Instructor Notes

Watershed Demonstration

The Problem

Watersheds, the area of land which drains water into other bodies of water, will be discussed through guided inquiry and exploratory learning using the watershed demonstration table located in The Water Wagon.

Key Science Concepts
Earth Science – 4th Grade
- S1-C2-PO1, PO3
- S1-C3-PO2
- S1-C4-PO5
- S6-C2-PO3, PO4

Prior Concepts and Skills Needed

Students should complete the definition portion of the student handout in class before this activity. This will prepare them for the terminology discussed in today’s lesson.

Materials

Per Student Group

These should be provided in the watershed demonstration table supply area but you will need to check supplies before you begin.

- watershed demonstration table
- plastic and/metal toys such as vehicles, animals, people, buildings, plants, blocks, fences, foliage, etc.
- plastic PVC pipes of various lengths
- rocks of various sizes
- watering can
Safety and Disposal

The watershed demonstration table is supplied with a special type of ‘sand’. This is made from recycled soda, milk and detergent bottles. This is expensive so please ask students to keep their hands in or above the demonstration table at all times and to remove as much as possible from their hands before leaving the area.

Getting Ready

Become familiar with the watershed demonstration table and where the pump switch and on/off valves are located and how they work. The watershed demonstration table is designed with a slope to create a gravitational flow from high to low points, the high point area being the side of the table near the water spouts and the low area near the drain. This is to help the water flow with gravitational force as it does in nature.

The water spouts are located at the top of the table to simulate rain in the higher areas of a watershed, like rain on a mountain. Just as rain comes down in varying quantities in different areas, the water spouts are designed to control the speed of the water flow and can be turned on and off independently. Rocks are placed under these spouts to lessen the splashing and to create a uniform flow.

To prepare the table, rake all the sand towards the spout area of the table away from the drain. Place rocks in the area under the spouts. Have the watering can filled and nearby as well as the toys, pipes, foliage, etc.

This lesson is set up for the instructor to lead the students in a question/answer discussion about the various terms (noted in bold print) that they defined on their student handout. All of the terms correlate with a watershed. Hands-on activities are then completed to apply their learning and to create a model of a watershed.
Procedure Notes

1. What is a watershed?

   The area of land that catches and drains water into other bodies of water.

2. What do you call water that enters a watershed in the form of rain, snow, or hail?

   Precipitation

3. The boundaries of the watershed demonstration table are its sides. These boundaries help control where the water within the table flows. What would be the boundaries of a natural watershed?

   Mountains, hills, ridges and other types of high geographic features. Students may also name specific mountains, such as the Pinaleno Mountains, Mt. Graham, Frye Mesa, etc.

4. Allow students 3-4 minutes to create high features for the watershed area near the water spouts. From these high points, students are to create water pathways (creeks, washes, streams, rivers, etc.) towards the low part of the table (drain).

5. Using the watering can, sprinkle water on the high land areas and observe. What is this water called that is running off the land and where does it go? Why?

   Runoff. Runoff water travels from high to low areas.

   Gravity.

6. The low area is represented by the drain. In nature, what geographic features would the drain area represent?

   Large lakes, reservoirs, rivers, or oceans.

7. Turn both water spouts on slowly. Is the water the only thing moving down the water pathways that are created?

   No. Students should see small particles of sand moving along with the water.

   What is the name of the process in which water carries sand, soil, dirt, and gravel with it as it moves?

   Erosion.
8. Discuss the good and bad things brought about by erosion. Good: it carries fertile soil into flood plains (farming areas along the Gila River) and can create beautiful landforms (Grand Canyon). Bad: landslides and avalanches; sediment in a stream can be altered and thereby change a habitat.

9. Turn off the water and ask students if it is possible to stop erosion? Ask the group of students standing near one spout to add plastic foliage along the bank area at the beginning of the water pathway area that leads from that spout to the drain. Tell them they have just created a Riparian area. This is an area along a body of water which supports different plant and animal life. Why would different animals likely be found in this area?

There are more plants, which provide food and habitats for the animals.

10. Turn the water on to both spouts and observe. Near the spout area with the foliage, students should observe less erosion occurring than in the area near the spout with no foliage. Why?

This happens because the roots from the plants help trap soil and sediment and keep it from flowing away with the water. These roots and plant parts, if located in the water pathway, help reduce the force of the water in this area.

11. Does water only move across soil? No. Demonstrate this by having students dig down into the sand as if they were digging a pond. This water is called groundwater. How did it get there?

Water seeps into the ground, (soil, gravel, rocks) because it is permeable, and continues to move to lower elevations because of gravity. This process of water moving through permeable substances is called percolation.

12. With the water on, ask the students to observe the flow of water through their simple watershed. Turn the water off. Can changing one part of a watershed area, through the development of a community, affect the rest of the watershed? Provide the students with the toys, pipes, etc. and give them 4-6 minutes to complete creation of their community within their watershed area. When time is up, ask the students to remove their hands from the sand, brushing the sand off while over the table, and then turn on both spouts slowly and observe. Turn the flow down to a small trickle and observe to create drought conditions. Turn the flow up to high and observe what can happen to this designed community if precipitation comes in large amounts (summer monsoons) in a short amount of time.
**Assessment**

Students will complete the Post-Activity Discussion and Conclusion portion of their handout back in the classroom.

Watershed terms defined:

**watershed:** the area of land that is drained by a water system

**boundaries:** borders or limits

**run-off:** water from precipitation that runs across land and then into a stream or river

**erosion:** wearing away of a bank or river

**sediment:** sand, gravel, rocks, or other materials that settle down to the bottom of a stream

**riparian area:** the area along a water body which is wet enough to support different plants and animals

**groundwater:** water contained in permeable materials below the earth's surface

**permeable:** having openings that will allow liquids to pass through

**percolation:** to ooze or trickle through a permeable layer

Watersheds will vary according to location. Possible resources to finding this answer include the Internet, the library, Bureau of Land Management office, USDA Natural Resource Conservation Development office, and your local water utility company.

Human activities within a watershed area can decrease (dams) or increase the flow of water (buildings and roads reduce the areas available for water to flow). Many communities use the water located in the streams and rivers as drinking water. Business, agriculture, and human activity near these sources of water can add contaminants to the water making water treatment necessary for human consumption. Watershed can become dry during drought conditions thereby affecting life within. Also, flooding can occur affecting the watershed's ability to handle the amount of water within its boundaries, sometimes forcing changes in boundaries and damaging property within its path.
Answers to the Discussion and Conclusion section will vary. A possible idea is to form groups and have each group use a different resource for locating and naming the watershed they live in. These groups could then discuss and reply to the next two answers and then share and discuss their answers with other groups in the class.

**Explanation**

In this activity, students create a simple watershed and observe how water is transported over the earth’s surface after it enters until it drains from that watershed area. Watersheds can be as simple as a creek carrying water to a nearby pond, or more complex such as the waterways within a large geographic area such as Arizona and New Mexico, and other areas of the United States. Students also learn how humans can affect a watershed, just as a watershed can affect the humans living within.

This activity has been adapted from a project funded by the U.S. Bureau of Reclamation for Rolling Rivers. Coronado RC&D and Arizona Conservation Districts and USDA Natural Resources Conservation Service were also part of the joint project to get the trailers built and in use throughout the state. 1/05