

Wrangling Over Riparian Zones

Adapted from: An original Creek Connections activity.
Creek Connections, Box 10, Allegheny College, Meadville, Pennsylvania, 16335

Grade Level: Intermediate to Advanced

Duration: 45 minutes to 1 hour.

Setting: Classroom

Summary: Students play the role of a farmer or Conservation District agent and debate a proposed mandate for 100-foot-wide buffers along all waterways.

Objectives: Students will

- identify the functions of riparian forest buffers;
- identify and discuss the concerns of farmers who have riparian forest buffers on their property; and
- attempt to arrive at a compromise between the ecological needs of waterways and economic concerns of farmers

Vocabulary: riparian zones, riparian forest buffers, mitigation

Related Module Resources:

- Articles: [Understanding the Science Behind Riparian Forest Buffers: Factors Influencing Adoption](#) and “Riparian Ownership: Who Owns the Water and the Land Around It?”
- Pamphlet: “Land Owners... Streamside Buffers for Your Backyard”
- “Fact Sheet: When a Landowner Adopts a Riparian Buffer—Benefits and Costs”

Materials (Included in Module):

- Handouts:
 - “Riparian Buffer Basics” Fact Sheet
 - “Forest buffers raise concerns for farmers”
- Overhead: “Minimum Buffer Widths” and “Recommended Minimum Buffer Widths for Wildlife”
- For extension:* Pennsylvania Code Chapters 102 & 105

ACADEMIC STANDARDS (ENVIRONMENT & ECOLOGY):

7th Grade

- 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.
- 4.2.7.C. Explain natural resource distribution.
- Analyze the effects of management practices on air, land and water in forestry, agriculture, fisheries, wildlife, food and fiber production
- 4.3.7.B. Describe how human actions affect the health of the environment.
- Identify land use practices and their relation to environmental health.
- 4.4.7.C. Explain agricultural systems’ use of natural and human resources.
- Define issues associated with food and fiber production.
- 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.

Covered by one or more Extensions

- 4.9.7.A. Explain the role of environmental laws and regulations.
- Identify and explain environmental laws and regulations (e. g., Clean Air Act, Clean Water Act, Recycling and Waste Reduction Act, Act 26 on Agricultural Education).
 - Explain the role of local and state agencies in enforcing environmental laws and regulations (e. g., Department of Environmental Protection, Department of Agriculture, Game Commission).

10th Grade

- 4.1.10.D. Describe the multiple functions of wetlands.
- Describe wetlands in terms of their effects (e. g., habitat, flood, buffer zones, prevention areas, nurseries, food production areas).
 - Explain how a wetland influences water quality, wildlife and water retention.
- 4.1.10.E. Identify and describe natural and human events on watersheds and wetlands.
- Identify the effects of humans and human events on watersheds.
- 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.
- 4.8.10.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.
 - Compare and contrast the environmental effects of different industrial strategies (e. g., energy generation, transportation, logging, mining, agriculture).

Covered by one or more Extensions

- 4.9.10.B. Explain why environmental laws and regulations are developed and enacted.
- Explain the positive and negative impacts associated with passing environmental laws and regulations.
 - Understand conflicting rights of property owners and environmental laws and regulations.
 - Analyze the roles that local, state and federal governments play in the development and enforcement of environmental laws.
 - Identify local and state environmental regulations and their impact on environmental health.

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.
- 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.

Covered by one or more Extensions

- 4.9.12.A. Analyze environmental laws and regulations as they relate to environmental issues.
- Compare and contrast environmental laws and regulations that may have a positive or negative impact on the environment and the economy.
 - Research and describe the effects of an environmental law or regulation and how it has impacted the environment.

BACKGROUND:

Riparian zones are the areas next to waterways. When these areas consist of forests they are referred to as **riparian forest buffers** because they protect the waterway from the adverse affects of adjacent land use. Riparian forest buffers serve numerous beneficial functions: natural water treatment, recreation, pollution (nutrients, sediment, fertilizers, and pesticides) reduction, flood and runoff **mitigation** (reduction), shade and temperature regulation, diverse habitats, food base for aquatic habitats, corridors for wildlife, streambank stabilization, timber and groundwater recharge. These benefits significantly improve the quality of waterways and surrounding areas. (Refer to “Riparian Buffer Basics” Fact Sheet for more information on the basic functions of forest riparian buffers.) However, to effectively carry out these functions, scientists often recommend a riparian forest buffer width of 100 feet or more! If we were to consider only the ecological costs and benefits, all waterways would be lined with such wide buffers; however, economic, social, and political interests also play a significant role in the determination of riparian forest buffer width and mere presence.

The interface between ecology and economy is rarely as confrontational as it is on agricultural lands containing waterways. As produce prices decline, farmers are forced to put more land under cultivation simply to break even and keep their farms. At times, the only land left to cultivate is that area currently occupied by trees and vegetation next to a waterway: a forest riparian buffer. And so the farmer is left with a daunting decision: to deforest the area, lose the benefits of riparian forest buffers, and cultivate the land to keep his/her farm functioning or to preserve the buffer and all of its ecological advantages while putting his/her farm and livelihood at risk.

There are a number of agencies and groups that help farmers make these decisions. These groups also help to educate farmers on the value of riparian buffers, and some provide financial and technical assistance to farmers who are interested in riparian restoration on their land. These agencies include the Department of Environmental Protection (DEP), county Conservation Districts, the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS), the Bureau of Forestry’s Department of Conservation of Natural Resources (DCNR), as well as non-profit and educational groups. The DEP provides grant money for riparian restoration. County Conservation District agents help farmers plan riparian restoration efforts and provide technical support. The NRCS encourages the establishment of conservation buffers via incentives and cost-sharing programs. The DCNR encourages tree planting on agricultural lands through cost-sharing programs and technical assistance as well as education. Non-profit groups such as Ducks Unlimited and Trout Unlimited provide matching aid to farmers interested in projects that benefit waterfowl and trout, including riparian buffer restoration.

Farmers and other landowners participate in the aforementioned programs mostly on a voluntary basis. However, there is a long-standing conflict between landowners who wish to preserve their land rights and the government that passes laws controlling how people can use their land. Landowners feel that they should be able to manage their land as they choose, as long as they do not misuse the land. However, what is best

economically for farmers is not always the most beneficial for streams, water quality, and/or aquatic life. Although many farmers do participate voluntarily in riparian restoration efforts, others do not because they would not benefit financially from such activities. Thus, some government officials and agencies are pushing for government laws and regulations to insure that farmers do what it takes to protect streams, water quality, and aquatic life.

If you were the farmer, what would you do? If you were an agent of the Department of Conservation of Natural Resources or a local Conservation district, how would you convince the farmer to spare the riparian forest buffer on his/her property?

OVERVIEW:

Students debate whether or not to keep a riparian forest buffer intact. They play the role of a farmer who wants to cut down the riparian forest in order to increase the acreage of his crop fields and a Conservation District agent who tries to convince the farmer not to cut down the forest.

PROCEDURE:

Teacher Preparation:

Make copies of the following handouts for students: “Forest Buffers Raise Concerns for Farmers” for half of the class and “Riparian Buffer Basics” Fact Sheets for the other half. The article, “Understanding the Science Behind Riparian Forest Buffers: Factors Influencing Adoption” also contains useful background information for the farmer group. Pages 1-4 would be particularly useful. In addition, numerous Fact Sheets in the Module Resource Guide could be used in addition to “Riparian Buffer Basics.”

Student Experiment or Activity:

1. Review the beneficial functions of riparian forest buffers and generate a list on the board.
2. Use the “Minimum Buffer Widths” and “Recommended Minimum Buffer Widths for Wildlife” figures on the “Wrangling Over Riparian Zones” overhead transparency provided in the module to stimulate a discussion about the buffer widths necessary for riparian forests to effectively carry out their beneficial functions.
 - Ask students what the minimum riparian forest buffer widths are for the following functions and record their answers on the overhead transparency:
 - Bank stabilization and aquatic food web: _____ feet
 - Water temperature moderation: _____ feet
 - Nitrogen removal: _____ feet
 - Sediment removal: _____ feet
 - Flood mitigation: _____ feet
 - Wildlife habitat: _____ feet
 - Bald eagle habitat: _____ feet
 - Hairy woodpecker habitat: _____ feet

-Ask students to determine the ideal riparian forest buffer width based on the

minimum widths cited above and record their answer on the overhead transparency.

3. Ask students what obstacles might be encountered if local authorities were to mandate riparian forest buffers of that ideal width along all sections of all waterways. What stakeholders might object to such a regulation? What parties might support such a regulation?
4. Divide the class into two teams, one of which represents a local farmer who has a stream running through his/her property and wants to cut down the riparian forest buffer to increase the acreage of his farm. The other group represents a local Conservation District agent who will try to convince the farmer to spare the riparian forest buffer. Distribute copies of the article, "Forest Buffers Raise Concerns for Farmers" to students representing the farmer. Distribute copies of the "Riparian Buffer Basics" Fact Sheet to students representing the Conservation District agent.
5. Have the farmer group read the article and develop a comprehensive list of farmer concerns about riparian forest buffers.
6. Have the Conservation District group read over the "Riparian Buffer Basics" Fact Sheet or other fact sheets in the Module Resource Guide and make a list of riparian forest buffer functions. Have them brainstorm the negative impacts of cutting down riparian forest buffers on water quality, aquatic and terrestrial organisms, etc.
7. Inform the groups that the local authorities have proposed a mandate of 100-foot-wide buffer strips next to all waterways, including the one that runs through the farmer's property. Were the mandate passed, the Conservation District would be charged with its enforcement. Have the groups use their lists to generate a one-minute long opening statement that clearly asserts their position on the proposed mandate and why. Have the group select a spokesperson to present the opening statement.
8. Have the spokesperson from each group present their opening statement. Have students in the opposing group write down points to debate. Have them hold all comments and questions until both spokespeople have presented their statements.
9. Allow students to address points of confusion or confrontation and questions. Foster a debate between the farmer and Conservation District groups over the proposed mandate of 100-foot-wide buffer strips next to all waterways. Refer to the Discussion section for questions to keep the debate going.

DISCUSSION:

Why are the farmers concerned? *Have the farmer group express their concerns.*

Why are the Conservation District agents concerned? *Have the Conservation District group express their concerns.*

Is there any way to address both of these parties' concerns? *Try to arrive at a compromise.*

Would a narrower mandated buffer width be a way to preserve both the ecological benefits of the riparian zone and the economic viability of the farmers' farm? *Have students debate this point.*

Is government regulation necessary? What are the positive and negative impacts associated with passing such regulations with regard to riparian buffers? *Opinions on government regulation vary. See farmer concerns for the downside of regulation. The positive side is that farmers who would not voluntarily participate in riparian buffer restoration efforts would be required to be better environmental stewards.*

Other than government regulation, how else might farmers otherwise be encouraged to preserve existing riparian forest buffers or plant new ones? *In lieu of government regulation, farmers might be encouraged to plant riparian buffers by the facts that, in addition to their ecological benefits, riparian forest buffers increase property values, improve privacy and aesthetic value of property, improve fish habitat, decrease the time and energy spent mowing the lawn, etc. That is education about other benefits is important. Furthermore, cooperation between landowners and conservation groups/government agencies, incentives and tax breaks, and awards could be used to encourage farmers to plant riparian buffers.*

How might planting or selectively harvesting hardwoods along the stream benefit both water quality and the farmer? *The farmer could periodically harvest some of the hardwoods and sell them to generate income to replace income lost by not clearing and cultivating in the riparian area.*

What other tree species might farmers plant in riparian forest buffers to generate income? *Sugar maples for maple syrup, birch trees for birch beer, blueberry bushes, raspberries, etc.*

EVALUATION:

- Discussion questions above.
- List five beneficial riparian forest buffer functions.
- List five concerns farmers might have about riparian forest buffers, particularly if local authorities regulate them.

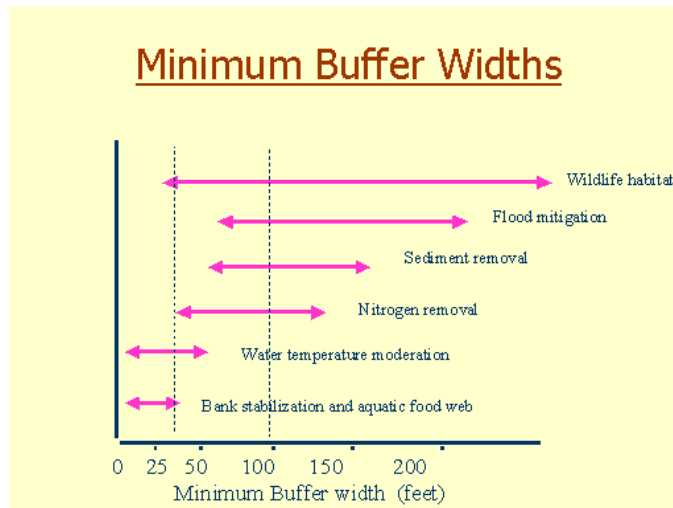
EXTENSIONS AND MODIFICATIONS:

- Have students research the following topics:
 - Existing laws and /or regulations that would influence this debate (e.g., Pennsylvania Code Acts 102 and 105 included in module at the end of this activity)
 - What roles do government agencies (DEP, Conservation District, USDA Forest Service, etc.) play in this debate?
 - What riparian buffer-related services does the county Conservation District provide?
- At the end of the debate, have students consider how the presence of numerous non-native species in the farmers' forest riparian buffer might influence the discussion. What new issues would this bring to the debate? Keep in mind that non-native species frequently take over niches previously occupied by native species. Sometimes the non-native species completely replace native species. How might these non-native species negatively and positively affect the riparian ecosystem? (Note: This extension idea is adapted from "Riparian Zone" in Project WILD by the Council for Environmental Education, 2000).

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



OVERHEAD : WRANGLING OVER RIPARIAN ZONES



Source: Riparian Buffer Systems Website Slide Show. <http://www.riparianbuffers.umd.edu/slide/html>

| Recommended Minimum Buffer Widths for Wildlife | |
|---|------------------------------------|
| SPECIES | DESIRED WIDTH (in feet) |
| Wildlife, dependent on wetlands or watercourses | 30-600' |
| Bald eagle, nesting heron, cavity nesting ducks | 600 |
| Pileated woodpecker | 450 |
| Beaver, dabbling ducks, mink | 300 |
| Bobcat, red fox, fisher, otter, muskrat | 330 |
| Amphibians and reptiles | 100-330 |
| Belted kingfisher | 100-200 |
| Songbirds | 40-660 |
| Scarlet tanager, American redstart, rufous-sided towhee | 660 |
| Brown thrasher, hairy woodpecker, red-eyed vireo | 130 |
| Blue jay, black capped chickadee, downy woodpecker | 50 |
| Cardinal | 40 |
| Cold water fisheries | 100-300 |

Source: Connecticut Rivers Joint Commission Website. <http://www.crjc.org/riparianbuffers.htm>

Minimum Buffer Widths Required for Effective Riparian Buffer Functioning

- Bank stabilization and aquatic food web: _____ feet
- Water temperature moderation: _____ feet
- Nitrogen removal: _____ feet
- Sediment removal: _____ feet
- Flood mitigation: _____ feet
- Wildlife habitat: _____ feet
- Bald eagle habitat: _____ feet
- Hairy woodpecker habitat: _____ feet
- Ideal buffer width to allow optimal riparian buffer functioning: _____ feet