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Stream Geo-ecology

Subject Area: Environmental Science **Core Curriculum Content Standards:** 3.3A, 3.4A, 5.1A&B, 5.5A&B, 5.7A, 5.8ABC&D, 5.10A&B, 6.6E

Session Description

In this session, students take a scenic hike along the Big Flatbrook River. Several stops include hands-on demonstration, simulation, and investigation activities related to the concept of watersheds.

Objectives

1. In the classroom, after observing the watershed demonstration, students will state orally the definition of a watershed in their own words.
2. At the Big Flatbrook, given a poster of a watershed that shows how stream profile, human activity, and wildlife usage differ in upper, middle, and lower portions of the watershed, students will discriminate between the upper, middle, and lower watershed by describing the stream profile, human activity, and wildlife usage that occur in each portion of the watershed.
3. At the Big Flatbrook, given the definition of point and nonpoint source pollution, students will discriminate between point and nonpoint source pollution by naming who represented each type of pollution after participation in a simulation of pollution traveling through a watershed.
4. At the Big Flatbrook, given a net, pan, and biotic index, students will generate an evaluation of water quality in the Big Flatbrook River by sorting the organisms caught into groups according to tolerance level.
5. At the Big Flatbrook, given a tape measure, stick, and stopwatch, students will demonstrate, by solving for the stream's velocity, the formula $d = rt$.
6. At the Big Flatbrook, given the formula for carrying power and the stream's current velocity, students will identify, by calculating, the stream's carrying power.
7. At the Big Flatbrook, after role-playing sediment in a watershed, students will identify the upper, middle, and lower watershed as primarily erosional or depositional bodies by interpreting the position of each type of sediment at the end of the role-play.
8. At the Big Flatbrook, after role-playing the flow of water along a tree-lined stream bank, students will identify how a stream meanders and cuts a flood plain over time by interpreting the effects of the water on the stream bank in the role-play.
9. At the old home site next to the Big Flatbrook, students will generate strategies for altering human activity in order to protect watersheds by synthesizing concepts learned during the Stream Geo-

ecology hike.

Materials Needed

Paper, markers, spray bottle, relief map, watershed map, drainage patterns card, Flatbrook watershed card watershed diagram rope, watershed pollution bottles, 5 strainers, biotic index collection pan, biotic index invertebrate reference card.

Procedure

1. Demonstrate the making of a watershed by folding a piece of paper in half, coloring 1/2 inch on either side of the fold with a washable marker, crumpling the paper up, and then un-crumpling it. Have a student spray water on the top of the fold and watch two separate watersheds (or drainage basins) form on either side of the mountain. Ask students to define the term watershed (the land area from which a body of water receives its supply of water). A watershed is an open system. What are its inputs? (Precipitation, snow melt, sediment). What are its outputs? (Evaporation, stream flow, deposition).

2. Have students identify which watershed they live in using the DEP map and point out its major rivers as well as the larger body of water into which it empties. Next, point out the Big Flatbrook watershed to the students and compare and contrast it to the watershed in which they live. (e.g. both empty into the Atlantic Coastal basin).

3. Show students the types of drainage patterns a watershed can have. Briefly discuss how the slope of the land and the structure of the underlying rock help shape each pattern. Show students the smaller map of the Upper Delaware Watershed. Which pattern do they think it most resembles? The Ridge and Valley province is often classified as a trellis-shaped watershed, with major rivers in the valleys and smaller streams joining them at nearly right angles from the ridges. Point out how the shape of the watershed changes as you change your scale of examination by having students try to identify the drainage pattern of just one stream in the Upper Delaware Watershed.

4. Begin your hike along the Big Flatbrook watershed. At the top of the hill overlooking the Flatbrook river, take out the watershed diagram. What drainage pattern does this diagram exhibit? Inform the students that although the Upper Delaware watershed has a trellis-like pattern, the Flatbrook watershed (within it) is more dendritic. Dendritic drainage patterns are the most common and can be found anywhere. Use the pictures on the diagram and the information on the back to discuss with students the differences in stream profile, human activity, and wildlife usage at each level of the watershed. Have students observe the environment around them. What part of the watershed do they think they are in now? Why? In what part of the watershed do they normally live?

5. At the bottom of the hill, use the ropes to illustrate the dendritic watershed pattern again. Have one student stand in the lower watershed holding a clear jar half full of water from the Big Flatbrook. Hand out the different types of “pollution” to the students in the upper watershed. Have each student contribute his or her type of pollution to the jar. You may refer to the watershed diagram to elicit from students where these types of pollution might come from. Discuss the differences between point source pollution (pollutions discharged from an identifiable point such as a pipe, ditch, or sewer) and nonpoint source pollution (widespread overland runoff).

6. Walk to a pebbled beach or other area where the water can be accessed easily for the biotic index. Use the watershed diagram to discuss different animal uses of the watershed. Hand out nets to pairs of students and demonstrate collecting techniques for aquatic organisms. Allow ten to fifteen minutes for collecting and then use the chart provided to complete a biotic index of the stream. If the stream were identified as Class III, how would scientists go about deciphering where the pollution was coming from? (they would check each stream leading into the Big Flatbook)

7. Head down stream to the big boulder that sits mid-stream. This is an erratic. Ask the students how it

may have gotten here from its origin 10 miles away (Glaciers). Talk about this major climate event and how it allowed the first humans to enter North America, about 10,000 years ago (across the land bridge formed between Asia and Alaska). Talk about the ensuing impact humans have had on the continent.

8. Conclude your hike at the old building site. Have students contrast this part of the floodplain with the portion they have just left. Have them look for evidence of human activity. Was this a good place for a home (in the flood plain)? Why or why not?

Additional Optional Activities

1. Determine the velocity of the water using a tape measure, a stick, and a stopwatch. Square this number to get the carrying power of the stream. Point out to students the importance of this calculation: the carrying power of the stream increases proportionately with its velocity. Thus, even though the carrying power for cobblestones is considerably higher than the carrying power for sand, the stream only needs to be going a little faster in order to transport them

Summary

Review the activities of the hike and the concepts learned. How could humans change their activities to better protect watersheds? Discuss current litigation.

Classroom Extensions

Have students research their own watersheds. They can go to www.state.nj.us/dep/watershedmgt for maps and information.

Bibliography

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