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## Riparian Buffers for Agricultural Land

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# Agroforestry Notes

USDA Forest Service, Rocky Mountain Station • USDA Natural Resources Conservation Service

January, 1997

## Riparian Buffers for Agricultural Land

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### Purpose

- Define what a riparian buffer is
- Describe what benefits a riparian buffer can provide in an agricultural landscape
- Identify situations where installing a riparian buffer should be considered

### Definition

A riparian buffer is land next to streams, lakes, and wetlands that is managed for perennial vegetation (grass, shrubs, and/or trees) to enhance and protect aquatic resources from adverse impacts of agricultural practices.

### Benefits for Aquatic Resources

- **Stabilize eroding banks**  
**Problem:** Eroding and collapsing banks can remove valuable agricultural land, particularly if unchecked for many years. Soil from bank erosion becomes sediment in the waterway which damages aquatic habitat; degrades drinking water quality; and fills wetlands, lakes, and reservoirs.  
**Benefit from a buffer:** Plant stems absorb the erosive force of flowing water and wave action, while roots hold soil in place.  
**Effectiveness:** Potentially good on small streams and lakes; poor or ineffective on large unstable streams where bank erosion is severe and rapid.

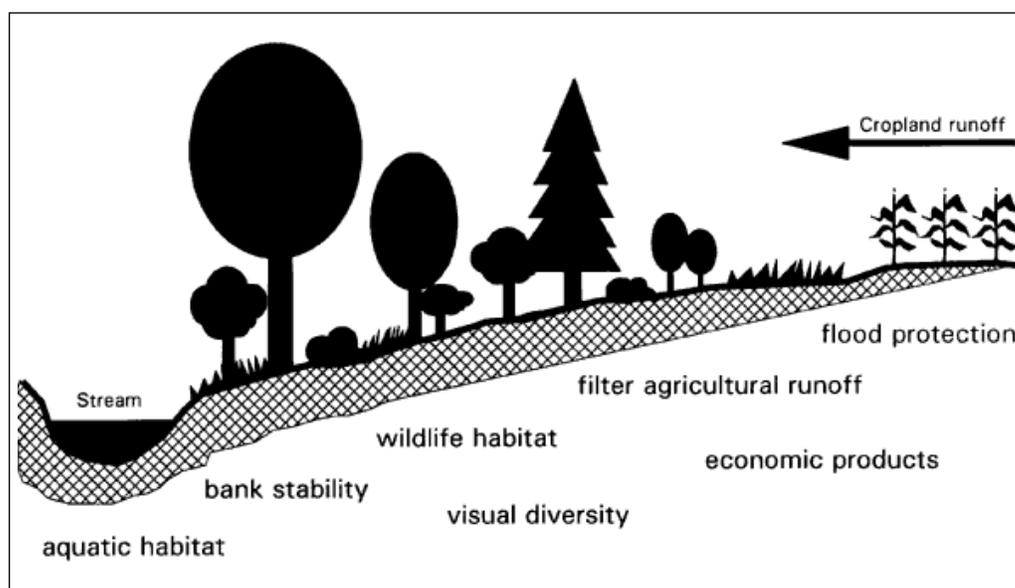


Figure 1 — Benefits that a riparian buffer can provide.



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- Filter sediment from agricultural land runoff**

**Problem:** Sediment in the waterway damages aquatic habitat; degrades drinking water quality; and fills wetlands, lakes, and reservoirs.

**Benefit from a buffer:** Plant stems slow and disperse flow of surface runoff, and promote settling of sediment. Roots stabilize the trapped sediment and hold riparian soil in place.

**Effectiveness:** Potentially good, especially for filtering larger-sized sediment such as sand, soil aggregates, and crop residue. Generally less effective for clayey sediments. Periodic removal of sediment from the buffer may be needed to sustain this benefit where sediment loads are high.
- Filter nutrients, pesticides, and animal waste from agricultural land runoff**

**Problem:** High contaminant levels degrade drinking water quality and aquatic habitat. Specifically, nitrate and pesticides can be toxic to humans and aquatic organisms; fecal bacteria and other microbes in animal wastes can cause disease; and phosphate can promote algae blooms which suffocate fish and other aquatic organisms.

**Benefit from a buffer:** Particulate wastes and sediment-attached contaminants are filtered along with the sediment. Uptake and transformation of soluble contaminants by plants and soil microbes is promoted by improved infiltration of surface runoff and vigorous growth of vegetation. Soluble contaminants may be similarly removed from shallow groundwater. No fertilizers, pesticides, or animal wastes are applied to the buffer zone which could be picked up by runoff. Contaminant-rich runoff from adjacent agricultural land is diluted by rainfall within the buffer zone.

**Effectiveness:** Potentially good for particulate wastes and sediment-attached microbes, nutrients, and pesticides. Generally less effective for dissolved nutrients and pesticides, although excellent nitrate removal from shallow groundwater may be obtained under wetland conditions. Ineffective on contaminants in tile drainage water and drainage ditches that bypass the buffer. Periodic harvesting of vegetation may be required where nutrient loads are high in order to remove the nutrients it contains, maintain vigorous plant growth, and promote additional nutrient uptake. Where sediment loads are high, periodic removal of sediment build-up may help prevent formation of channels which quickly transport contaminant-rich runoff across the buffer without adequate filtering and infiltration.
- Provide shade, shelter, and food for fish and other aquatic organisms**

**Problem:** Bare, unshaded, sediment-laden channels are poor habitat for fish and other aquatic organisms.

**Benefit from a buffer:** Shade reduces light intensity and water temperature. Plant litter as well as insects and other invertebrates on plants are food for fish. Larger plant debris and roots can form stable shelter for aquatic organisms.

**Effectiveness:** Potentially good for small streams and lakes. Shade is particularly important for cold water fisheries occurring in warmer climates. Water temperature control may depend on extent of buffers within the watershed.
- Wildlife habitat**

**Problem:** Expansive cultivated cropland may provide insufficient cover and food for upland game, songbirds, and other wildlife, especially in winter.

**Benefit from a buffer:** Perennial vegetation supplies diversity of cover and food for wildlife.

**Effectiveness:** Very good for smaller animals and birds, depending on the kind of vegetation. Connected stretches of buffers become wildlife corridors, greatly improving habitat for larger animals.

**Benefits for  
Terrestrial  
Resources**

- **Economic products**

**Problem:** Buffers may take land out of cultivated crop production and require additional cost to install.

**Benefit from a buffer:** Buffers may produce perennial crops, such as lumber and veneer, fiber, hay, nuts, fruit, and berries.

**Effectiveness:** Variable, depending on markets for products and additional costs associated with managing the crop.

- **Visually diversify a cropland landscape**

**Problem:** Expansive cultivated cropland may have less visual diversity than people would like to see.

**Benefit from a buffer:** Strips of trees, shrubs, and perennial grasses add visual diversity to a cultivated cropland landscape. Evergreens and deciduous trees and shrubs may provide color diversity at certain times of the year.

**Effectiveness:** Potentially good. Depends on personal tastes.

- **Protect cropland from flood damage**

**Problem:** Flooding caused by larger storm runoff events can erode valuable cropland, and deposit debris in fields.

**Benefit from a buffer:** Plant stems reduce floodwater velocity and erosive power, and block stream debris from entering cropland and pastures. Roots hold stream banks and buffer soil in place. Extensive riparian buffers in a watershed may reduce peak flood level.

**Effectiveness:** Potentially good, depending on the kind of vegetation used and the extent of buffers within the watershed.

**Where to Install a Buffer**

Agricultural situations where a buffer should be considered:

- Cropland, grazing land, livestock enclosures, and pasture
- Where a landowner wants and/or needs **any** of the benefits a buffer can provide
- Where an acceptable level of benefit can be derived at acceptable cost to the landowner and the general public

**Additional Information**

“Riparian Buffer Systems in Crop and Rangelands” by R.C. Schultz, T.M. Isenhart, and J.P. Colletti. p. 13-27 In “Agroforestry and Sustainable Systems: Symposium Proceedings”. USDA Forest Service General Technical Report RM-GTR-261, 1995.

“Steward of Our Streams: Riparian Buffer Systems”. Iowa State University Extension Bulletin Pm-1626a/ January 1996.

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