

ROBERSON MUSEUM AND SCIENCE CENTER

Post-Visit Confluence: Build Your Own Watershed

Grade Level: 7 through 12

New York State Standards: M S & T 1, 4, & 7

Pennsylvania State Standards: S & T 4.3, & 4.7

Objectives: In this activity students will learn the basic properties of a watershed: how water flows from higher elevations to lower elevation and how watersheds are interconnected. The students will also learn that the placement of buildings, roads, and parking lots can be important to watershed runoff. In addition, students will explore that the careless use and disposal of harmful contaminants can have a serious effect on down-stream watersheds.

Materials:

- 1 large Tupperware Container (about 1.5'W x 3' L x 1' H)
- 2 lbs of modeling clay
- 3 lbs of sand (any type will do)
- 2 lbs of aquarium gravel
- 1 roll of wax paper
- Tin foil
- Plastic wrap
- ¼ cup of cocoa mix
- Iced tea mix (to represent chemicals)
- One spray bottle

Procedures:

1. Background Information: The land we live on is divided into watersheds. A watershed is a land area whose runoff drains into any river, stream, lake, or ocean. Small watersheds, such as those for a creek or a pond drain into small bodies of water and cover small land areas. The runoff from small watersheds, join together, and their combined areas become a new larger watershed. All watersheds perform the same function of transporting water over the Earth's surface. The watersheds encompass suburban lawns, parking lots, and city streets. Water seeps down through the soil to aquifers, which are underground formations of rock and soil that contain enough ground water to supply wells and springs.

Many human activities have an effect on watersheds. The construction of dams can limit the flow of water. The construction of roads and buildings can divert and even increase the flow of water. Agricultural fertilizers runoff into rivers and lakes can have an adverse effect on the quality of freshwater and marine life. The irresponsible disposal of household and industrial chemicals can be harmful because these chemicals travel through the watershed, poisoning life and damaging natural ecosystems. Watersheds can also have an effect on humans. Floods are one of the major events in a watershed. Homes built on flood plains are susceptible to flooding conditions when heavy precipitation exceeds the watershed's capacity to absorb water. Rivers, streams, and lakes overflow, threaten human lives, and destroy roads and buildings. It is clear that humans have a close relationship with watersheds. The responsible use of, and planning of, watersheds' use and development is important to ensure that the ecosystems sustained by the watersheds are not destroyed.

2. Procedure:

- a) Explain to students what watersheds are. See if you can obtain a map of your local watershed and what it drains into. Ask students to sketch their watershed after you have had a detailed discussion about it.
- b) Before you meet with your students again, prepare the next four steps (c-f).
- c) Wash the aquarium gravel well so as to remove the powdery residue that may add cloudiness to the water. Fill the container to about 2 inches from the bottom with gravel. Slope the gravel slightly so, that at one end (downslope), the gravel is only about $\frac{1}{2}$ inch deep and, at the other end (upslope), the gravel is about 3 inches deep. This gravel layer will represent the aquifer.
- d) Mix the clay and the sand. The consistency of this mix should be gritty, with slightly more clay than sand. This mixture should allow water to run freely over it, but if left standing, the water should slowly permeate the surface. Add this mixture to the container carefully, so as not to disturb the slope of the aquifer already placed. The slopes should be similar, with about 2 inches of sand/clay mix overlying the gravel already placed, and on the downhill end there should be about 3" of gravel left exposed.
- e) Carve a channel in the middle of the clay/sand/ layer, about $\frac{1}{2}$ inch deep and 1 inch wide. This channel will represent the main river of the watershed. Near the top of the slope, split the channel into two and three separate channels to represent tributaries.
- f) With some extra clay/sand mix, build little hills between the tributaries. These hills separate the smaller watersheds, but when looked at as a whole, the entire river system is one watershed. You may also wish to add some small model trees or green felt to represent forests of fields. Buildings can be represented with small blocks of wood.

- g) When your students arrive have them flatten out an area along the main river that is about 8 inches by 3 inches. Cut out a piece of wax paper to be about 4 inches by 3 inches in size. Stick this down onto the clay sand mix, sloping it slightly toward the river. Explain to the students that the wax paper represents the impervious surface of a parking lot.
- h) Fill the bottom of the aquarium up to about 2 inches from the bottom with water. The water should fill all of the aquarium gravel “aquifer” area, and should just reach up to the lowest extent of the clay/sand mixture. Explain to the students that the aquifer captures and transports water that seeps down through the soil.
- i) Using the spray bottle, simulate rain over the flattened soil area and the parking lot. Ask the students to note that the “rain” soaks through the soil, but runs off the parking lot to the river. Ask them what the effect would be if the entire watershed was paved?
- j) Sprinkle some cocoa mix over the sides of one of the smaller watersheds. Tell the students that the cocoa mix represents pollution. Over one of the unpolluted watersheds, cause some rain with the spray bottle (you may need to actually pour the water). Note that the runoff from the rain is clean. Now, make it rain over the polluted area. Ask the students to note how the pollution travels down through the watershed, contaminating all downstream areas. Discuss with the students why pollution is a problem, and what can be done to fix the problem.

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