Establishing Riparian Buffers

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Landowners establish riparian buffers for a variety of reasons. Some want to stop cropping the lowest, wettest end of the field because of the difficulty planting and harvesting flood-prone areas. Many want to improve wildlife habitat or the appearance of their farm, while others seek to improve water quality.

A common reason is to take advantage of governmental programs, such as the Conservation Reserve Program (CRP), that will share the cost of establishing a buffer area or pay annual rental payments for a period of 10 or more years for converting a portion of a crop field to a riparian buffer.

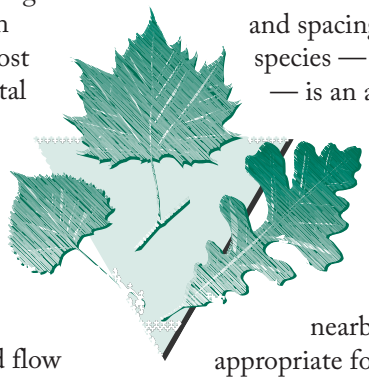
The type of permanent vegetation that is established depends on the desired benefits and agency priorities, if government funded. If the primary concern is the overland flow of sediment-laden water, then a 30-foot-wide filter strip of dense switch grass may be adequate. But if maximum nutrient and pesticide uptake is the goal, a 150-foot-wide buffer with a variety of trees and other vegetation types is needed. Grass, shrubs, and trees provide different benefits in the buffer area (Table 1).

	Vegetation Type		
Benefit	**Grass**	**Shrubs**	**Trees**
Streambank stability	low	high	high
Filter sediment	high	low	low
Nutrient retention	medium	medium	high
Pesticide buffering	medium	med/high	med/high
Livestock protection	low	medium	high
Flood damage protection	low	medium	high

Table 1. Relative effectiveness types of various riparian buffer vegetation. (Adapted from Dosskey et al. 1997.)

Methods of establishment

There are several methods of establishing riparian buffer vegetation. The most popular is planting bare-root tree and shrub seedlings in early March and April. This offers the most control over species composition and spacing. Direct seeding, using the most desired species — black walnut, pecan, oaks and hickories — is an alternative. This method relies on the wind to disperse the seed of cottonwood, sycamore and willow to fill in the new stand.



Natural regeneration is the least expensive, least certain method of establishing a riparian buffer. This requires a nearby seed source of mature trees and is most appropriate for cropland sites that experience flooding almost annually. Flood waters deposit sediment that makes a good seed bed and often carries tree and shrub seeds from upstream. The resulting stand is usually dominated by fast-growing species, such as cottonwood, elm, silver maple, boxelder and willow, all of which have wind-borne seeds.

Grass filter strips are often established on the crop field edge of the buffer area by drilling the seed through the crop stubble in either fall or spring.
A schematic diagram of the various buffer vegetation types is shown in Figure 1.

Riparian buffers in pastures often can be naturally regenerated by fencing off the area for several years. After the new stand is well established, limited grazing may be re-introduced unless the buffer was established with a governmental cost-share program. The stand resulting from this practice usually will be dominated

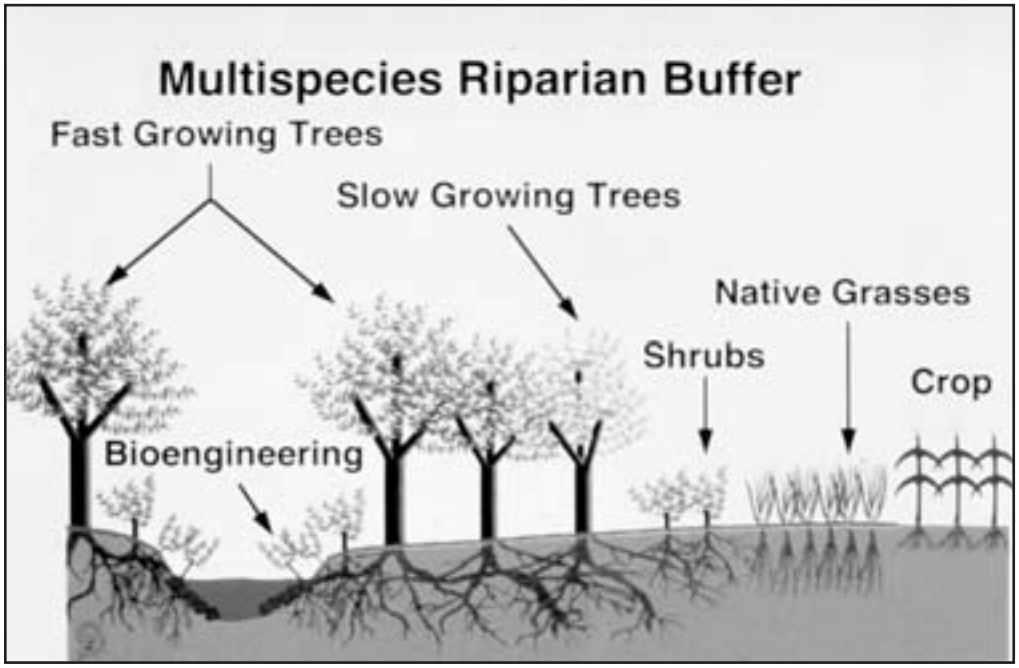


Figure 1. Riparian buffer vegetation drawing with stream bank practices. (Adapted from ISU Leopold Center for Agroecology.)

by bird-dispersed or larger-seeded species that were not palatable to grazing livestock, typically honeylocust, hedge (Osage orange), hackberry and eastern redcedar. Some sites have a good number of oak and ash seedlings already present that simply need protection from the trampling and grazing to grow well. Contact your Kansas Forest Service district forester for help developing a regeneration plan.

Site Preparation

Thorough soil preparation the fall before planting is very important for riparian buffer establishment. This is due to the intense weed competition, which can suppress tree growth that is usually present on these fertile, well watered areas. Most failed tree plantings — whether for windbreaks, buffers, nut orchards or Christmas trees — can be traced to inadequate soil preparation.

Disking the site the fall before planting is almost always necessary, unless a low-residue crop, such as soybeans, was grown with little weed growth. Fall site preparation is essential if planting into an established grass sod, such as a hay meadow or pasture. Over the winter, the freezing and thawing of the plowed or disked sod will break up and settle the clods, exposing the roots and effectively killing grass crowns. If erosion is a concern, herbicides can be used to kill the grass in four-foot planting circles or down the entire row to be planted in the spring. In heavy-textured soils, if a clay pan or plow pan is present, it will restrict tree root growth. A subsoil ripper or shank plow can be used on the rows before planting. This will allow deeper rooting and better tree growth with little risk of erosion.

Competition control

Competition control is crucial during the first two to three years. Even the best prepared site is likely to develop a heavy growth of annual grasses and weeds by early summer. Weed barrier fabric applied at the time of planting is effective, but in eastern Kansas is not approved for federal cost-share programs. In flood-prone areas the fabric may be disturbed if exposed to rushing flood waters the first year, or it may be covered with sediment, allowing weeds to grow on top of the material.

Mowing between the rows is a common, minimum practice. Close mowing several times each summer can help prevent the trees from being overtaken by weeds. Herbicide applications are cost effective and do the best job of controlling weeds and enhancing tree growth. On well-prepared sites, pre-emergent herbicides are effective at reducing weed growth.
K-State Research and Extension publication MF-656 Chemical Weed Control in Tree and Shrub Plantings covers this practice.

Preventing Animal Damage

Several animal species, including deer, can damage young riparian forest plantings (Figure 2). After tree seedlings outgrow this stage, the saplings are prone to antler-rubbing damage by bucks in the fall. Unfortunately, the target of the rubbing often is the tallest, straightest black walnut in the planting.

A protection system is an added expense, in both labor and materials, but should be considered to assure success of the planting. A three- to five-strand electric fence is effective for protecting several acres from deer damage. At remote sites these are powered by a 12-volt vehicle battery. An alternative protection system uses

Figure 2. A five-year-old oak seedling less than two feet tall due to heavy deer browsing.

plastic tubular tree shelters, 4 to 5 feet tall (Figure 3) to prevent browsing and rubbing. These have the added benefit of increasing early height growth and making mowing and herbicide applications easier because seedlings are easily located and protected from herbicide drift. A number of commercial and homemade deer repellents have shown variable, limited success.

Rabbit clipping of seedlings usually occurs only the first year or two, and only on plantings near favored brushy cover. The tree shelters also work to prevent rabbit clipping. An extruded plastic mesh cylinder 18 inches tall is available at a much lower cost from the Kansas Forest Service. Commercial rabbit repellants have shown variable success. Beavers can heavily damage riparian plantings, usually most severely in the sapling stage. Most damage occurs in fall as the creatures are preparing their winter cache of browse. Fencing and repellents are not effective. Trapping and removing offending individuals can be effective in reducing damage. Individual trees can be protected with a collar of galvanized steel screening. Beavers have definite feeding preferences, with cottonwood, willow, ash and hackberry high on the menu list. They seldom bother black walnut and sycamore.

Sample Buffer Design

The best buffer design is site specific, and depends on the landowner's goals, the supporting agency's requirements and site conditions, such as soil type, current vegetation and flood frequency. A three-zone, 66-foot buffer design developed by Iowa State University uses grass, shrub and tree components. While still being evaluated, 66 feet is thought to be about the minimum width to provide key water quality functions of sediment, nutrient and pesticide removal. Tree and shrub species recommended for Kansas riparian plantings are listed in Table 2.

The ISU model calls for a 20- to 24-foot wide strip of native warm-season grasses nearest the cropland, shrubs in a middle zone that is at least 12 feet wide, and a tree zone at least 30 feet wide, with a minimum of four rows. The total width of the buffer should measure at least 66 feet. The spacing between rows depends on the size and type of equipment used for weed control, but is usually between 8 and 15 feet. The distance between trees and shrubs depends on their mature size. Shrubs are usually spaced 3 to 6 feet apart, while trees are spaced 8 to 15 feet apart.

A combination of trees, shrubs and grasses helps to protect a stream more than planting a single type or species of vegetation. Trees and shrubs provide deeper, perennial root systems for streambank stability and uptake of nutrients from subsurface flow. The warm-season grasses provide the high density of stems to slow surface runoff, disperse concentrated flow and trap sediment from the field. Shrub rows offer food and cover for wildlife and help reduce competition between the grass and trees. Initially the grass competes with tree seedlings, reducing growth of the trees. As the trees mature and cast shade, the grass growth is reduced. Most shrub species are more tolerant than trees of shade and competition and help reduce this negative interaction.

For further help establishing a riparian buffer, contact your local National Resources Conservation Service (NRCS) office or Kansas Forest Service district forester.

Figure 3. Bur oak seedlings beginning their second growing season, already emerging from four-foot shelters. Note the shorter, unsheltered trees in the background.

Table 2. Recommended tree and shrub species for Kansas riparian buffers.

Tree Species	Poorly drained, flood-prone areas	Well-drained soils	Comments
Black willow	X		The common, native willow in Kansas. Grows rapidly, and can be easily started from cuttings. Willows are a favorite food of beaver.
Hybrid willow (ie.Austree)	X		Very rapid growth, but no drought tolerance, and may be short-lived.
Cottonwood	X	X	Grows rapidly, a favorite food of beaver. Timber.
Hybrid poplar	X	X	Grows even more rapidly than the native cottonwood, but is short er lived and may be more prone to attack by borers and disease.
Silver maple	X	X	Used for timber.
Sycamore	X	X	Grows rapidly on good sites, beaver rarely feed on it.
Baldcypress	X	X	Native to southern U.S. rivers but grows well in Kansas riparian areas. A deciduous conifer, it drops its needles in the fall.
Pin oak	X	X	Native to southeastern Kansas wetlands. Requires acidic soil (pH<6.5).
Bur oak	X	X	Most common oak in Kansas, long-lived and produces valuable timber. Large acorns are an important wildlife food.
Green ash	X	X	Moderate growth rate. Winged seeds are an important wildlife food.
Pecan	X	X	Requires fertile, moist soils for nut production.
Honeylocust		X	Drought tolerant; excellent firewood; may be thorny.
Hackberry		X	Moderate growth rate. Some value for timber.
Northern red oak		X	Moderate growth rate; valued for timber; only adapted to eastern two-thirds of Kansas.
Black walnut		X	Produces very valuable timber, but requires deep, fertile, well-drained soils to grow well.
Shrub Species			
Sandbar willow	X		Native to river sandbars; forms thickets; cuttings root easily.
Buttonbush	X		Native to shorelines; flowers attract butterfies
Red twig dogwood	X	X	Native to some riparian areas in eastern Kansas. Red twigs are quite showy in winter. Not drought tolerant.
American plum	X	X	Forms thickets; excellent wildlife cover.
Choke cherry	X	X	Forms thickets; birds relish the small fruit.
Golden currant		X	Drought tolerant.
Common ninebark		X	Flowers attract butterflies; fruit eaten by birds.
Fragrant sumac		X	Drought tolerant.

References

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Stewards of Our Streams: Buffer Strip Design, Establishment and Maintenance. Iowa State University Extension Bulletin PM-16266. April 1996.

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