

# Riparian Buffer Metaphors!

**Adapted from:** The Wonders of Wetlands by Alan S. Kesselheim, Britt Eckhardt Slattery, Susan H. Higgins, and Mark R. Schilling. Produced by Environmental Concern Inc. and The Watercourse, 1998

**Grade Level:** Basic to Advanced

**Duration:** 30 to 40 minutes

**Setting:** Classroom

**Summary:**

Students compare the characteristics, functions, and benefits of riparian buffers to common objects.

**Objectives:**

The students will become aware of the positive effects that riparian buffers can have on water quality, overall stream health, and biodiversity.

**Vocabulary:**

Riparian zones, buffers, mitigation, biodiversity

**Related Module Resources:**

- “Riparian Buffer Basics” Fact Sheet
- “Introduction to Riparian Buffers” Fact Sheet

**Materials (Included in Module):**

- Sunglasses, ice pack, sponge, speed limit sign, straws, boat anchor, coffee filter/kitchen strainer, transformer toy, Tupperware container, umbrella, oatmeal, classified ads or illustration of a home, road map, box of animal crackers, pillow, block of lumber, Frisbee, orange safety vest, duct tape, soap, post card
- Riparian Buffer Metaphors! Functions List

**Additional Materials (NOT Included in Module):**

- Potted plant for soil anchoring demonstration extension idea.

**ACADEMIC STANDARDS (ENVIRONMENT & ECOLOGY):**

7<sup>th</sup> Grade

- 4.1.7.B. Understand the role of the watershed.
  - Explain factors that affect water quality and flow through a watershed.
- 4.1.7.D. Explain and describe characteristics of a wetland.
  - Describe the different functions of a wetland.
- \*NOTE: Riparian areas frequently contain wetlands or are considered to be wetlands.
- 4.1.7.E. Describe the impact of watersheds and wetlands on people.
  - Explain the impact of watersheds and wetlands in flood control, wildlife habitats and pollution abatement.
- 4.6.7.C. Explain how ecosystems change over time.
  - Explain a change in an ecosystem that relates to humans.
- 4.7.7.C. Explain natural or human actions in relation to the loss of species.
  - Identify natural or human impacts that cause habitat loss.
- 4.8.7.D. Explain the importance of maintaining the natural resources at the local, state and national levels.
  - Explain how human activities and natural events have affected ecosystems.

10<sup>th</sup> Grade

- 4.1.10.B. Explain the relationship among landforms, vegetation and the amount and speed of water.
  - Explain how vegetation affects storm water runoff.
  - Explain how the speed of water and vegetation cover relates to erosion.
- 4.1.10.D. Describe the multiple functions of wetlands.
  - Describe wetlands in terms of their effects (e. g., habitat, flood, buffer buffers, prevention areas, nurseries, food production areas).
  - Explain how a wetland influences water quality, wildlife and water retention.
- 4.8.10.C. Analyze how human activities may cause changes in an ecosystem.
  - Analyze and evaluate changes in the environment that are the result of human activities.

12<sup>th</sup> Grade

- 4.1.12.D. Analyze the complex and diverse ecosystems of wetlands.
  - Explain the functions of habitat, nutrient production, migration stopover and groundwater recharge as it relates to wetlands.
- 4.1.12.E. Evaluate the trade-offs, costs and benefits of conserving watersheds and wetlands.
  - Evaluate the effects of human activities on watersheds and wetlands.
- 4.6.12.C. Analyze how human action and natural changes affect the balance within an ecosystem.
  - Analyze effects of human action on an ecosystem.

**BACKGROUND:** Riparian zones are the areas found alongside waterways. When these areas consist of trees, shrubs, and vegetation, they act as **buffers** between outlying farms, industries, homes, or other land uses and waterways. Such forested riparian buffers serve a multitude of functions that benefit humans, wildlife, and water quality. For example, riparian soils function as sponges to soak up extra water and riparian vegetation acts like straws to suck up even more water. In addition to absorbing large quantities of water, riparian vegetation slows the flow of runoff. Therefore, intact riparian areas play a tremendously important role in the **mitigation**, or reduction, of flood damage to both human structures and wildlife habitat.

Riparian vegetation also helps stabilize streambanks and reduce soil erosion. The dense roots of this vegetation anchor soil in place and keep it from being washed or eroded away. Riparian trees form windbreaks along farmers' fields and prevent precious topsoil from being blown away. Furthermore, riparian buffers are natural water treatment facilities because they filter out and store sediment, nutrients, pollutants, and other toxins from runoff and can even transform certain chemicals into less harmful forms. Runoff that passes through riparian buffers is effectively treated for some pollutants and this treatment method costs much less than manmade water treatment processes. For example, it costs just \$0.30 to remove one pound of nitrogen from runoff by maintaining riparian forest buffers. It costs \$3-\$5 to remove one pound of nitrogen at a wastewater treatment facility! That's more than ten times as expensive!\*

In addition to contributing to the maintenance of high water quality, riparian vegetation hangs over waterways, blocking out sunlight, cooling the water, and regulating light and temperature conditions. These settings are ideal for cool water-loving aquatic organisms such as trout, salmon, caddisfly larvae, and stonefly and mayfly nymphs. Leaf litter and other vegetative debris from the riparian area that fall into the stream provide the base of the aquatic food web. Moreover, riparian buffers provide habitat for terrestrial and aquatic life as well as travel corridors and resting points for animals on the move, including migratory birds. Because of the array of habitats found in streamside areas, **biodiversity**, or the variety of living things, is particularly high in forested riparian buffers.

And, as if these numerous benefits aren't enough to demonstrate the importance of riparian buffers, these areas are also remarkably aesthetically pleasing and make for excellent recreation and vacation spots.

\* From "Economic Benefits Associated with Riparian Forest Buffers." Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers. Chesapeake Bay Program, Annapolis, MD: 1997.

**OVERVIEW:** Students are introduced to or reinforce their knowledge of riparian buffer functions, characteristics, and benefits by comparing riparian buffers to household objects. They then discuss how these different riparian functions are important to humans in general, fishermen, terrestrial and aquatic life, and water quality. Finally, they consider the impact of riparian disruptions on each of these functions.

**PROCEDURE:**

1. Discuss the importance of riparian buffers and how they positively affect water quality, overall stream health, and biodiversity. Encourage students to share what they already know about riparian areas, possibly by listing riparian functions on the board, and discuss their opinions of the importance of these buffers.
2. Explain the concept of a metaphor, giving an example and then soliciting other examples from students. For instance, "riparian buffers are sponges because..."

3. Divide the students into small groups and distribute a few items from the Riparian Metaphor Objects bag to each group.
4. Within their small groups, have students discuss how riparian buffers are comparable to the different objects they received, i.e., have them determine what riparian function or benefit the object represents.
5. Create a chart on the board with the following headings:

Object	Riparian Buffer Function/Benefit Represented

6. Have each group present their riparian metaphors to the rest of the class and add their results to the chart on the board.
7. Encourage students from other groups to add their interpretations of the objects after each group has finished presenting their items and metaphors. Have students share their ideas for additional riparian metaphors.

**DISCUSSION:**

- Have students think back to their pre-activity thoughts on riparian buffers. After doing the activity, how do their impressions/knowledge/opinions of riparian areas compare to those initial thoughts? If their opinions have changed, how and why? *Allow students to share their initial and current thoughts on riparian areas.*
- Which functions/benefits are most important to humans in general? Fishermen? Aquatic life? Terrestrial organisms? Water quality? Why?  
*For example,*  
***Humans***  
*-Sponge and Straws—Riparian buffers help mitigate costly flood damage and recharge groundwater for drinking water supplies.*  
*-Filter and/or Transformer—Riparian buffers remove harmful substances from runoff or transform them into less noxious forms so that they don't contaminate drinking water supplies.*  
***Fishermen***  
*-Sunglasses and Ice Pack—Coveted fish like trout and salmon prefer the cool, shaded waters of riparian buffers.*  
*-Homes—Fallen logs and other debris in streams provide ideal habitat and feeding and spawning grounds for fish.*

### ***Aquatic Life***

-Sunglasses, Ice Pack, Homes—See “Fishermen” above for explanations. Also, aquatic organisms are adapted to specific temperature (related to dissolved oxygen) and light conditions that are stabilized by riparian buffers.

-Boat Anchor and Umbrella—By reducing streambank and soil erosion in general, riparian areas keep a lot of soil from entering the stream and making the water cloudy or “turbid.” Aquatic predators have a tough time finding their prey in turbid environments and eroded soil can fill in the spaces between rocks where aquatic macroinvertebrates live.

-Coffee Filter, Transformer, Tupperware Container—Riparian areas remove and store pollutants (chemicals, nutrients, pesticides, etc.) that would otherwise be harmful to aquatic life.

-Oatmeal—Debris from riparian forests that falls into waterways provides the energy base of the aquatic food web.

### ***Terrestrial organisms***

-Homes—Riparian areas provide lots of great habitat for terrestrial plants and animals.

-Road Map—Riparian travel corridors give wildlife safe and protected paths on which to move from place to place, eat, take cover, or rest.

-Pillow—Migrating birds, exhausted from their long treks, can rest in riparian areas.

### ***Water Quality***

-Ice pack—Cooler, riparian-shaded waters can hold more dissolved oxygen, an important indicator of water quality.

-Coffee Filter/Kitchen Strainer—Riparian soils and vegetation filter out nutrients, pollutants and sediment before they enter the stream. Were these substances to enter the waterway, water quality would be significantly compromised.

-Tupperware Container—By storing nutrients and keeping them out of waterways, riparian buffers help reduce the occurrence of algal blooms and consequent eutrophication, both of which negatively impact water quality.

-Duct Tape—Riparian areas truly are fix alls for improving stream conditions. Without riparian buffers, waterways are exposed to the numerous threats posed by adjacent land uses.

-Soap—By filtering and storing nutrients, riparian buffers “cleanse” stream water of sediment and pollutants.

- If riparian areas are disrupted and their functions impaired, what might the consequences be for the groups in the previous questions? For example, riparian buffers serve as filters, removing sediment as well as certain nutrients, chemicals, and other pollutants from runoff before it enters streams. If a community gets its drinking water from a stream and its riparian buffer is damaged, what effect would this have on the community drinking water? What would the community have to do to replicate the benefits of the lost riparian area?  
*Allow students to brainstorm answers.*

- Are the students familiar with any real life cases of riparian area disruption and consequences locally? If so, what happened?

*Allow students to share anecdotes about local riparian area disruption.*

### **EVALUATION:**

- Discuss the questions above.
- Have students compare riparian buffer functions to four household objects.
- Test students' knowledge by holding up an object and having them call out the function represented by that particular object.

### **EXTENSIONS AND MODIFICATIONS:**

- Have students identify objects in the classroom or around their homes that could also be used as metaphors for the characteristics/functions of riparian buffers.
- The soil anchoring capacity of riparian vegetation can also be demonstrated by removing a plant, its roots, and the soil held together by those roots from its flowerpot. The dirt and roots will retain the shape of the flowerpot even after they are removed from it. Riparian buffer vegetation acts similarly to hold soil in place on streambanks and to reduce soil erosion.
- Have students select a specific riparian buffer function and do further research on that topic. For example, riparian buffers were compared to transformer toys in the activity, meaning that riparian buffers can transform noxious pollutants into less toxic forms. Have students investigate exactly how riparian buffers carry out this function. What are the chemical reactions involved? At what level are these processes occurring, i.e., in the soils, plant tissues, elsewhere? The results of students' research might then be presented in poster, report, pamphlet or other form. This might be a good idea for Student Research Symposium investigations.
- Have students interview community members, farmers, fishermen and environmental specialists to assess their awareness of the important functions carried out by riparian buffers. Students could then compare the different groups' perceptions of riparian areas. Students might create educational pamphlets on the importance of riparian areas to give to interviewees after asking their questions.
- Students could prepare an educational skit or puppet show using the props in this activity and other ideas they might have. They could then present it to other classes at their school in order to educate their peers on the value of maintaining riparian forest buffers. They might act out the parts of runoff, sediment, pollutants, or nutrients being held up by a riparian buffer as they try to get to a stream, etc.

### **NOTES (PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):**

