Rainy-Day Hike

What do a puddle on your playground and a nearby lake or stream have in common?

■ **Grade Level:**
Upper Elementary, Middle School

■ **Subject Areas:**
Earth Science, Environmental Science, Geography

■ **Duration:**
Preparation time:
Part I: 30 minutes
Part II: 30 minutes
Activity time:
Part I: 50 minutes
Part II: 50 minutes

■ **Setting:**
Classroom, schoolyard

■ **Skills:**
Gathering information (collecting, observing), Organizing (mapping), Analyzing, Interpreting

■ **Charting the Course**
This activity provides a good introduction to watersheds. Students make a model of a watershed in "Branching Out." Students can investigate the possible effects of the run-off from their schoolyard in "A-maze-ing Water." Following this activity, students can explore aspects of nonpoint source pollution in "Sum of the Parts."

■ **Vocabulary**
watershed, nonpoint source pollution

Summary
Students are introduced to the concept of watersheds by collecting data about water flowing over school grounds.

Objectives

Students will:

- identify the watershed in which their school is located.
- explain the role the schoolyard plays in the watershed.

Materials

- *Maps of the local community, showing streams, lakes, and topography*
- *Drawing paper*
- *2 sets of copies of the Legend*
- *Waterproof outerwear*
- *Clipboards or sturdy cardboard with rubber band to secure paper* (Tape 2 pieces of cardboard to form a book; students can close map inside cardboard to keep it dry.)
- *Plastic wrap*
- *Pencils*

Making Connections

Students may be familiar with the idea of a watershed, but unaware that they live and attend school within one. Observing water flowing through and collecting on their school grounds provides students with direct experience in their watershed.

Background

Puddles, streams, and lakes all have something in common. They collect water that has drained from watersheds. Watersheds are like funnels; they are drainage basins where surface water runs off and drains into a common collection site. Watersheds are separated from each other by land forms (ridge lines or mountain divides). Water falling on each side of the divide drains into different watersheds and collection sites.

Surface runoff flows over a school's grounds on its way to the collection site (e.g., a river); therefore, schoolyards are part of a watershed. (Puddles are the collection sites of mini-watersheds: land surrounding puddles are the mini-drainage basins that empty into the puddle.) When the puddles overflow or the soil becomes saturated, water is released.

Often, materials carried by water to the school grounds (e.g., litter, twigs, leaves, oil) are left behind. Surface water leaving the school grounds may carry materials to the collection site of the watershed. These materials include soil, leaves, and twigs; litter; oil and gasoline from parking lots; and fertilizer from lawns.

As water flows from the school grounds, it combines with runoff from other land areas within the drainage basin. Materials from these other places are added to the water. While some substances decompose, settle out, or are filtered by soil, other matter continues to travel long distances downstream. Organic materials carried by the water nourish aquatic life. Some substances are toxic, however, and can endanger organisms consuming or living in the water.

Contaminants whose entry point into the watershed is difficult to locate are classified as nonpoint source pollutants. Along with residential areas, agricultural fields, and paved parking lots, school grounds can contribute nonpoint source pollutants. The schoolyard contributes point source pollution when the source of the pollutant can be traced back to a specific location on the school grounds (e.g., sewer, ditch, pipe).

Procedure

▼ *Warm Up*

Show students a map of the community and identify local rivers or lakes. Ask the class if they think a connection exists between their schoolyard and these bodies of water. Tell the class they will take a fair-weather and a rainy-day hike, to study what happens to the water that falls on and flows over their school property.

Although plans for a rainy-day hike will generate student excitement, the wait for a wet day may prove discouraging. The lack of rain offers the opportunity to discuss with students the idea that people do not control the rain or other aspects of the weather. Remind students that even if people cannot "control" the weather, they can often predict it.

Have students listen to, watch, or read weather reports. When is rain predicted? Students can mark the calendar with the date and continue "preparations" for the hike.

▼ *The Activity*

Part I

1. **In planning for the rainy day, have students create a map of the school grounds. Divide the grounds into sections and assign groups to map each area.** Orient students to which direction is north so all maps face the same direction.

2. **Remind groups to include the following: school buildings, parking lots, designated playgrounds, natural areas (trees, grass, flower gardens), with emphasis on water features like streams, temporary and permanent ponds, and constructed water features like bird baths and fountains.**

3. **After students have completed their initial mapping, if there is a school building in their area, have them consider the following questions.** Can they determine where the water that falls on the roofs goes? Does it flow off the roof into gutters that lead to waterspouts or does it fall directly onto the ground? Have students place an "X" on the buildings to indicate the location of waterspouts.

4. **Make two copies of student maps, one for the fair-weather hike where students make predictions of water flow and one for the rainy-day hike when students check their predictions.**

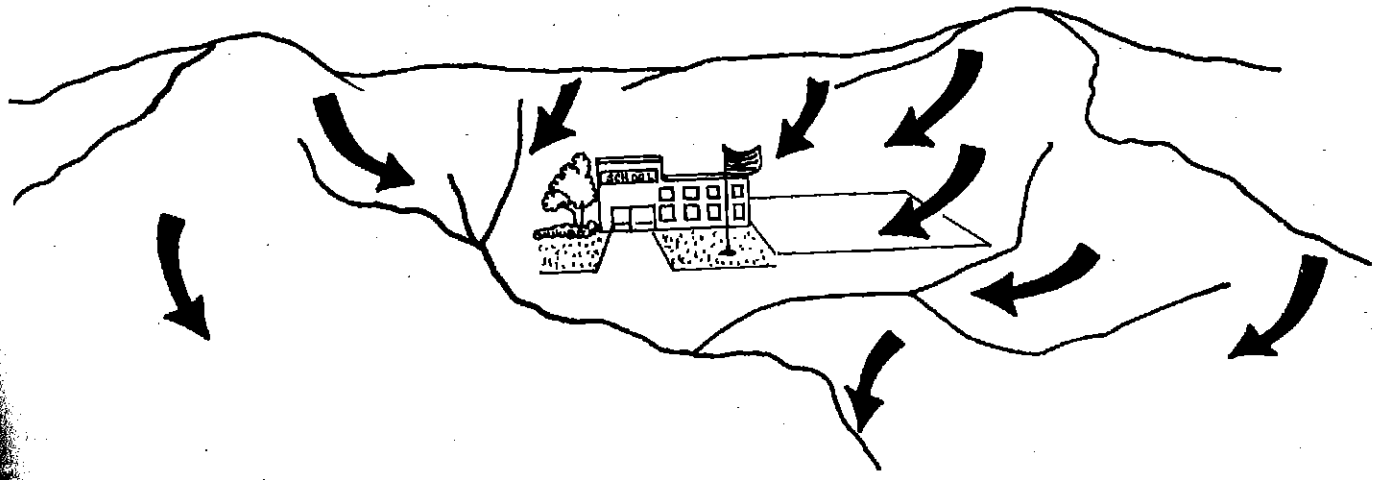
5. **For the fair-weather hike, give each group a copy of their mapped section and the *Legend*. Have each group predict the direction water will flow through their section.** Where do students think water will be stored? Are there ponds or low spots?

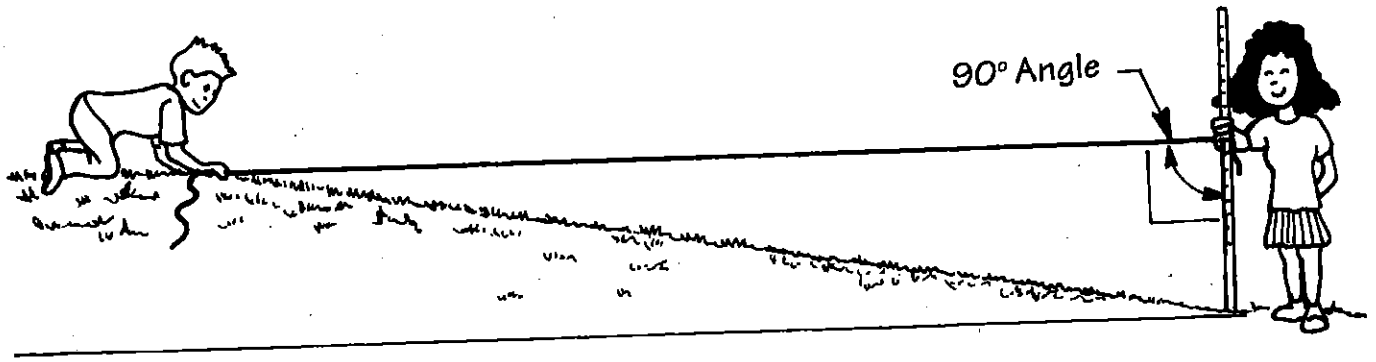
6. **Have students survey the ground area of their section for possible sources of point and nonpoint contamination (oil stains on parking lots, trash, tainted soil near the school dumpster). What materials could be on the roof of the school building that could be washed off during a rain (bird and rodent droppings, insects, dirt, roofing materials, leaves, twigs, etc.)?**

7. **Assemble the map sections from the groups and post in the classroom. Have them summarize their predictions.** How do the predictions of individual groups relate to each other? Where do students think water flows onto the school grounds? Where will it flow off the school grounds?

Part II

1. **On a rainy day, have students dress properly; take them outside and begin a simple tour of the school grounds. Have students identify patterns of water flow.** Discuss what influences the direction water moves. Have students:





- note slopes, depressions, cracks in the sidewalk, erosion trails, rocks, buildings, gardens, trees, etc.
- compare how fast or slow water flows in different places.
- identify ways water affects the surface of the school grounds (e.g., watering plants, eroding soil, piling up litter, washing away litter).
- note water flowing from the roofs of buildings and waterspouts.

2. **Divide the class into their original groups and give each group a copy of their unmarked map section and the *Legend*.** Have students indicate the following on their maps: direction and patterns of flowing water; natural and unnatural materials being carried onto and off their study area; and areas of standing water. Remind students to use pencils—ink runs. They can cover their note pads with plastic wrap or cardboard when they are not writing.

3. **When students have completed their investigations, assemble the map sections and post.** Arrows of adjacent map sections should line up. If they don't, discuss reasons for discrepancies.

▼ *Wrap Up and Action*

Have students summarize the general pattern of surface water as it flows across the school property. They should identify areas where the flow of water is slowed by landforms and vegetation, collects in depressions, and flows off school property. Have them compare the completed map on the rainy-day hike to the map indicating their predictions. How accurate were their predictions?

Referring to a community map, discuss the school's location within a watershed. Trace the likely course of runoff from the school grounds into a local lake or river.

City engineers or planners have information on storm drainage systems, or can identify destinations of storm water runoff from streets and parking lots.

Have the class list uses of water in local lakes or rivers (e.g., drinking water, animal habitat, irrigation, swimming, fishing, etc.). Do any activities occurring on your school grounds affect, positively or negatively, the water moving across it?

Some school property plans incorporate surface water treatment systems, such as detention ponds, to reduce materials carried by runoff. Ask the principal for a copy of the school site plan. Does the plan show the surface water management system for the school?

If students believe their school grounds contribute to erosion or to point or nonpoint source pollution, they may want to develop a plan to improve the area. They can plant trees or a garden, encourage parking lot patrons to keep their cars in tune, promote wise use of fertilizers and pesticides, etc.

Assessment

Have students:

- predict the movement of water and possible contaminants across their school grounds (Part I, steps 5 through 7).
- identify the school's location within a watershed or in relation to a body of water (***Wrap Up***).
- list ways the school grounds positively affect water passing through the watershed (***Wrap Up***).
- locate sources of point and nonpoint source pollution on the school grounds (***Wrap Up***).

Extensions

To increase the detail of their study area maps, students may include measurements of slope. Slopes can be classified as level, gentle, moderate, or steep. How does steepness of slope affect rates of water flow, erosion, and sediment load? To measure slope, one student stands at the top of the study area (top of the slope) and another student, holding a meter stick, stands at the bottom. The run or distance between the two students is measured. The student at the top holds one end of a string at

his ground level and the other end is extended to the student at the bottom of the slope. A level is needed to ensure the string is held straight. The point at which the string intersects the meter stick held by the second student is the rise. Slope gradient is calculated by dividing the rise by the run.

$$\frac{\text{rise}}{\text{run}} = \text{slope gradient (expressed as a percentage)}$$

On a community map, have students use pins to locate the school and their homes. Do students share the same watershed address as the school? They can observe surface runoff to see where the water goes. Topographic maps may help locate ridge lines within the community.

K-2 Option

Have students work in small groups to investigate sites of flowing water on the school grounds. They should observe what is in the water. Caution them not to touch the water, especially if the water is running off a parking lot. Children can search the area for natural materials with which to construct tiny boats. Have boat races to see how far and where the boats travel. Students can draw pictures describing what the tiny boat might encounter if it flowed off the school grounds. Discuss reasons why the school grounds must be kept clean.

Resources:

Doppelt, Bob. 1993. *Entering the Watershed: A New Approach to Save America's River Ecosystems.* Washington, D.C.: Island Press.

Dorros, Arthur. 1991. *Follow the Water From Brook to Ocean.* New York, N.Y.: Harper Collins.

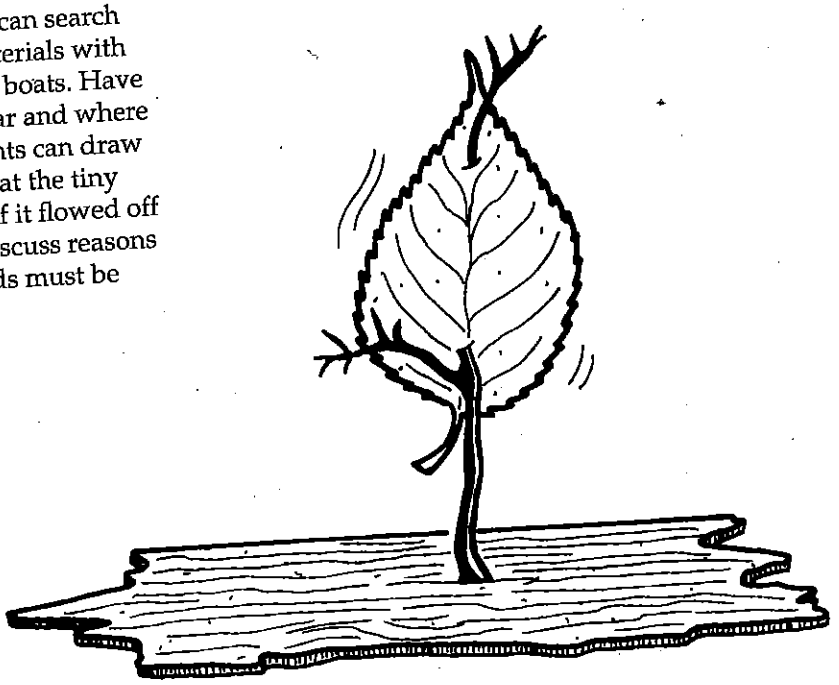
Holling, Clancy. 1941. *Paddle to the Sea.* Boston, Mass.: Houghton Mifflin Company.

Locker, Thomas. *Where the River Begins.* New York, N.Y.: Dial Books.

Miller, G. Tyler, Jr. 1990. *Resource Conservation and Management.* Belmont, Calif.: Wadsworth Publishing Company.

Project WILD. 1992. Activities "Puddle Wonders," "Where Does Water Run Off After School?" and "Watershed." *Aquatic Project WILD.* Bethesda, Md.: Western Regional Environmental Education Council.

Notes ▼



Legend

arrows indicate direction of water flowing onto and away from study area

a leaf indicates natural materials, such as leaves, soil, and twigs, that might have been carried onto study area from another location

a puddle shows where water collects in the study area

a crumpled ball of paper indicates unnatural materials, such as litter, oil, and chemicals, that might have been carried onto the study area from another location

a flower shows things that help slow the flow of water

a shaded leaf indicates natural materials that are being or could be carried away from the study area

a shaded, crumpled ball of paper indicates unnatural materials that are being or could be carried away from the study area