30. Surface Water Demonstration

Description: Students observe what happens in a model of a watershed with a plastic-draped surface representing the mountains and spray bottles to simulate precipitation. Students observe and identify how water behaves on the land's surface.

Objective: Students will understand:

- what a watershed is;
- how different land areas (mountains, foothills, valleys, plains) can be part of the same watershed;
- how surface water collects together and flows only downhill; and
- the cohesive property of water.

Materials:

1. large, heavyweight plastic garbage bag, split open, or plastic drop cloth
2. four or more misters (squirt bottles with a fine mist)
3. lunch boxes or backpacks placed under the plastic sheet to make 'mountains'
4. optional: bucket to collect water that drains off the model, and towels to wipe up the inevitable wetness

Background: All the water on our planet is connected via the water cycle (or hydrologic cycle). The water cycle is a water circulation network. (See the "Rio Grande Bosque Water Cycle" activity in this guide.) The water in the Rio Grande is part of the water cycle. This activity explores the surface water part of the water cycle—precipitation and surface water flow.

30. Surface Water Demonstration

Grades: 3–8

Time: Set-up: five minutes; at least 10 minutes to explain, observe, and compare. Add clean up time for spills.

Subject: science

Terms: *precipitate, cohesion, gravity, watershed, surface water, divide, tributary*

The area of land from which water drains into a river is called its watershed. If you imagine that raindrops fall on your school, you might imagine them collecting with other drops and flowing downhill. All of the water that drains into one river system is part of that river's watershed. It is at the high ridges of mountains that the water dropping in one spot may flow east to one river, while a few inches away, the drops flow west ending in a different river system. Your students will set up a model of a mountain and look for the watersheds of their model. This easy, inexpensive model allows observation of what happens in part of the water cycle, how different land areas (mountains, foothills, valleys, plains) can be part of the same watershed, and how surface water collects together and flows only downhill.

Surface water:
collects together *(cohesion),*
moves only downhill *(gravity)*, and
is used and needed by plants, wildlife, and people.

Procedure:

1. Using a large table, floor or outdoor space, spread the plastic sheet over lunch boxes or other objects forming a 'landscape' with higher mountains on one side or in one corner, some lower hills just below the mountains, and plenty of fairly flat areas. For a table display, arrange the plastic so that water, which collects and flows to the lowest point, will drain off the plastic in one spot where it can be drained into a bucket.

2. Explain that students will be observing behavior of surface water using a model. Ask your students how real land is different than plastic (it has soil, plants, animals, houses, and people). Real land also allows some water to soak into the ground. However, when the spaces in the soil are filled with water, additional water that falls will collect together and flow.

   Things to look for and identify are:

   Water drops—their size, location, and movement.

   Where on this landscape would our school be? (The foothills? The valley?) (Or where on the landscape would be a good place to build a school?)

   Answer these questions through observation: Where does the water come from? Where does the water go?

3. Select several students to be the clouds—the mister operators. The misters must be set on very fine spray. Other participants will be the scientists. Everyone will observe and describe what happens. The clouds should listen for when to precipitate (mist), when to stop, and when to start again. They need to pay attention for directions on where to mist and to be sure

mist falls on all areas of the 'land,' but not on the scientists. Ask the scientists to observe all areas of the land: the mountains, the foothills, the valleys, the plains, and to let us know what happens on all areas. Encourage students to explain their observations using terms such as **gravity** (the force of gravity causes water to move downhill); and **cohesion** (the property of water molecules connecting and pooling). Encourage students to describe everything observed. Much of the precipitation that falls on the landscape will be part of one watershed.

4. Tell the clouds to begin precipitating. Within a few seconds tell the clouds to stop. Ask the observers what they saw the water do. Guide your scientists to describe water falling through the air, tiny drops forming on the surface of the whole landscape—the mountains to the plains. Be sure to observe the entire landscape. Water should not be flowing yet. Focus on observing the drops appear, then grow, then collect.

5. Precipitate (mist) again. Within a few seconds tell the clouds to stop precipitating. What do students notice about the water? Notice the water flowing downhill on the steepest areas. What is happening elsewhere? Water drops are growing larger as more and more water flows downhill. A few puddles are forming. Guide your observers to watch all areas of the landscape.

6. Resume precipitating. Let the clouds keep going and encourage the scientists to describe what they see as it is happening. Direct scientists to report from all areas of the landscape: the precipitation that still makes tiny drops, the drops that still collect together, the movement downhill. Look for movement uphill or over obstacles—it can't happen! The only way for water to spill out of a mountain pond is to keep collecting together until it is higher than the edge of the pond and then overflow. Look for a lake forming in the valley or on the plains. Where is that water coming from? Water flows down from the mountains and also from land near the lake. The clouds continue precipitating until all scientists and observers have had a chance to observe action on all areas of the landscape, and until valley lakes have joined, finding a way to form a river and flow off the plastic. Most of the precipitation will form one main river; some observant scientists will note that the drops on the back of the mountains or on some parts of the flat areas do not flow into the main river, rather, they leak off the side somewhere. This water is part of a different watershed. Precipitation falls everywhere, not just in one watershed at a time. Some water will also move through the watershed as ground water; this is at a much slower rate of movement.

7. Stop precipitating. Share observations.
8. Define the boundaries of the main watershed with your class. Determine ridge tops and areas where the drops collect into the main watershed of the model. Locate land areas where drops form and do not join the main watershed. Guide students to recognize that there are two or more watersheds, depending on where the water flows. Encourage students to review all observations in summary.

Assessment: Depending on the age of students, have them write or draw what might happen to a raindrop.

How are mountain water and valley water connected?

List three things you observed about water on the surface water model.

Define these vocabulary words: precipitate, cohesion, gravity, watershed, surface water, flow.

Extensions: Do the "Watersheds in New Mexico" activity in this guide.

Connecting with the Watershed: Contact a school along another part of the Rio Grande and trade information. Imagine pen pals in another state, or another country, but in the same watershed! What would you like to tell students on a different acequia or arroyo or tributary about your part of the watershed? One school in Albuquerque hosted and gave tours to another local school investigating the bosque. Students can trade photos; monitor the river near their school and post the data; create a field guide to part of the bosque nearest your school or for use on a visit to the Rio Grande Nature Center State Park; visit a school in a different part of town for a tour of how they care for their part of our river.

Students can connect to another stretch of the river. Examples include a high school class from Las Cruces that planned a raft trip near Taos, to experience another reach of their river, and an elementary school in Santa Fe that visited the Rio Grande Nature Center and compared the Rio Grande to their reach of the Santa Fe River.

Mapping Fun: How can we tell if we're in a watershed? Where are we on the map? What map?

You might want to start by making your own map. Imagine a raindrop falling on your schoolyard, joining with other drops and flowing downhill. Where does it go? Is there a tiny arroyo from the canales or gutters of your school building? Does your parking lot drainage lead to an arroyo at the edge of your school grounds?

Does it have a name? Maybe that is as far as you want to draw your first map.

Where does it go from there? Perhaps you would like to get a topographic map including the area of your school. This will show the major arroyos or tributaries near you. How far does your raindrop have to travel to reach the Rio Grande? Locate your country, locate your state, and locate your town on a map. Then get a map of your town, and your part of town. Maybe you want to start with the big picture before you imagine your raindrop. (See "Watersheds" activity in this chapter.)

Watershed Health: How healthy is your section of the Rio Grande watershed?

We all share in the water quality and other resources of our watershed. One way to contribute to the care of our watershed is to collect data and monitor conditions. A **survey** is a collection of measurements, and to **monitor** is to take those measurements over time and compare them. This allows us to notice changes. We can be informed as to the quality of wildlife habitat, drinking water, and pollution issues. Investigate the activity "Kick-net Kritters" (in Chapter 3) for information on how sampling a stream's aquatic macroinvertebrates (water bugs) constitutes a rapid assessment and is an indicator of riparian habitat and water quality.