Lessons from the Bay

Riparian Buffers

How do riparian buffers protect streams, rivers, and wildlife?

Objectives

Students will

- conduct research to learn the roles of riparian buffers
- build a watershed model to illustrate the role of riparian buffers in protecting waterways from polluted runoff
- form hypotheses, conduct an experiment, report findings, and draw conclusions.

Background

A riparian buffer is a zone of vegetation located along the bank of a waterway that serves to protect the water from harmful runoff. The roots of plants and trees in the buffer stabilize the soil and control erosion. They also slow water flow, reducing the threat of downstream flooding after heavy precipitation. By slowing water flow, riparian buffers allow the soil to absorb more water, and thus more water enters the underground water system. This water is naturally filtered as it slowly passes through the soil to replenish the aquifers.

In addition to being a natural water filter, riparian buffers provide habitats for wildlife. Songbirds live in the trees, and waterfowl are attracted to the cover at the edge of the water. Amphibians, turtles, eagles, foxes, and many other creatures utilize the buffer closer to the shoreline. Shad, herring, alewife, perch, and striped bass utilize forested streams and rivers to spawn, preferring the shaded areas near the edge of the water. The buffer's vegetation is a food source for wildlife in and out of the water.

Procedures

Session 1 (45 minutes)

Conduct this session in the classroom.

1. Conduct a class discussion of non-point source pollution in the watershed. Tell (or remind) students that non-point source pollution is discharged from a wide land area and cannot be traced to a single specific location. Guide the discussion so that various sources of pollution are listed, including farms, lawns, golf courses, and roads. Also discuss the types of pollution that might come from each source.

Related Standards of Learning

Science:
3.1.a; 3.1.j; 3.10.d; 4.1.a; 4.1.h; 4.9.a; 4.9.d; 5.7.f; 6.7
English:
3.1; 3.3; 3.6; 3.7; 3.8; 3.9; 3.10; 3.11; 4.1; 4.6; 4.7.b; 4.7.d; 4.7.i; 4.8; 5.1; 5.7; 5.8; 6.2; 6.4; 6.7; 6.8
History and Social Science:
3.10; VS.1.b; VS.1.d; VS.1.h; USI.1.e; USII.2.b; USII.9.b

Time Required

Two 45-minute sessions and one session requiring 2–3 weeks

Materials

- *Internet access*

For each group:

- *2 aluminum roasting pans*
- *soil*
- *grass seed*
- *food coloring*
- *water*

2. Divide the class into groups of 4–5 students. Instruct the groups to brainstorm and write a list of solutions for cleaning runoff and reducing the pollution that enters waterways.
3. Provide students with some of the resources listed at the end of the lesson plan, and allow them time to conduct research on riparian buffers. Tell groups to add to their lists of solutions any other ways they learned toxic runoff can be prevented. Discuss as a class what the students learned from their research.

Session 2 (2–3 weeks)

Conduct this session in the classroom.

1. Assign students to groups of 4–5. Give each group 2 aluminum roasting pans, soil, and grass seed, and provide them with the following instructions:
   a. *Fill 2/3 of both pans with soil.*
   b. *In one of the pans, plant grass seed in the soil in the middle portion of the pan. Do not plant grass in the other pan.*
2. Allow the grass to grow to the height of one inch. (You may choose to have students monitor the growth of the grass and even chart the growth on a line graph.)
3. When the grass has reached the height of one inch, provide each group with 2 cups of water colored with food coloring. Give students the following directions:
   a. *Raise the soil end of each pan by placing a book underneath the pan's edge.*
   b. *Pour 1 cup of colored water over each pan (the water represents polluted runoff).*
   c. *Observe the erosion and the amount of pollution that runs down into the 1/3 of the pan representing the waterway.*
4. When the groups have finished, have each student write a paragraph reporting the results of the experiment. Instruct students also to interpret the results to explain how these models illustrate the role and benefits of a riparian buffer.

Session 3 (45 minutes)

Begin this session in the schoolyard.

1. Take the class into the schoolyard and have students bring notebooks or journals. Direct students to find places where erosion is evident. Tell them to record their observations, including things such as location, appearance, and apparent reason for erosion.

Continue in the classroom.

2. Return to the classroom and instruct students to choose one of the cases of erosion and write a paragraph about their observations. Tell students to answer in their paragraph the following questions:
   - *What factors might contribute to erosion in these places?*
   - *Why should we be concerned about erosion in the schoolyard?*
   - *How does the water that flows over the schoolyard affect streams, rivers, and the Bay?*
   - *What might be done to prevent the erosion from occurring?*
3. When students have finished writing, discuss as a class some of the possible solutions for erosion. If possible, this activity can lead to an extended project in which students carry out one or more of the solutions.

Resources

"Build Your Own Rain Garden." Project Action Guide. *Lessons from the Bay.* 13–17.

"Building an Outdoor Classroom." Project Action Guide. *Lessons from the Bay.* 39–40.

Center for Subtropical Agroforestry. "Riparian Buffers." Agroforestry Information System. Institute of Food and Agricultural Sciences, University of Florida. <http://cstaf.ifas.ufl.edu/riparianbuff.htm>.

Chesapeake Bay Program. *Riparian Forest Buffers.* <http://www.chesapeakebay.net/ripar1.htm>.

Chesapeake Bay Foundation. "Bay Buffers," "Riparian Forests: The Final Frontier." *Watershed Action for Virginia's Environment (WAVE).* (See <http://www.cbf.org/site/PageServer?pagename=edu_educators_curriculum_va_index>, or contact the Virginia Office: Capitol Place, 1108 E. Main Street, Suite 1600, Richmond, VA 23219; phone 804-780-1392.)

Connecticut River Joint Commission. *Riparian Buffers for the Connecticut River Valley*. <http://www.crjc.org/riparianbuffers.htm>.

Conservation Trees for your Farm, Family & Future. Booklet. The National Arbor Day Foundation. (See <http://www.arborday.org/dmerchdetail.cfm?id=42>.)

The Horticulture and Food Research Institute of New Zealand, Limited. "Using Poplars and Willows to Reduce Nitrate Leaching from Dairy Shed Effluent." <http://www.lessoncorner.com/Science/Biology/Botany/Horticulture?page=8>.

Iowa State University Forestry Extension. "Buffer Strips for Riparian Zones." <http://www.extension.iastate.edu/forestry/planning/buffer.html>.

Merwin, Miles. "'Working' Buffer Strips Provide Both Profit and Protection for Oregon Farm." *Temperate Agroforester* (July 1997). Association for Temperate Agroforestry, University of Missouri. < http://www.centerforagroforestry.org/links.php >.

United States. Environmental Protection Agency. "Ecolotree Stream Buffer Filters Runoff, Provides Cash Crop." *Nonpoint Source NewsNotes: Notes on the Agricultural Environment* 44 (Jan.-Feb. 1996). <http://water.epa.gov/type/oceb/nep/upload/2007_04_09_estuaries_monitoruments_manual.pdf>.

United States. Dept. of Agriculture. Natural Resources Conservation Service. National Water and Climate Center. *Riparian Forest Buffers*. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/econ/data/?cid=nrcs143_009726>.

"Using the Library Media Center for Project Research." Project Action Guide. *Lessons from the Bay*. 55–56.

"Using the World Wide Web for Project Research." Project Action Guide. *Lessons from the Bay*. 57–58.

Virginia. Dept. of Forestry. "Riparian Forest Buffers–Introduction." <http://www.dof.virginia.gov/mgt/riparian/introduction.htm>.

Virginia Save Our Streams. < http://www.vasos.org/>.

Classroom Assessment Suggestions

- *Discussion of non-point source pollution*
- *List of solutions for cleaning runoff and reducing pollution*
- *Watershed model and written report of experiment results*
- *Written description of erosion case in schoolyard*

Extensions for Students

- *Become a Virginia SOS stream monitor (see Resources).*
- *Prepare a report about the importance of riparian buffers, supporting it with research from Session 1 and results from the experiment conducted in Session 2. Design the report so that it might be presented to community leaders to convince them of the need for regulation requiring developers and farmers to plant riparian buffers.*
- *Conduct research on the use of poplars and other hardwood trees to increase the effectiveness of riparian buffers. (See "Using the Library Media Center for Project Research" and "Using the World Wide Web for Project Research" on pages 55–58 of the **Project Action Guide**.) See resources specific to such research, including*
  - *Center for Subtropical Agroforestry*
  - *The Horticulture and Food Research Institute of New Zealand*
  - *Iowa State University Forestry Extension*
  - *Miles Merwin*
  - *United States Environmental Protection Agency.*
- *See "Building an Outdoor Classroom" on page 39 of the **Project Action Guide**.*
- *See "Build Your Own Rain Garden" on page 13 of the **Project Action Guide.***