Hands-On Activity

It's All Downstream

In this activity, students will create a model of a watershed that includes Chesapeake Bay. They will then simulate the introduction of pollutants somewhere in the watershed and observe how pollutants can travel downstream and affect many different water resources.

Estimated time to complete: 40 minutes

Materials:

Per each group of students:

- Approximately eight feet of aluminum foil; four feet to cover a large cookie sheet and four to help them model landforms. Have extra foil on hand in case it is needed.
- Medium-sized hardcover book
- Cooking oil with food coloring
- 2 cups of water
- Large cookie sheet (or other similar-sized flat and rigid material)
- Map of Virginia with watersheds clearly delineated
- Modeling clay

Before the start of this activity, add many drops of food coloring to a bottle of cooking oil. Shake the bottle so that the dye disperses. It will not blend completely with the oil, but it will enhance the color and visibility of the oil. When this oil is added to the water later in the activity, it will help students see the simulated pollution better. Also, you can wrap the cookie sheets in aluminum foil in advance if time for the activity will be limited.

Begin the activity by asking students to review what they have learned about water pollution so far. You may choose to have them read the passage **We All Live Downstream** or view the video segment **Water Pollution** in order to familiarize themselves with the effects pollution can have on water resources and surrounding watersheds.

Next, divide students into small groups. Provide each group with all of the above materials except the cooking oil. Instruct students to use the map of Virginia to assist them in shaping a watershed model on their cookie sheet. The model should show major rivers, changes in elevation, lakes, bays, and estuaries. All models should include at least some part of Chesapeake Bay. If you wish, you may also instruct students to create simple labels of the different features within the watershed they model. Students should use both the modeling clay and the aluminum foil to create landforms and changes in elevation. Students can prop up one end of the cookie sheet with a book to more clearly demonstrate the changes in elevation in the watershed.

Next, instruct students to predict what will happen when they pour water onto the model. Most students should see that water will move downstream, following any rivers they have modeled and gathering in the lakes, bays, and estuaries they modeled. Have students create charts to record their predictions and observations in.

A sample graph may look like this:

Trial #	Water Quality	Where will the water move to?	What did the water do?	The potential effects of the water flow
Trial 1	Clean			
Trial 2	Polluted			

Next, instruct groups to slowly pour one glass of water on the model and observe what happens. They should record notes on their observations.

After students have finished their first trial, inform them that a landowner near the headwaters of the main river has added pollution to the water. Move among the groups and carefully pour about two teaspoons of oil into their second cup of water. Again ask students to predict what will happen when the water with pollution moves through the watershed. Then allow students to carefully pour the water onto their models. Students will see that the pollution moves throughout the watershed. Some will move all the way downstream, ending at the estuary or bay they created, and some will stick to other parts of the model, leaving bits of oil along the banks of rivers.

End the activity by asking students several questions to help them summarize what they observed. For example, ask: *What happens when pollution enters a watershed? Why can pollution accumulate in the bay? What does the term "we all live downstream" mean? Why is it important to monitor the health and quality of different water resources?* Record the questions so that students can read them. After asking students to share their observations, have them write a short essay answering at least two of the questions, using evidence from their experiments to back up their responses.

Inquiry skills in this activity:

- Identify
    - Develop predictions/hypotheses
        - state what may happen in an investigation based on prior knowledge or experience (prediction)
- Design Investigations
    - Make or use models that:
        - Simulate a real thing that cannot easily be studied or manipulated.
        - Have as many details as possible replicated from the real thing.
        - Allow the testing of a hypothesis with results that can be extrapolated to the real thing
- Gather Data
    - Use senses to observe
        - Seeing (color, shape, size, texture, motion)
- Interpret Data
    - Sort and classify using
        - Objects, substances and organisms by characteristic
    - Identify and interpret patterns
        - Trends in data
        - Repeating physical or data pattern
        - Graphed data points
- Evaluate Evidence
    - Draw and support a conclusion by:
        - Reporting on trends and patterns in the data.
    - Assess the conclusion by:
        - Identifying alternate explanations
        - Extrapolating results beyond the investigation
- Patterns and Systems
    - Patterns and Change
        - Patterns in nature may be simple repeating patterns or complex growing or changing patterns
    - Systems
        - A system, such as the human body, is composed of subsystems.
        - As the complexity of any system increases, gaining an understanding of it depends on summaries, such as averages and ranges, and on descriptions of typical examples of that system.
- Scientific Investigation
    - Scientific Data and Outcomes
        - Collecting and analyzing data is the best way to understand a changing pattern.
        - Results of similar scientific investigations may turn out differently because of inconsistencies in methods, materials, and observations.