

As the River Flows

Strand	Earth Resources
Topic	Effects of human activity, erosion, and conservation on habitats
Primary	3.10 The student will investigate and understand that natural events and human influences can affect the survival of species. Key concepts include b) the effects of human activity on the quality of air, water, and habitat; c) the effects of fire, flood, disease, and erosion on organisms; d) conservation and resource renewal.
Related SOL	3.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which j) inferences are made and conclusions are drawn; m) current applications are used to reinforce science concepts. 3.6 The student will investigate and understand that ecosystems support a diversity of plants and animals that share limited resources. Key concepts include d) the human role in conserving limited resources.

Background Information

Rivers, creeks, and streams throughout the Chesapeake Bay watershed are lined with a wide variety of land types. The impact of the land use surrounding the upper portions of a river is felt all the way downstream, influencing the water quality of the river and, ultimately, the Bay.

The most effective method of reducing erosion which causes run-off, sediment, and nutrient levels in the water is the maintenance of vegetation along the riverbank. Vegetation serves as a natural filter, slowing the flow of run-off and holding the soil in place. Vegetation also shades the waterway and prevents the water from reaching unhealthy temperature levels. Farmers who practice no-till farming and/or contour plowing help to reduce run-off and erosion. Developers who maintain a vegetated buffer along waterways help to reduce the potential run-off of pollutants and sediment. Contractors who use retaining fences also reduce the level of run-off and erosion from building sites.

Materials

- Piece of drawing paper with edge cut to resemble the edge of a riverbank
- Long piece of blue bulletin board paper to represent a river
- 3 x 5 inch sticky notes
- Large piece of paper cut into the shape of a raindrop

For each group of students:

- A scenario cut from the “Land Use Scenarios”

Vocabulary

Stewardship

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

Introduction

1. Divide the class into pairs. Give each group a piece of drawing paper and one of the Land Use Scenarios. Instruct each group to draw a picture of their piece of land, using the information given in their scenario. Impress upon them that they should include in their drawing all the details from the scenario.

Procedure

1. Give at least one 3 x 5 inch sticky note to each group. Direct each group to list on the note items from their land that could end up in the river with or without the aid of surface runoff.
2. When all groups have finished, have students place their drawings along the edge of the blue bulletin-board-paper river.
3. Beginning at the head of the river, move the paper raindrop downstream. As you pass by each land-use picture, ask the group that drew it to read their scenario to the class, describe what they have drawn, and read the list from their sticky note. Then, have the group place their sticky note on the raindrop. Proceed to the next land-use picture, and repeat the process.
4. Upon reaching the end of the river, read the sticky notes that are on the raindrop, and discuss the items. Ask students to help you list on the board the items that appear most frequently. Are some items more harmful to the water than others? Are there any that could be helpful? Discuss possible improvements to the land use in each piece of land that would decrease the negative impact on the river's water quality.
5. Have the groups modify their drawings to reflect better stewardship of the river. Discuss the meaning of *stewardship*.
6. Take the "river" and "raindrop" outside. Again, give the student groups sticky notes, and tell them to imagine that the river passes through the schoolyard.
7. Direct the groups to search the schoolyard for land-use practices that could impact the river. Tell them to look for both negative and positive impacts and to record their findings on the sticky notes.
8. When students have completed their investigation of the schoolyard, have them attach their sticky notes to the raindrop.

Conclusion

1. Return to the classroom, and discuss the items listed on the raindrop. Ask students to name and list the items that appear most frequently. Are some items more harmful to the water than others? Are there any that could be helpful? Discuss possible improvements to the land use that would decrease the negative impact on the river's water quality.

Assessment

- **Questions**
 - List three things that might end up in a river. Explain how this would happen for each thing and what could be done to prevent it for each thing.

- **Journal/writing prompts**
 - Draw a map of the school grounds. Indicate at least three things that have been done or three things that could be done to prevent things ending up in the closest river to the school.
- **Other**
 - Conduct an informal assessment during the activity; determine whether or not students accurately report harmful/helpful impacts of the land area they were assigned.
 - Assess students' solutions for solving land-use problems.

Extensions and Connections (for all students)

- On a field trip to a local stream, creek, or river, have the students assess the land use along the waterway and offer recommendations for improvements.
- Have the students research best practices in land management.
- Have the students study maps to determine land-use practices along a river in your area and then write a story about water as it flows down the river.
- Have the students participate in the Chesapeake Bay Foundation's and Maryland Department of Natural Resources' "Bay Grasses in Classes" program. (see Resources below)
- Have the class write a letter to the principal recommending improvements in land-use practices in the schoolyard. Make sure the students support their recommendations with solid scientific reasoning. Prepare the students for both eventualities: that their letter will not be acted upon, and that it will.

Strategies for Differentiation

- Provide text with visual supports for "As the River Flows Land Use Scenarios."
- Preteach the terms *harmful* and *helpful* that are used during the observations and conclusions portion of the lesson. Create a graphic organizer/t-chart with examples of helpful/harmful impact to the water (visuals could be included or used in place of text).
- Assign strength-based roles within the student groupings.

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Land Use Scenarios

Scenario 1

You are a farmer who grows wheat, barley, and oats. Your farm is along the riverbank. In order to save money in equipment costs, you have chosen to use a no-till method of farming, which means that you do not plow the land that you farm. To keep your land free of unwanted plant growth between crops, you apply herbicides regularly.

Scenario 2

You are the owner of the Riverview Shopping Mall. This mall has many paved parking lots and concrete sidewalks. There is even a sidewalk along the riverbank, where shoppers can relax and eat while enjoying a lovely view of the river. There is extensive landscaping around your mall, with lush trees, shrubs, and flowers. You instruct your maintenance staff to apply fertilizers regularly to keep the landscaping lush.

Scenario 3

You are the owner of the Down by the Riverside golf course. Your course has 18 holes of manicured fairways and greens, all of which are kept green by the frequent application of fertilizers and herbicides. Many of the fairways slope to the river's edge, offering golfers an extra challenge, as well as a beautiful view.

Scenario 4

You are the developer of the Homes on the River subdivision. This subdivision contains 25 homes owned by high-income families. Many of these families have dogs and cats that enjoy the well-manicured lawns that surround each home. Most of the homeowners apply fertilizers and herbicides regularly to their lawns to keep them beautiful. The roads and driveways in the subdivision are paved. The trees and vegetation that once lined the riverbank have been removed in order to give residents a view of the river.

Scenario 5

You are the owner of the Big River Marina. You have numerous concrete boat ramps that descend directly into the river, where boaters can easily gain access to the water. You also sell oil and gasoline from a dock in the river, where boaters can fill their boats with fuel without leaving the water.

Scenario 6

You are a contractor assigned to build a new subdivision of riverfront homes. You are currently in the beginning stages of construction. Your bulldozers have dug up the soil where the foundations of these homes will eventually be built. There is a tremendous area of bare, exposed soil alongside the river.

Scenario 7

You are a farmer who grows corn. Corn extracts a tremendous amount of nutrients from the soil. Since you plant corn in the same fields every year, the soil does not always have enough nutrients to support the growth of the corn. Therefore, you apply a great deal of fertilizer, containing nutrients, to the soil. One of your fields slopes down to the edge of the river. You plow this field in rows that are perpendicular to the river. Rainwater often runs very fast down the gullies created by these rows.

Scenario 8

You are the owner of a forestry company that makes its money by cutting down trees along the river and selling them to lumber companies. You bring in several bulldozers and chainsaws that plow down and cut the trees. This equipment runs on gasoline and produces large quantities of exhaust. To ensure that you will have more trees to cut in the future, you replant the land in pines after you have finished clearing it.

Scenario 9

You are the owner of a chicken farm. Chicken manure contains a very high amount of nitrogen. You have about 20 chicken coops. When it is time for you to clean them, you shovel the manure and pile it on the edges of fields that drain into the river.

Scenario 10

You are the owner of a fishing pier. Many tourists and locals use this pier for sport fishing. Your dock contains a store that sells bait, tackle, and refreshments. Many of the people who fish from your pier catch an average of 20 fish a day. Those that are too small to keep are always thrown back. There is also a spot beside your pier where guests can clean their fish. The remains of the fish are dumped back into the river. There is also a paved parking lot beside your pier that extends very close to the river's edge.
