

**NATURAL RESOURCES CONSERVATION SERVICE**  
**CONSERVATION PRACTICE STANDARD**  
**RIPARIAN FOREST BUFFER**

(Acre)

CODE 391

**DEFINITION**

An area of predominantly trees and/or shrubs located adjacent to and up-gradient from watercourses or water bodies.

**PURPOSES**

Create shade to lower water temperatures to improve habitat for aquatic organisms.

Provide a source of detritus and large woody debris for aquatic and terrestrial organisms.

Create wildlife habitat and establish wildlife corridors.

Reduce excess amounts of sediment, organic material, nutrients and pesticides in surface runoff and reduce excess nutrients and other chemicals in shallow ground water flow.

Provide a harvestable crop of timber, fiber, forage, fruit, or other crops consistent with other intended purposes.

Provide protection against scour erosion within the floodplain.

Restore natural riparian plant communities.

Moderate winter temperatures to reduce freezing of aquatic over-wintering habitats.

To increase carbon storage in plant biomass and soils.

**CONDITIONS WHERE PRACTICE APPLIES**

On areas adjacent to permanent or intermittent streams, lakes, ponds, wetlands and areas with ground water recharge that are capable of supporting woody vegetation.

**CRITERIA**

**General Criteria Applicable to All Purposes**

The location, layout and density of the riparian

forest buffer will accomplish the intended purpose and function.

Dominant vegetation will consist of existing, naturally regenerated, or planted trees and shrubs suited to the site and the intended purpose.

All riparian buffers will consist of a Zone 1 that begins at the normal water line, or at the top of the bank, and extends a minimum distance of 15 feet, measured horizontally on a line perpendicular to the stream or water body. Zone 1 will be increased to 35 feet when Zone 2 is omitted.

Zone 1 should be left undisturbed to create a stable condition along the waters edge, provide nutrient buffering, and shade and improve aquatic habitat by providing woody debris. Occasional removal of some tree and shrub products such as high value trees is permitted in Zone 1 provided the intended purpose is not compromised by the loss of vegetation or harvesting disturbance. Tree and shrub pruning and removal shall be done according to the Oklahoma Conservation Practice Standards Tree/Shrub Pruning (660) and Forest Stand Improvement (666).

Natural regeneration of existing plants on the site may be possible for Zone 1 and Zone 2. When the existing vegetation in Zone 1 and Zone 2 meet all of the following criteria, natural regeneration is an option:

- Plants, must be native, non-invasive trees or shrubs, adapted to the area
- Have a density of 300 plants per acre (3 per 1/100 acre),
- Plants are at least 2 feet tall and in good health

Plant densities can be determined by marking the perimeter of a 1/100-acre circular plot (approximately 12 feet in radius) then counting all desirable woody plants. When the area of consideration is >100ft. in length, several sites must be sampled and summarized to determine if

the 300 plant per acre criteria is met.

**Table 1** contains a list of woody plant species (trees and shrubs) commonly associated with and suited to riparian areas. Species are arranged alphabetically by zone and area of adaptation.

Necessary site preparation and planting shall be done at a time and manner to insure survival and growth of selected species. Planting shall be done according to the Oklahoma Conservation Practice Standard Tree/Shrub Establishment (612).

Only viable, high-quality and adapted planting stock will be used.

Site preparation shall be sufficient for establishment and growth of selected species and is done in a manner that does not compromise the intended purpose.

Livestock and vehicles shall be controlled or excluded as necessary to achieve and maintain the intended purpose. Use of the area should be limited to those activities that will maintain or improve the riparian plant community.

Harmful pests present on the site will be controlled or eliminated as necessary to achieve and maintain the intended purpose. Invasive and/or non-native plants shall be removed as feasible.

For optimal carbon storage, select plant species that are adapted to the site to assure strong health and vigor and plant the full stocking rate for the site.

A Zone 3 shall be added to the riparian buffer when adjacent to cropland or other sparsely vegetated or highly erosive areas to filter sediment, address concentrated flow erosion, and maintain sheet flow. The Oklahoma Conservation Practice Standard Filter Strip (393) shall be used to design Zone 3.

Comply with applicable federal, state and local laws and regulations during the installation, operation (including harvesting activities) and maintenance of this practice.

**Additional Criteria To Reduce Excess Amounts of Sediment, Organic Material, Nutrients and Pesticides in Surface Runoff and Reduce Excess Nutrients and Other Chemicals in Shallow Ground Water Flow**

An additional strip or area of land, Zone 2, will begin at the edge and up-gradient of Zone 1 and extend a minimum distance of 20 feet, measured

horizontally on a line perpendicular to the water body. The minimum combined width of Zones 1 and 2 for permanent and intermittent streams will be 100 feet or 30 percent of the floodplain whichever is less, but not less than 35 feet.

The minimum combined widths for Zones 1 and 2 will be 35 feet for lakes, ponds, and wetlands.

The determination of the minimum widths of Zones 1 and 2 shall be consistent with examples provided in **Figure 1**.

Criteria for Zone 1 shall apply to Zone 2 except that removal of products such as timber, fiber, nuts, fruit and forbs is permitted and encouraged on a periodic and regular basis provided the intended purpose is not compromised by loss of vegetation or harvesting disturbance.

**Additional Criteria to Improve Water Quality by Providing Protection Against Out of Bank Flow and Scour Erosion Inside The Floodplain**

Zone 2 may be expanded to encompass scour channels that are adjacent to the main channel of a stream. The width of Zone 2 may be designed as wide as 30% of the floodplain to include the scoured area. Zone 2 shall not extend more than 35 ft. beyond the outer bank of the scoured area.

Criteria for Zone 1 shall apply to Zone 2 except that removal of products such as timber, fiber, nuts, fruit and forbs is permitted and encouraged on a periodic and regular basis provided the intended purpose is not compromised by loss of vegetation or harvesting disturbance.

**Additional Criteria To Provide Habitat For Aquatic Organisms And Terrestrial Wildlife**

When riparian buffers are used to enhance wildlife habitat by creating wildlife corridors along streams, follow the guidelines listed in the table below for design widths. The widths listed include Zones 1 and 2. They are also the total width for one or both sides of the stream. The design width will not exceed the floodplain.

Species	Minimum Design Width
Bald eagle, cavity nesting ducks, heron, sandhill crane	600
Beaver, dabbling ducks, mink, other water mammals	300
Deer, other game and non-game mammals, songbirds, game birds	200

When riparian buffers are designed for lowering warm season water temperatures by shading, it shall consist of Zone 1 for streams and water bodies. Zone 1 will be a minimum of 35 feet in width. When shading is desired for habitat improvement, a mixture of trees will be established that are suitable for the area with mature heights of at least 30 feet. Riparian buffers will be established and maintained on the south and west sides of water course as much as possible for shading effect. The tree canopy shall be established to achieve at least a 50% crown cover. Place drooping or wide-crowned trees nearest the water. Shoreline or channel depth and topographic shading will be taken into account in selecting species.

Establish and manage species capable of producing stems and limbs of sufficient size to provide an eventual source of woody debris for in-stream habitat.

Establish plant communities that address the target wildlife needs and existing resources in the watershed.

## CONSIDERATIONS

The severity of bank erosion, concentrated flow erosion, or mass soil movement and its influence on existing or potential riparian trees and shrubs should be assessed. Watershed-level or contributing area treatment or bank stability activities may be needed before establishing a riparian forest buffer.

When concentrated flow erosion and sedimentation cannot be controlled vegetatively, consider structural or mechanical treatments.

Favor tree and shrub species that are native, non-invasive, or have multiple values such as those suited for timber, biomass, nuts, fruit, browse, nesting, aesthetics and tolerance to locally used herbicides.

Tree and shrub species, which may be alternate hosts to undesirable pests, should be avoided. Species diversity should be considered to avoid loss of function due to species-specific pests.

Plants that deplete ground water should be used with caution in water-deficit areas.

Allelopathic impacts of plants should be considered.

The location, layout and density of the buffer should complement natural features, and mimic natural riparian forests.

## PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.

## OPERATION AND MAINTENANCE

The following actions shall be carried out to insure that this practice functions as intended throughout its expected life.

The riparian forest buffer will be inspected periodically and protected from adverse impacts such as excessive vehicular and pedestrian traffic, pest infestations, pesticides, livestock or wildlife damage and fire.

The Oklahoma Conservation Practice Standard Use Exclusion (472) shall be used when exclusion of animals, people, or vehicles is needed.

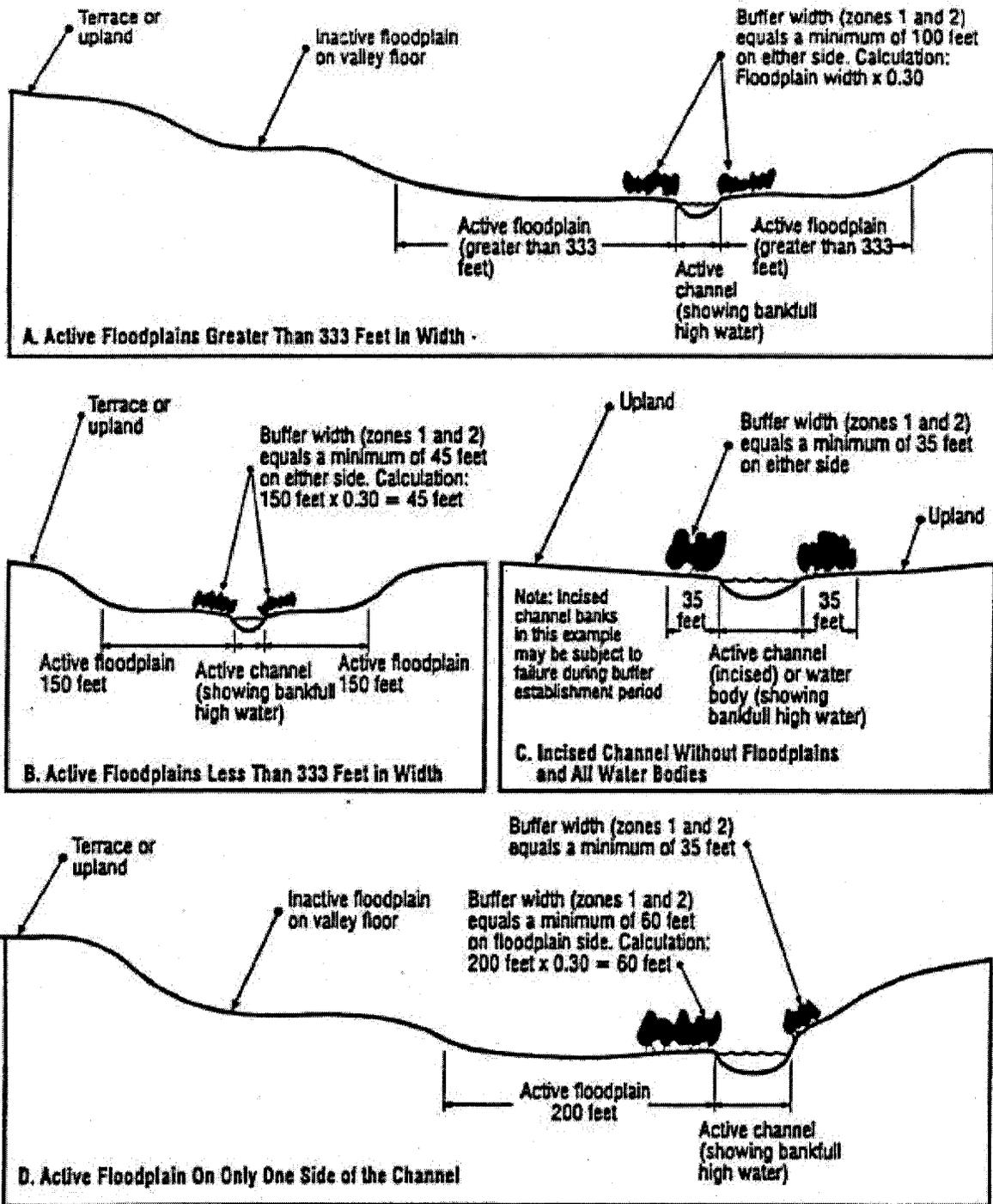
The Oklahoma Conservation Practice Standard Firebreak (394) will be used as needed to protect the area from wildfire.

Replacement of dead trees or shrubs and control of undesirable vegetative competition will be continued until the buffer is, or will progress to, a fully functional condition.

As applicable, control of concentrated flow erosion and sediment deposition shall be controlled by an adjacent filter strip.

Any use of fertilizers, pesticides and other chemicals to assure buffer function shall not compromise the intended purpose. The Oklahoma Conservation Practice Standards Nutrient Management (590) and Pest Management (595) shall be used as guidance when fertilizer and pesticides are used.

Figure 1: Examples of riparian buffer widths designed using the water quality criteria. The minimum width of zones 1 and 2 will be 100 feet or 30% of the geomorphic floodplain, whichever is less but not less than 35 feet.



**Table 1**  
**Plant List for Riparian Forest Buffers**

<b>Tree Species</b>	<b>Zone 1</b>	<b>Zone 2</b>	<b>Area of Adaptation</b>
alder, smooth	X		SE
ash, green	X	X	east of 25" rainfall
ash, white		X	east of I-35
baccharis		X	statewide except panhandle
baldcypress	X		SE
basswood, American		X	Adair, Cherokee, LeFlore, Delaware, Sequoyah, McCurtain counties
birch, river	X		east of 40" rainfall
blackgum	X	X	east of 40" rainfall
blacklocust	X	X	statewide except panhandle
boxelder		X	east of I-35
buckbrush	X	X	statewide
buckeye, Texas		X	east of I-35
buttonbush	X		statewide except panhandle
bumelia		X	statewide except panhandle
cherry, black		X	McCurtain, LeFlore counties
cottonwood	X	X	statewide
dogwood, roughleaf		X	east of 24" rainfall
elm, American		X	statewide except panhandle
elm, lacebark	X	X	statewide
elm, red	X		east of I-35
elm, winged		X	east of I-35
Greenbrier		X	statewide except panhandle
hackberry		X	statewide except panhandle
hawthorn, cockspur		X	east of 40" rainfall
hawthorn, downy		X	east of I-35
hawthorn, green		X	east of 40" rainfall
hickory, bitternut		X	NE, SE, west to Arbuckle Mts.
hickory, mockernut		X	MLRA 133B, 119, 118, 116A
holly, American		X	MLRA 133B in McCurtain Co.
indigo, false	X	X	statewide
maple, red	X		MLRA 116A, 133B, 119, 118

<b>Tree Species</b>	<b>Zone 1</b>	<b>Zone 2</b>	<b>Area of Adaptation</b>
maple, silver		X	east of 32" rainfall, except MLRA 133B
maple, sugar		X	MLRA 116A, LeFlore and McCurtain counties
mulberry, red		X	east of 24" rainfall
oak, bur	X	X	east of 24" rainfall
oak, chinkapin		X	east of 24" rainfall
oak, overcup	X	X	MLRA 133B in McCurtain Co.
oak, red		X	eastern tier of counties, up Arkansas River to Tulsa
oak, Shumard		X	east of I-35
oak, water	X	X	east of 40" rainfall
oak, white		X	eastern tier of counties, west to Coal Co. in SE
Oak, willow	X	X	LeFlore, McCurtain, Pushmataha & eastern Choctaw counties
pecan	X	X	SW, SE, NE, except for MLRA 116A, 119, 118
persimmon		X	east of I-35
pine, loblolly		X	MLRA 133B, McCurtain Co.
plum		X	statewide
plum, American		X	statewide, except panhandle
possumhaw		X	east of 40" rainfall
redbud		X	east of 24" rainfall
soapberry	X	X	east of 24" rainfall
sugarberry	X	X	statewide except MLRA 70A, 77A, 77B
sumac		X	statewide
sweetgum		X	Choctaw, Latimer, LeFlore, McCurtain and Pushmataha Cos.
sycamore	X	X	all counties along and east of I-35
walnut, black		X	statewide except panhandle
walnut, little		X	statewide except MLRA 70A, 77A, 77B
willow, black	X		east of 24" rainfall
willow, coyote	X	X	statewide except panhandle
willow, sandbar	X		statewide