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Riparian Buffers

A Livestock Best Management Practice for Protecting Water Quality

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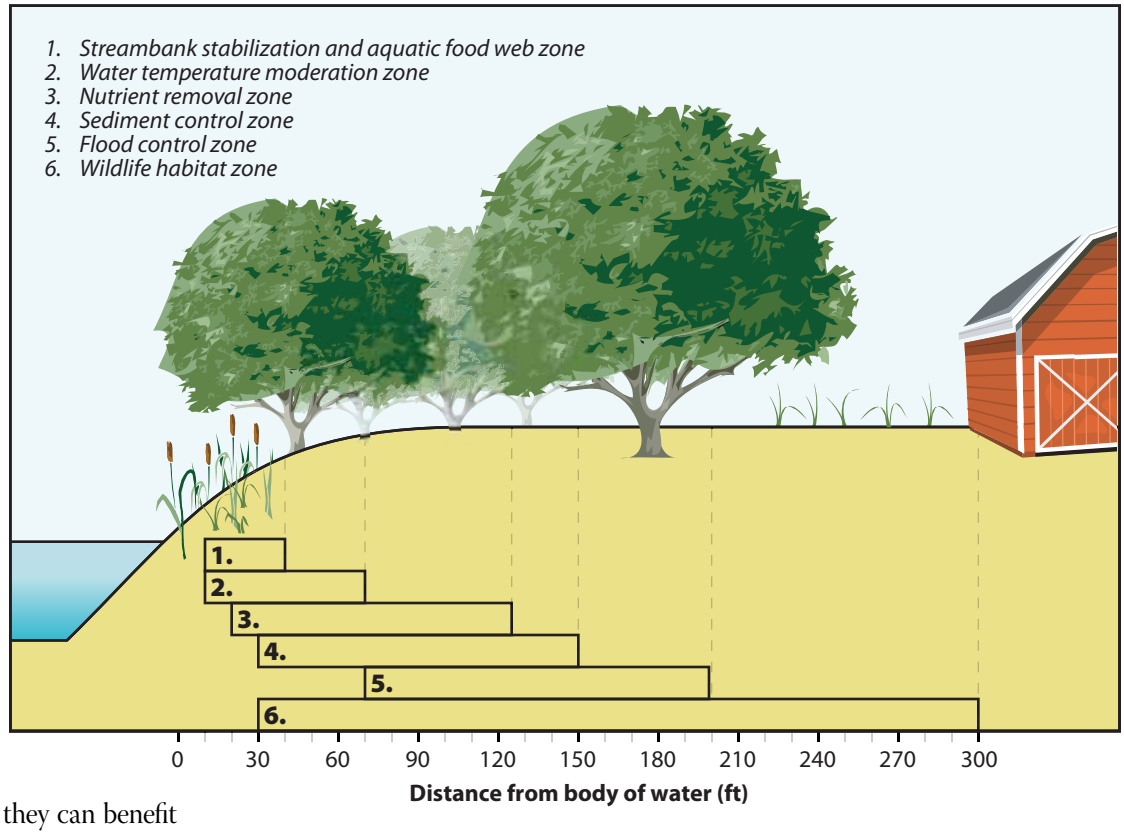
In Kentucky, cattle on pastures are often watered by streams. Although this practice solves water requirements for cattle, providing livestock free access to streams and riparian areas can lead to a contaminated water supply and damaged ecosystems. A better solution is to implement riparian buffers with limited access points to streams or provide alternative water sources. This practice can protect water quality, increase herd production, and provide other landowner benefits. The purpose of this publication is to explain the role of riparian areas and how they can benefit the livestock producer, the herd, and the environment.

Figure 1. Riparian area widths (in feet) and specific benefits.



What Is a Riparian Buffer?

A riparian buffer is the strip of land that borders a stream, river, or other body of water. The water body may be permanent or intermittent and may include areas associated with groundwater recharge. The riparian buffer, also called a riparian area or zone, is a transitional zone between aquatic ecosystems (the water body itself) and upland areas (such as pasture or woodlands). The riparian buffer may consist of trees, shrubs, grasses, or a combination of the three.

Buffer Widths

Accomplishing any of the riparian functions listed above will depend on vegetation location, layout, and density of the riparian buffer. Riparian buffer vegetation may be naturally occurring or planted by the landowner or farm manager.

Buffer width is determined by the distance between the stream or water body and the next adjacent land use on each side of the stream. A buffer width of 20 feet means a width of 20 feet on each side of the stream. Land use should be considered when determining buffer width. For example, a cropped area might require a different buffer width than a well-maintained pasture area. Riparian buffer width plays a role in determining specific benefits (Figure 1). For example, wider buffers (>160 feet) tend to be more efficient in removing nitrogen from water, whereas narrower buffers (<160 feet) may not remove significant amounts of nitrogen. Other research has shown that the most effective buffers are at least 100 feet wide and composed of native forest. However, a buffer of 160 feet could take a large portion of land out of production. Some buffer between an agricultural field and a water body is better than none at all. A buffer of 20 feet will at least provide stream bank protection, especially if livestock are given only limited access to the stream.

Vegetative Zones

The United States Department of Agriculture's Natural Resources Conservation Service (USDA-NRCS) promotes the use of three zones when establishing and maintaining riparian forest buffers.

- **Zone 1:** An undisturbed forested area that begins at the top of the stream bank and continues up gradient for about 15 feet.
- **Zone 2:** Often a managed forest area. Zone 2 begins at the ending edge of Zone 1, and continues away from the stream for a width of 35 to 165 feet. The widths of Zones 1 and 2 are measured horizontally on a line perpendicular to the water body.
- **Zone 3:** Considered the runoff control zone, providing the primary sediment retention function for the buffer. Zone 3 is approximately 20 feet wide and is managed in permanent grass/legume/forb cover. This management of Zone 3 can be accomplished with mowing or rotational grazing by livestock. Information and technical assistance about planting schemes can be obtained from your local NRCS or conservation district office.

Note: special considerations are given to major river systems such as the Ohio and Mississippi Rivers.

Establishing vegetation in areas dominated by tall fescue typically requires special treatment. Much of Kentucky's tall fescue is endophyte-infected. This endophyte often slows plant succession by suppressing the growth of tree species. Pasture renovation procedures are outlined in the University of Kentucky publication *Weed Management in Grass Pastures, Hayfields, and Other Farmstead Sites* (AGR-172) and include killing existing vegetation with herbicide. Herbicide application to the designated area generally occurs in the fall, followed by the planting of a winter wheat crop. Native tree seedlings are then planted into the winter wheat crop in late winter or early spring. Successful establishment of the riparian vegetation can take from three to five years, depending on species. Contact your local NRCS office for specific technical guidance for planting density and tree species selection.

Landowner Benefits of Riparian Buffers

Maintaining and enhancing riparian buffers will provide landowners with many benefits. Stable stream banks mean landowners are less likely to lose valuable land. In addition, landowners can benefit from the aesthetic value of trees and grasses, and they may also see an increase in property value. Riparian buffers create wildlife habitat, so landowners may benefit from hunting and fishing opportunities. In addition, payments from government programs can provide economic benefits.

Riparian buffers can improve overall water quality and serve many functions. These functions include:

- **Trapping sediment**—Slower moving water allows sediment to drop out; vegetation helps reduce erosion.
- **Maintaining stream banks**—Roots of vegetation hold soil in place and protect stream banks from energy carried by the water.
- **Reducing flood damage**—Buffers slow down and store flood water.
- **Groundwater recharge**—Buffers allow time for infiltration by slowing water down.
- **Vegetative production**—Adequate moisture supports production of trees, shrubs, and grasses.
- **Water temperature regulation**—Shade from trees reduces summer water temperatures, which improves fish habitat.
- **Filtering contaminants from runoff**—Buffer zone provides infiltration time for water; soils filter contaminants from water.
- **Providing wildlife habitat**—Diversity of trees, shrubs, and grasses provide food and shelter for terrestrial and aquatic animals.

Riparian Areas and Cattle Production

Cattle are naturally attracted to riparian areas. They will often use them at higher rates than adjacent uplands, mostly because of the availability of water and lush forages that are found in these areas. They may also loaf around one or two large trees, taking advantage of the shade in warmer months. The increased residence time of cattle in riparian areas leads to increased sediment deposits and erosion of stream banks caused by foot traffic. In addition, there is a higher concentration of manure being deposited in these areas. When cattle are located in riparian areas for extended periods of time, pastures cannot be utilized effectively. The vegetation in the riparian area can become degraded, the soil compacted, and the stream contaminated. Therefore, cattle should be excluded from riparian areas to improve pasture utilization and protect water quality.

The two main pollutants to waterways that can be attributed to cattle production are pathogens and sediment. In addition, manure can also cause nutrient and other water quality impairments. These water quality impairments occur as a result of cattle reducing or eliminating the vegetation around streams, compacting the soil, degrading the stream banks by entering and exiting the stream, and loafing and defecating in the stream (Photo 1). Moving cattle away from a riparian area reduces the amount of potential contaminant runoff and deposition in the stream. In addition, moving cattle off the riparian area may better utilize forages within a pasture.

As part of the Kentucky Agriculture Water Quality Act (KAWQA), livestock producers are encouraged to implement best management practices (BMPs) to restrict or limit livestock access to streams. Appropriate BMPs for cattle operations include controlling access to streams by installing riparian fences, cattle crossings, and alternative water sources (Photo 2).

Photo 1. Riparian buffer and stream bank damaged by livestock in central Kentucky. Courtesy of the author.

Photo 2. Stream crossings limiting livestock access to the stream. Courtesy of Carmen Agouridis and Jose Bicudo.

Photo 3. A gated stream crossing.

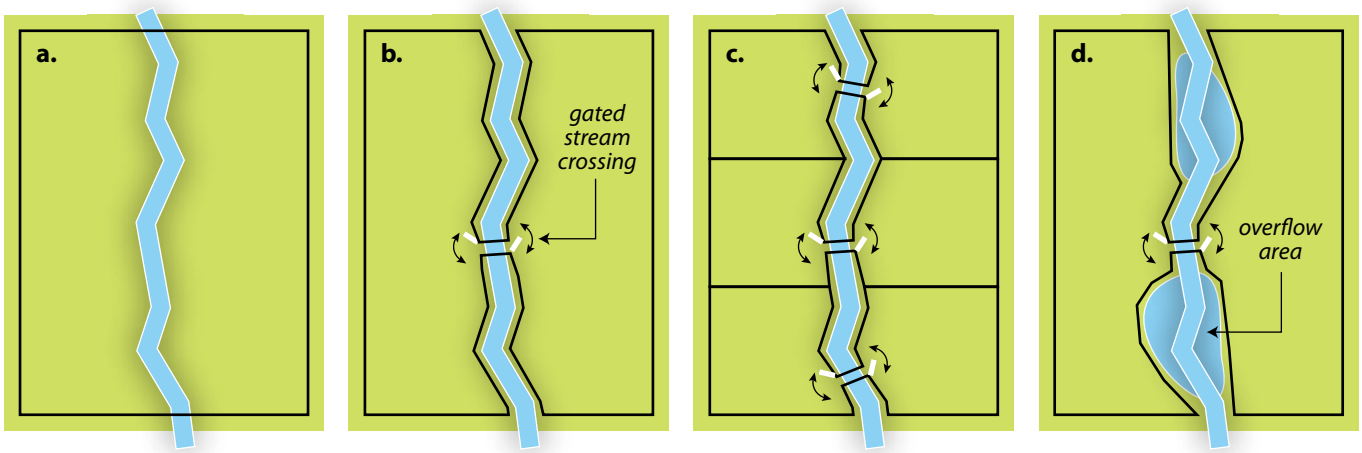
Shade structures, mineral supplement, and alternative water sources can also be used to lure cattle away from riparian areas. Rotational grazing practices can also restrict livestock from riparian areas and improve pasture utilization. Using combinations of these BMPs can improve the stream system and water quality.

Figure 2a shows what could be a typical pasture in Kentucky with a stream dividing the two halves and giving cattle full access to the stream. A producer may not want to exclude the riparian area because of cost, loss of pasture, or the trouble to move temporary fences. However, the pastures should be divided into smaller pastures to take advantage of improved animal and pasture productivity using rotational grazing.

Cost share opportunities exist for rotation grazing and to create or enhance riparian buffers on farms. The Conservation Reserve Program (CRP), the Conservation Reserve Enhancement Program (CREP), the Conservation Security Program (CSP), and the Environmental Quality Incentives Program (EQIP) pay producers either through cost share dollars or annual rental payments to convert highly erodible and environmentally sensitive land into riparian buffer areas. These federal conservation programs are administered by the Farm Service Agency (FSA) and the NRCS (American Farmland Trust, 2004).

Photo 4. Flooded pasture with fenced riparian areas.

Figure 2. Example of riparian area establishment in existing pasture.



Without exclusionary fencing, cattle have unrestricted access to the stream. Damage to streambanks and water quality are often the result.

Fencing that largely excludes cattle will protect the stream while still allowing controlled access to water and to the entire pasture.

Pastures can be subdivided with either permanent or temporary fencing. See Photos 2 and 3.

In practice, fencing may follow to some extent the outline of a stream's typical overflow after heavy rains. See Photo 4.

State and local cost-share programs are also available through local conservation districts and the Kentucky Soil and Water Conservation Commission.

Depending on the size of the floodplain, the loss of pasture from implementing a riparian area could be minimal and even negligible for a much larger pasture system. The cost can also be reduced by using temporary fencing systems. This practice allows a producer to practice flash grazing techniques to utilize the forage in the riparian area on a temporary basis. As a rule, the location of the exclusion fence should not be based on distance, but by the area covered by a typical flood. Figure 2d and Photo 4 show a riparian area during a flood and how the fence delineates the flooded area. Figures 2b and 2c demonstrate how the pasture could be divided into smaller areas and utilize stream crossings (see Photo 2) to access additional pasture. A system of gates on both sides of the stream crossings can be used to either completely exclude the animals from the stream or to provide a limited access to the stream for drinking water.

Because cattle productivity is greater when animals drink clean water, it is important that the water supply be protected and/or tested depending on your management style. Producers may want to have the water source tested for contaminants such as nutrients and pathogens.

For more information about riparian buffers, the KAWQA, and cost share programs for implementation of buffers, contact your local USDA Service Center or your local conservation district office.

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How to Create a Riparian Buffer

Delineate the Area: Inspect the area adjacent to streams after storm events. The flooded area makes a good outline area for fencing (Figure 5). Installing fence outside the flooding area will decrease fence damage from flooding debris and reduce maintenance costs. The flood-prone area might include a large area of land, so remember that even a 20-foot buffer along a stream will provide some streambank stabilization.

Preparation the Site: Pastures dominated by endophyte-infected fescue may require preparation prior to tree planting. Consult AGR-172 for renovation instructions.

Select Trees, Shrubs, and Grasses to Plant: Native tree and shrub species appropriate to your location should be selected for planting in the riparian buffer. Native species are best suited to local soils and weather conditions (i.e. flooding and drought), and they offer multiple values, including streambank stabilization, timber, and wildlife habitat. Non-native invasive species should be avoided.

Plant Vegetation: Tree seedlings may be planted by hand or with a tree planter.

Maintain the Buffer: Riparian buffers enrolled in cost-share programs must meet the criteria of the programs. Maintenance may include removal of non-native vegetation.

Fence the Buffer: Riparian buffers should be protected by fencing to limit livestock access.

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