

Watersheds

Time: One 90 minute session

National Benchmarks: Benchmarks 5A: Diversity of Life; 5D Interdependence of Life; 5E: Flow of Matter and Energy; 9B:Symbolic Relationships; 9D:Uncertainty; 12B:Computation and Estimation; 12D:Communication Skills; 12E:Critical-Response Skills.

National Science Content Standards: *Science as Inquiry: A; Life Science: C:* Biological Evolution; The Interdependence of Organisms; Matter, Energy, and Organization in Living Systems; *Science and Technology: E:* Abilities of Technological Design; Understandings about Science and Technology; *Science in Personal and Social Perspectives: F:* Population Growth; Natural Resources: Environmental Quality; Natural and Human-induced Hazards; Science and Technology in Local, National, and Global Challenges

New York State Standards: 1, 2, 3, 4, 5, 6, 7

Objective:

1. Students will know how water flows around their school and be able to create a map of their local watershed.
2. Students will know what a watershed is and will be able to explain how pollution and permeability within a watershed will affect water quality.

Lesson Outline:

1. Students discuss what they know about watersheds and create a drawing of their school's watershed after a walking tour
2. Students create a watershed model
3. View powerpoint explaining the importance of land cover in watersheds

Materials:

- For each group: a plastic or metal tray, a spray bottle filled with water, newspaper, paper towels, plastic wrap, food coloring or kool aid, tennis ball, tape measure, local topographic map
- For each student: copies of Runoff worksheet

Preparation: Students should read for homework an introduction to watersheds. Students should dress appropriately as the first part of this lesson takes place outside.

Engage: Ask students where water goes when it rains. Answers may include the ground, gutters, sewers, streams, etc. Ask which direction water runs: The answer, of course, is downhill. Water always follows gravity. Ask students if they know what a watershed is? They should have read about watersheds for the previous night's homework and may remember the definition. Write definition on the board and give further explanation of what a watershed is. Show pictures of the watershed where the school is or where most students live. Explain that we get our drinking and household water from a watershed.

Explore 1: Students should brainstorm what sorts of land cover are permeable (forests, soil, fields, lawns, etc.) and which are impermeable (rooftops, cement, asphalt, some types of clay and rock formations)

Go for a walk with students around the outside of the school. Have them sketch on scrap paper the rough perimeter of the building and its viewable surroundings (roads, soccer fields, parking lots, etc.). Students should draw arrows indicating which direction water would flow in the case of a rainstorm or melting snow. Make sure they include the roof of the school, roads, etc. Students should use a tennis ball or other spherical object to indicate direction of the pull of gravity to help them determine which way water would runoff of a surface. For the more ambitious students, use the 100 ft tape measure to make their drawings to scale.

Return to class and, in groups of no more than 4 students each, have them sketch the school and its surroundings on large paper. Shade areas that are permeable in one color and areas that are impermeable in another. Use black arrows to indicate the direction of runoff of water. When students have finished their sketches have them use the topo map and their own drawings to answer the questions on the Runoff Worksheet.

Explore 2: Instruct students to use the newspaper to create a landscape in their tray. Then cover their newspaper landscape with plastic wrap and spray with the water bottle. Have students make observations about how the drops of water are moving. Have one member of each group report to the rest of the class the observations their group made. Discuss the different landscapes made by the groups and the following questions: How do the water droplets move? (downhill), are they collecting?, what might these collections of water represent? (lakes, ponds, streams, rivers), how did the large rivers and lakes form? (from smaller streams feeding them). Ask students if they think the plastic wrap accurately represents the land in a watershed? Remind students that the plastic wrap is impermeable. Have students suggest types of land cover that are impermeable (rock, pavement, buildings, etc.). Ask what types of land cover are permeable? (soil and vegetation). Tell students that the paper towels will represent permeable surfaces. Have each group add paper towels to their models. Instruct each group to use a different amount, one group to leave just the plastic wrap, and one group to cover the entire landscape. Now have students spray again and observe differences with the paper towels. Discuss the role vegetation plays in regulating the flow of water.

As a class, brainstorm what types of pollutants are likely to be on the land. Make a class key of pollutant colors and types. Next, have students add pollution to their models using either the food coloring or different types of colored sugar and spray again. Have students make observations of how the rain affects the movement of the pollution and what this means for our water supply.

Explore 3: Ask students how permeability or impermeability of water may affect water quality. Get several suggestions. Using the powerpoint presentation, review the effects of different land cover on runoff.

Explain: A watershed is all the land uphill from the river or stream. You can think of it as a V-shaped land formation with smaller streams or rivers as well as lakes, ponds, wetlands and of course urban development. Everything that falls or is put on the Hudson's watershed feeds the river. Precipitation flows into small rivulets that flow into larger and larger streams that eventually flow into the Hudson. The Hudson River officially starts at Lake Tear of the Clouds in the High Peaks area of the Adirondacks,

although many sources dispute the ‘source’ and name Henderson Lake, which is even further north. However, you may not even recognize the mighty Hudson where it begins, because it is a small stream that slowly gains in strength and size as it flows south. The river flows south for 315 miles to the Atlantic Ocean at New York City. The huge watershed of the Hudson covers approx. 13,390 square miles, which includes most of eastern New York, small parts of Vermont, New Jersey, and Massachusetts.

Since the northern part of the Hudson is surrounded by a largely forested landscape and ancient metamorphic rocks, the river is clear and cold and is a favorite of fishermen and white-water rafters.

When the Hudson passes over the Troy dam, it becomes an estuary, which means that it is mixing place for fresh and salt water. From here to the mouth of the river, the Hudson is large, tidal, and nearly flat. Tides affect much of the Hudson river, causing changes in its flow and its chemical composition. The Hudson changes dramatically as you move south to New York City, becoming more developed.

Extend: Students can create more specific watershed models of their school or home.

Evaluate: Have students write a response to the prompt – Why is it important to protect watersheds from pollution and development? You can also use their answers to the Runoff worksheet and their drawings as evaluation methods.

Comments:

References: The ‘create a watershed’ part of this lesson is adapted from Activity 3: What is a Watershed? from the DEP, www.nyc.gov/dep).