

VIDEO: Riparian Forest Buffers: The Link Between Land & Water

Adapted from: Riparian Forest Buffers: The Link Between Land & Water. Maryland Cooperative Extension. Wye Research and Education Center, Queenstown, MD.

Grade Level: Basic to Advanced

Duration: 40 minutes to 1 hour

Setting: Classroom

Summary: Students watch a video about riparian forest buffers, complete a worksheet, and discuss what they learned about riparian buffer functions, preservation, and restoration.

Objectives: Students will become familiar with the role riparian buffers play in protecting water quality, providing habitat and regulating flow, as well as with biodiversity and riparian management strategies.

Vocabulary:

Riparian areas, streamside forests, buffer(s), biomass, biodiversity, porous, fascines

Related Module Resources:

- “Riparian Buffer Basics” Fact Sheet
- Other Videos: Life on the Edge, The Riparian Zone

Materials (Included in Module):

- Riparian Forest Buffers Video
- Riparian Forest Buffers Worksheet
- Riparian Forest Buffers Answer Key

Additional Materials (NOT Included in Module):

- TV, VCR

ACADEMIC STANDARDS (ENVIRONMENT & ECOLOGY):

7th 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 different types of wetlands.
 - 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.
- 4.3.7.B. Describe how human actions affect the health of the environment.
- Identify land use practices and their relation to environmental health.
 - Explain the difference between point and nonpoint source pollution.
- 4.8.7.D. Explain the importance of maintaining the natural resources at the local, state and national levels.
- Explain how conservation practices have influenced ecosystems.

10th 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.
- 4.3.10.B. Explain how multiple variables determine the effects of pollution on environmental health, natural processes and human practices.
- Explain how human practices affect the quality of the water and soil.
- 4.7.10.C. Identify and explain why adaptations can lead to specialization.
- Explain how management practices may influence the success of specific species.
- 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.

12th 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.

BACKGROUND:

Riparian areas are the interfaces between waterways and the uplands. That is, they are the land areas next to waterways. Riparian areas that consist of trees and vegetation act as **buffers** to protect waterways from the adverse effects of adjacent land use (e.g., fertilizers from agriculture, industrial pollutants, storm water runoff from urban areas, sewage, etc.). These highly productive streamside forests are instrumental in maintaining the water quality, flow, bank stability and biodiversity of a stream. When riparian areas are

intact and filled with trees, shrubs, grasses, and/or other vegetation, they have the ability to filter sediment, nutrients, toxins, and other pollutants out of runoff. They also provide a shaded canopy over the stream, which moderates light conditions and helps maintain cool temperatures. The **porous**, sponge-like soils, detritus, and leaf litter in riparian areas soak up excess water during high flow conditions, reducing the impacts of flooding. During periods of low flow, this stored water is slowly released. Sponge-like riparian soils are held firmly in place by tree and plant roots, making healthy streambanks relatively erosion-resistant. Furthermore, the high content of **biomass** (organic matter such as vegetation, leaf litter, etc.) found in riparian areas provides energy and food to the organisms living there. The variety of habitats available in riparian areas supports myriad life forms and high aquatic and terrestrial **biodiversity**. Biodiversity means many different kinds of living things.

Taking all of these amazing functions into consideration, it is clear how important and precious intact riparian areas are to the health of our watersheds. Unfortunately, the value of riparian areas is often overlooked. Today, streamside forests are one of the most altered ecosystems on the planet. These buffers have been cleared for agriculture, industry, and construction, leaving sections of many waterways exposed to the threats of sediment-, nutrient-, toxin-, and pollutant-laden runoff. Destruction of riparian buffers and other land use practices negatively impact stream health. Fortunately, landowners and community members are starting to grasp the importance of riparian areas and are doing what they can to protect, restore and improve riparian function.

The video, [Riparian Forest Buffers: The Link Between Land & Water](#), presents the above information in a concise and interesting format and is based, in part, on the Chesapeake Bay, an important Pennsylvania water resource. This video is a superb introduction to the topic of riparian buffers and helps instill a stewardship ethic in viewers. This video includes excellent, interesting footage and images associated with riparian areas.

OVERVIEW:

Students watch the 21-minute video, [Riparian Forest Buffers: The Link Between Land & Water](#). They complete a worksheet and discuss the functions, restoration, and preservation of riparian areas as well as the consequences of disrupting these areas.

PROCEDURE:

Teacher Preparation:

1. Obtain a TV and VCR for the presentation of the video.
2. Photocopy an appropriate number of [Riparian Forest Buffers: The Link Between Land & Water](#) worksheets for your students.

Student Activity:

1. Watch the video attentively, paying particularly close attention to information about the major functions and restoration of riparian buffers.

2. Complete the worksheet and go over the answers with the rest of the class.

DISCUSSION:

Note to Teachers: Use worksheet questions to fuel discussions. Below are some additional discussion questions.

Describe how riparian forest buffers are related to pollution abatement, wildlife habitat and flood and erosion control. See “*Riparian Buffer Basics*” Fact Sheet.

Describe methods of community management and stewardship of riparian forest buffers. How might some of these management practices positively affect certain wildlife species? *Planting live willow and dogwood stakes will eventually provide habitat to migrating birds and other wildlife. Fascines are another method of restoring riparian buffers. Fascines are bundles of twigs that are buried to encourage natural growth. These absorb water during periods of high flow and can also provide wildlife habitat. Fencing off waterways and/or riparian areas to keep out livestock preserves stream banks and reduces erosion.*

See Riparian Forest Buffers: The Link Between Land & Water Worksheet.

EVALUATION:

- Students have accurately completed the Worksheet.

EXTENSIONS AND MODIFICATIONS:

- Have students work in groups to make brief documentaries, photo albums, or illustrated guides of riparian buffers in your area.
- Have students interview local riparian landowners to see how their land use affects the streamside buffer and what they might be doing to improve, restore, or preserve the riparian areas on their land.
- Have students research different types of riparian environments, e.g., desert, meadow, or forest streamside buffers, and/or in different areas of Pennsylvania or the U.S.

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



WORKSHEET: VIDEO: RIPARIAN FOREST BUFFERS: THE LINK BETWEEN LAND & WATER

Name _____ Date _____

1. What is a riparian area?

2. What is a riparian buffer?

3. Why are riparian forest buffers referred to as “the link between land and water”

4. How does clear-cutting streamside forests affect the health of waterways?

5. What are five main functions of riparian forest buffers?

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

6. How do riparian buffers slow down runoff? Why is this an important function?

7. What is denitrification?

Bonus Question: *How is denitrification related to reducing the effects of fertilizers on streams?*

8. What are three important purposes of woody debris that falls into streams from riparian areas?
a. _____
b. _____
c. _____

9. What are the objectives of each zone of the Three Zone Riparian Management System?
Zone 1- _____

Zone 2 - _____

Zone 3 - _____

10. a. Name three land uses that adversely affect the health of waterways.
b. Describe how each of the three land uses negatively impacts waterways.
c. Describe how riparian forest buffers can reduce those negative effects.
Land Use #1: a. _____
b. _____

c. _____

Land Use #2: a. _____
b. _____

c. _____

Land Use #3: a. _____
b. _____

c. _____

11. What are three things related to riparian forest buffers that you can do to help protect streams?
a. _____
b. _____
c. _____

Bonus Question: *What is the term scientists use to refer to “less obvious, pervasive sources of pollution”?* _____



ANSWER KEY: VIDEO: RIPARIAN FOREST BUFFERS: THE LINK BETWEEN LAND & WATER

Name _____ Date _____

1. What is a riparian area?
A riparian area is the land area adjacent to waterways.
2. What is a riparian buffer?
A riparian buffer is a riparian area that consists of tree, shrubs, grasses, and other vegetation. Riparian buffers protect waterways from the adverse effects of adjacent land use.
3. Why are riparian forest buffers referred to as “the link between land and water”
Riparian forest buffers are transitional areas between waterways and the uplands and they protect the waterway from the negative impacts of adjacent land use.
4. How does clear-cutting streamside forests affect the health of waterways?
Removing streamside trees affects the health of waterways by increasing the waterway’s exposure to the sun, thereby increasing water temperatures. Without trees to anchor the streambank soil in place, these banks are more easily eroded. The eroded sediment enters waterways and increases turbidity. Streamside trees also contribute leaf litter to the waterway. This leaf litter forms the base of the aquatic food web. Without it, this food web is disrupted. Streamside forests also filter out and store nutrients and pollutants. When these forests are clear-cut, more nutrients and pollutants contaminate waterways.
5. What are five main functions of riparian forest buffers?
 - a. *Shade the stream and moderate stream temperatures*
 - b. *Wildlife habitat*
 - c. *Filter out and store nutrients and pollutants*
 - d. *Soak up runoff*
 - e. *Decrease erosion and stabilize streambanks*
6. How do riparian buffers slow down runoff? Why is this an important function?
Riparian buffers are filled with obstacles, such as trees, shrubs, vegetation, and leaf litter, that physically slow runoff. Riparian soils are also very porous so runoff is also soaked up as the aforementioned obstacles slow it down.
7. What is denitrification?
Denitrification is the conversion by anaerobic denitrifying bacteria of nitrates into nitrogen gas, which escapes into the atmosphere.
Bonus Question: *How is denitrification related to reducing the effects of fertilizers on streams?*
Nitrate-rich fertilizers from farm fields are washed in runoff into streams. If there is a riparian buffer between the agricultural land and the stream, the riparian buffer soils take up the nitrates before they reach the stream. Anaerobic bacteria in riparian soil convert the nitrates to harmless nitrogen gas, which escapes into the atmosphere, and does not get into the stream.

8. What are three important purposes of woody debris that falls into streams from riparian areas?
 - a. Anchor streambanks
 - b. Form channel structure
 - c. Trap gravel and sediment on the stream bottom
 - d. Physical habitat for fish and aquatic macroinvertebrates
 - e. Diffuse the force of severe floods and rains

9. What are the objectives of each zone of the Three Zone Riparian Management System?

Zone 1- control runoff

Zone 2 – managed for water quality and habitat

Zone 3 – shade, food, habitat, streambank stabilization, “last line of defense”

10. a. Name three land uses that adversely affect the health of waterways.
 b. Describe how each of the three land uses negatively impacts waterways.
 c. Describe how riparian forest buffers can reduce those negative effects.

Land Use #1: a. Agriculture

b. Land is cleared for agriculture, increasing erosion. Fertilizers are added to the soil and are eventually washed into waterways. Cattle and other livestock graze near and erode streambanks, increasing erosion.

c. Intact riparian buffers reduce erosion by slowing and absorbing runoff and stabilizing the soil with their roots. Fertilizers are filtered out and stored in riparian buffers before they reach waterways.

Land Use #2: a. Timber Operations

b. Riparian forests are clear-cut for timber, leaving the land exposed and easily eroded. Eroded sediment increases turbidity in waterways and harms aquatic life.

c. Riparian forests that are not cut at all or those that are sustainably harvested buffer streams from numerous negative effects, including erosion and contamination by pollutants.

Land Use #3: a. Urbanization

b. Meadows and forests are cleared and replaced by impermeable surfaces such as black top and sidewalks. Storm water from urban areas leads to soil erosion, particularly of stream banks and beds, creating costly problems to fix. Sediment and other pollutants enter waterways in storm water.

c. Riparian buffers in urban areas can help negate the adverse effects of urbanization by stabilizing streambanks, reducing erosion, and filtering out and absorbing sediment and other pollutants.

11. What are three things related to riparian forest buffers that you can do to help protect streams?
 - a. Preserve existing riparian forest buffers on your property or in your community.
 - b. Restore riparian buffers on your property or in your community by planting live willow and dogwood stakes or burying fascines.
 - c. Educate your friends and neighbors about the importance of riparian buffers and instill a sense of stewardship in them.

Bonus Question: What is the term scientists use to refer to “less obvious, pervasive sources of pollution”? Non-point sources.