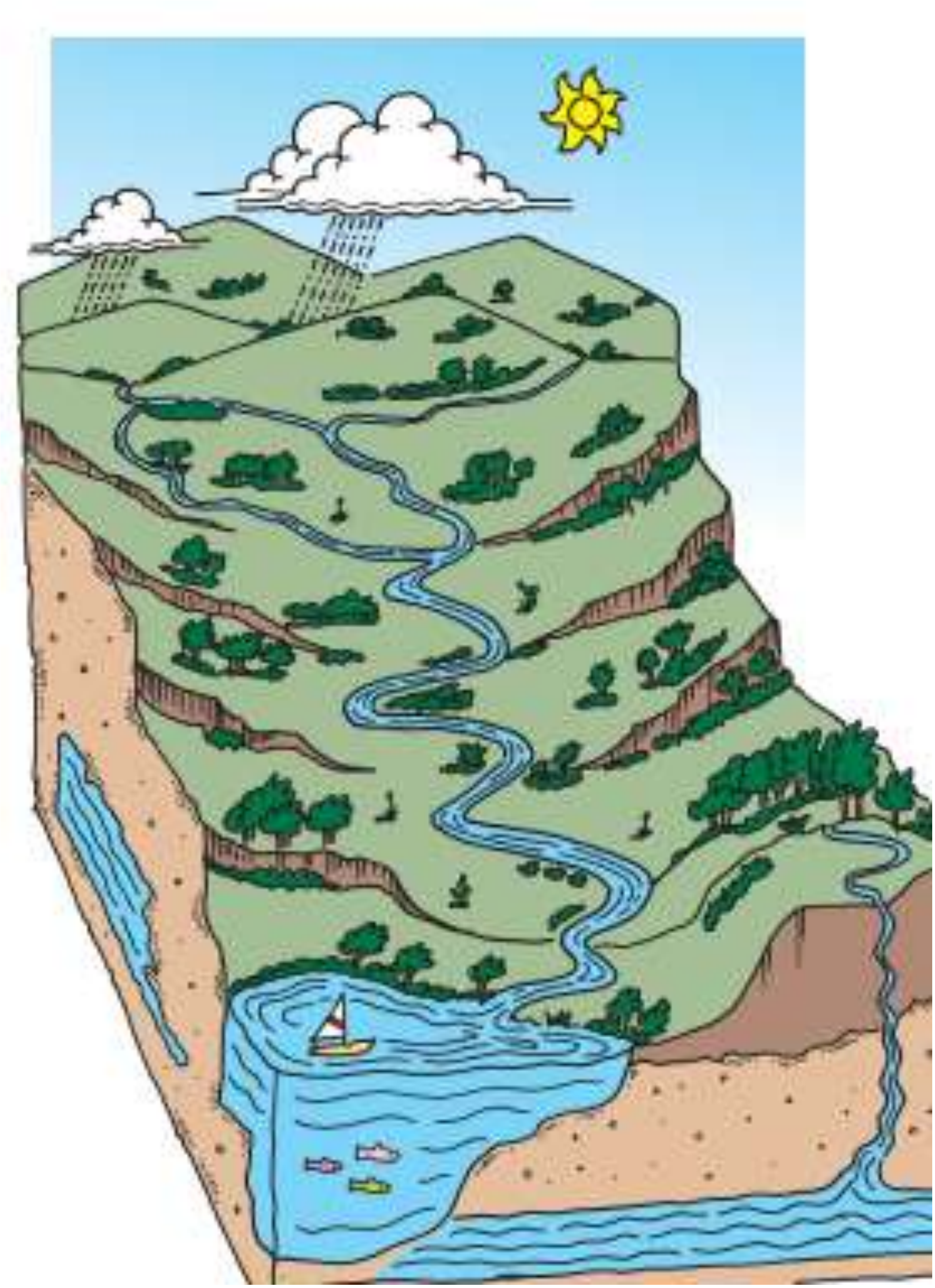
GUIDING QUESTIONS

- What did the cups in your watershed model represent in a real watershed?
- What did the black line represent that ran between the highest points on your model?
- What did the spaces between the cups in your watershed model represent in a real watershed?
- What did the blue line that you drew on your model represent if it were in a real watershed?
- Over time, what happens to soil on the hilltops and the side slopes?
- Where does the water and soil end up once it leaves the hills?
- What is the main river in the San Antonio River Basin?
- What are the tributaries of the San Antonio River?
- What is the destination of the San Antonio River?
- What counties are in the watershed of the San Antonio River?

EVALUATION

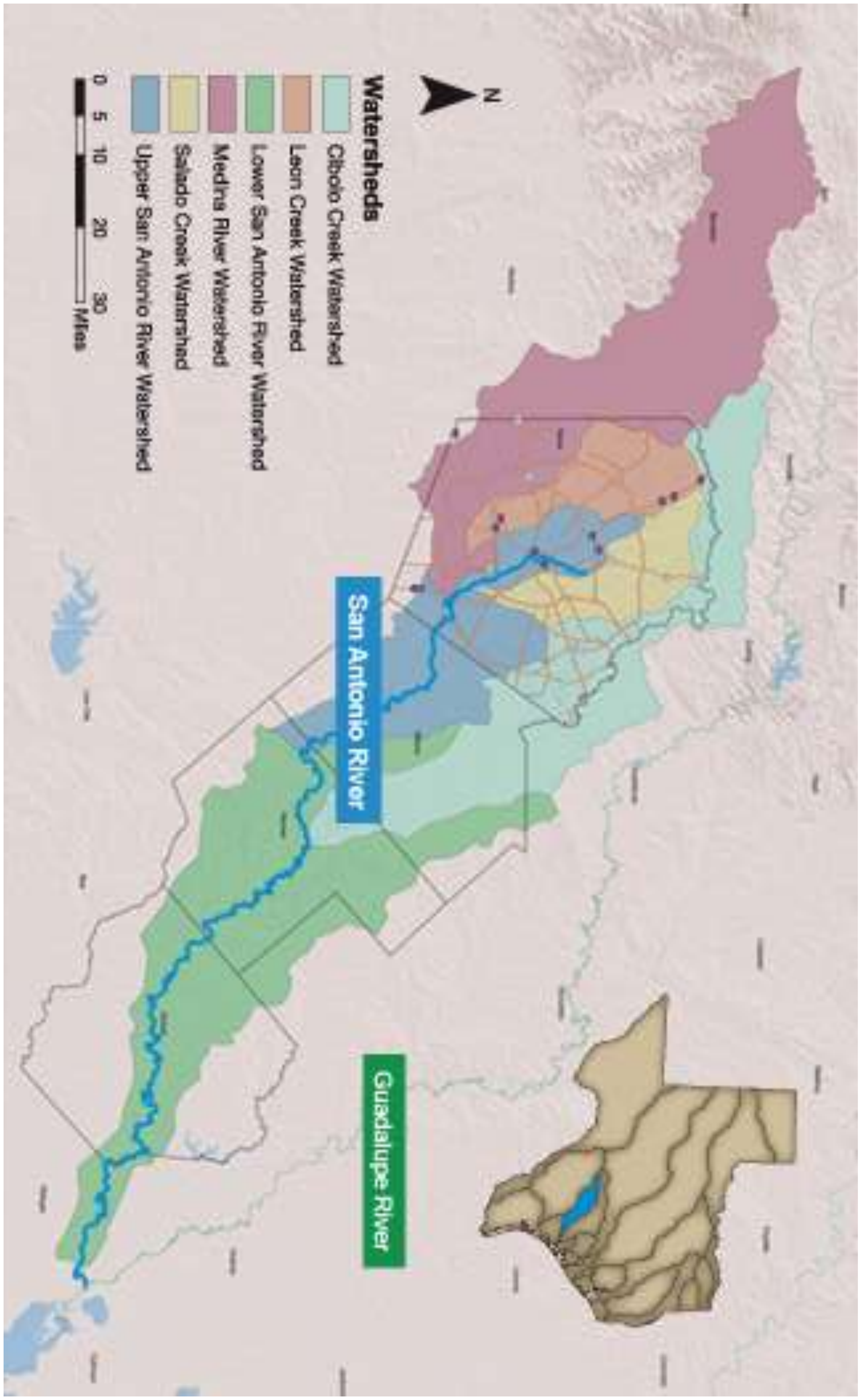
Have the students research and write about one of the other major river watersheds in Texas. Have them include information about its size and location, the major rivers and tributaries, major cities, industry and agriculture that are found there. Also have the students include information about any problems that the watershed might have because of the pollution or human activity.

STUDENT SHEET 1



STUDENT SHEET 2

Watersheds of the San Antonio River Basin



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