NRCS Natural Resources Conservation Service
MISSISSIPPI

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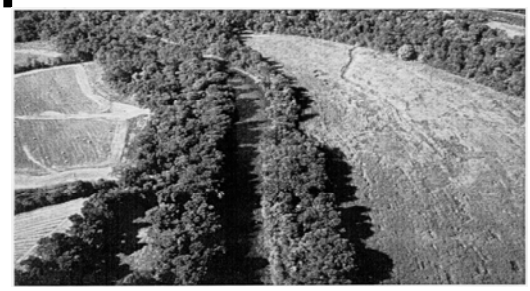
# Riparian Forest Buffers



**Definition**
A riparian forest buffer is an area of predominantly trees and/or shrubs located adjacent to and up-gradient from watercourses or water bodies, such as streams, rivers, lakes, ponds, and wetlands.

**Purpose(s)**
- Create shade to lower water temperatures (generally resulting in higher dissolved oxygen levels) to improve habitat for aquatic organisms.
- Provide a source of detritus (litter fall) and large woody debris for aquatic and terrestrial organisms.
- 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.
- Create wildlife habitat and establish wildlife corridors.
- To increase carbon storage in plant biomass and soils.

**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.

**General Criteria for All Purposes**
There are potentially three specific zones that are applied in a riparian forest buffer depending upon the intended purpose(s) and site conditions.

All buffers will consist of a Zone 1 that begins at the normal water line, or at the upper edge of the active streambank (if incised), or shore, and extends a minimum distance of 15 feet, measured horizontally on a line perpendicular to the watercourse or water body. Zone 1 should provide a stable area near the water's edge to facilitate nutrient buffering, provide shade to stabilize water temperatures, and contribute detritus and woody debris to the stream ecosystem. Dominant vegetation will consist of existing, naturally regenerated, or planted trees and shrubs that according to the soil survey are suited to the site **and** the intended purpose. A seed source adjacent to the site must be present when using natural regeneration to establish a buffer.

If planted, there shall be a minimum of two rows in Zone 1. Plantings in Zone 1 will consist of at least two native tree species suited to the seasonal variation of soil moisture and other site specific conditions within the planned buffer. To achieve the desired detritus and large woody debris, plant species from suitable hardwoods, with one or more being a suitable oak species (planting of pine species is not allowed in Zone 1).

For all riparian buffers (regardless if located in buffer Zone 1 and/or 2), a restrictive area extending a minimum average distance of 35 feet, measured horizontally on a line perpendicular to the watercourse/body will be designated along all perennial and intermittent streams, lakes, ponds, and wetlands.

**General Criteria for All Purposes (cont.)**
Within the entire restrictive area, certain silviculture practices **are permitted**. They include: mowing, sub-soiling/ripping (especially when a restrictive layer exists within the seedlings' rooting zone); direct seeding, hand planting, or machine planting on the contour (Seedlings should be planted in the sub-soil trench or immediately beside if the soils have a high shrink-swell capacity.); and chemical control of competing vegetation during the first year after planting for increased survival. Herbicides should be banded (not broadcast) along the subsoil trench as a pre-emergent application (prior to bud break of the seedlings) in order to provide better control of competing vegetation and have fewer problems with phytotoxicity in seedlings. An on-site assessment of competitive species will be conducted. Selected herbicides should provide effective control on the targeted competitive species and be labeled for use on hardwoods since planting of pine species is not allowed within the restrictive area. Any use of herbicides to increase chances for survival shall not compromise the intended purpose(s) of the buffer. Practices that are **not allowed within the restrictive area** include mechanical site preparation (except as previously noted), fertilization, and aerial application or mist blowing of herbicides and insecticides.

**Outside the restrictive area,** any site preparation and planting methods consistent with Mississippi's Best Management Practices for Forestry may be used. Site preparation, use of fertilizers, pesticides, and other chemicals shall be sufficient for establishment and growth of selected species and done in a manner that does not compromise the intended buffer purpose(s).

Occasional removal of some tree and shrub products such as high value trees is permitted in Zone 1. For purposes of moderating water temperatures and providing detritus and large woody debris, riparian forest buffer management must maintain a minimum of 50 percent canopy cover in Zone 1. All forest harvesting operations shall be in compliance with Mississippi's Best Management Practices for Forestry.

**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 Groundwater 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 course/body. The minimum combined width of Zones 1 and 2 will be 35 feet. Where floodplain width allows, the minimum combined width of Zones 1 and 2 will be increased to 30 percent of the geomorphic (active) floodplain up to 150 feet. Zone 2 will consist of riparian trees and shrubs designed to provide contact time for the buffering process to occur, establish wildlife habitat, and/or improve aesthetics. A seed source adjacent to the site must be present when using natural regeneration to establish a buffer.

Plantings in Zone 2 will consist of predominately native tree and shrub species that according to the soil survey are suited to the seasonal variation of soil moisture and other site specific conditions within the planned buffer. At least three or more tree species will be planted in the **combined** areas of Zones 1 and 2. (Native pine species maybe added within Zone 2. However, even in Zone 2, planting of pine species is not allowed within the 35-foot restrictive area.) Shrubs may be planted on the outside edge of Zone 2 so they will not be shaded out as the trees mature. Use of site preparation, planting, and other silviculture practices for establishing Zone 2 will meet the same criteria as for Zone 1.

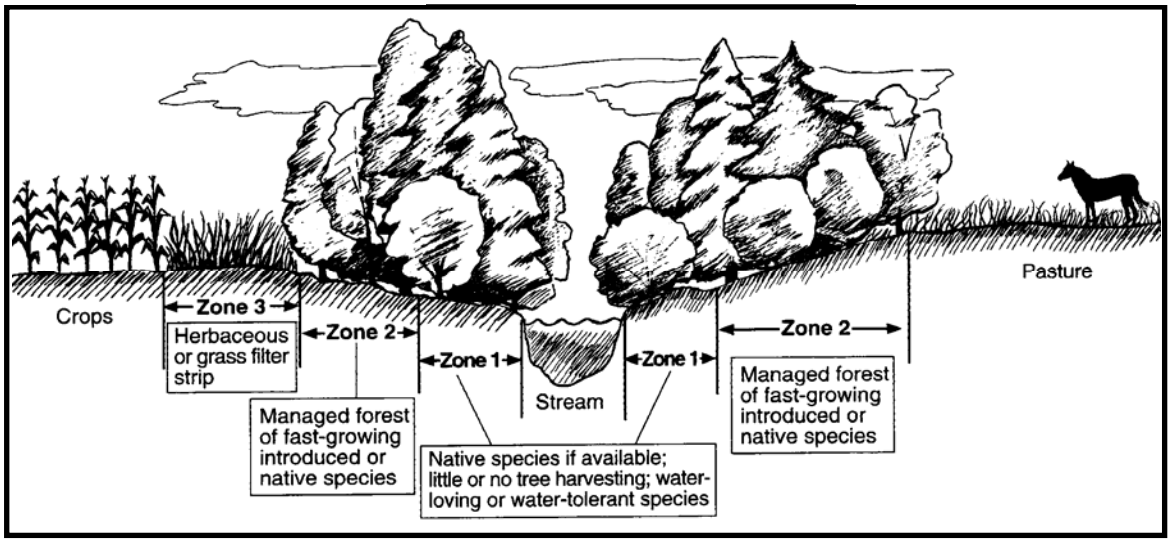



**Figure 1.** A riparian forest buffer includes Zone 1, the area closest to the waterbody or course, and Zone 2, the area adjacent to and up gradient of Zone 1. Trees and shrubs in Zone 1 provide important wildlife habitat, litter fall for aquatic organisms, and shading to lower water temperature. This zone helps stabilize streambanks and shorelines. Trees and shrubs in Zone 2 (along with Zone 1) intercept sediment, nutrients, pesticides, and other pollutants in surface and subsurface water flows. Zone 2 can be managed to provide timber, wood fiber, and horticultural products. A third zone, Zone 3, is established if periodic and excessive water flows, erosion, and sediment from upslope fields or tracts are anticipated. Zone 3 is generally of herbaceous plants or grass and a diversion or terrace, if needed. This zone provides a "first defense" to assure proper functioning of Zones 1 and 2.

**Additional Criteria to Reduce Excess Amounts of Sediment, … (cont.)**

Removal of tree and shrub products such as timber, fiber**,** nuts, fruit and forbs is permitted and encouraged on a periodic and regular basis in Zone 2 provided the intended purpose is not compromised by loss of vegetation or harvesting disturbance. All forest harvesting operations shall be in compliance with Mississippi's Best Management Practices for Forestry.

A Zone 3 shall be added up-gradient of Zone 2, if periodic and excessive water flows, erosion, and sediment from upslope fields or tracts are anticipated. Zone 3 is generally 20 feet wide and consists of permanent grass and/or herbaceous plants and a diversion or terrace, if needed. This zone provides a "first defense" to assure proper functioning of Zones 1 and 2. (Figure 1 illustrates examples of Zones 1, 2 and 3 for water courses and water bodies.) Zone 3 is required to convert concentrated flow erosion to sheet flow or subsurface flow to control excessive sheet and rill erosion or mass soil movement prior to establishment of the riparian forest buffer. If concentrated flow erosion within the buffer is caused by soil disturbing practices during establishment, the area will be adequately treated, including providing any necessary stable outlets. Stiff stemmed grasses or forbs may be established in Zone 3 to accelerate sediment deposition.

Riparian forest buffers are normally established concurrently with other practices (such as diversion, and/or critical area planting) as part of a conservation management system. Use of this practice without other nutrient, pesticide, sediment, and erosion control practices can result in adverse impacts on buffer vegetation and hydraulics.

Livestock shall be controlled or excluded as necessary to achieve and maintain the intended purpose.

**Design Considerations**

The location, layout, width, length and species of plants in the riparian forest buffer will be designed to accomplish the intended purpose(s) and function.

Table 1. Recommended Combined Widths for Zones 1 and 2 for Riparian Forest Buffers

| Buffer Purpose | Minimum | Optimum |
|---|---|---|
| Create shade to lower water temperatures | 35 feet | 35 feet |
| Provide source of detritus and woody debris | 35 feet | 50 feet |
| Reduce excess amounts of sediment, organic matter, nutrients and pesticides in surface runoff and reduce excess nutrients and other chemicals in shallow ground water flow | 35 feet | 150 feet |
| Provide a harvestable crop of timber, fiber, forage, fruit, or other crops consistent with other intended purposes | 35 feet | 300 feet |
| Provide protection against scour erosion within the floodplain (Perennial streams and rivers) | 35 feet | 200 feet |
| Restore natural riparian plant communities | 35 feet | 150 feet |
| To increase carbon storage in plant biomass and soils | 35 feet | 300 feet |
| Create general wildlife habitat and establish wildlife corridors | 35 feet | 150 feet |
| Create specific wildlife habitat: | --- | --- |
| Upland small game | 35 feet | 75 feet |
| Aquatic species | 35 feet | 150 feet |
| Reptiles & amphibians | 35 feet | 150 feet |
| Non-game birds and mammals | 35 feet | 150 feet |
| Big game | 35 feet | 200 feet |
| Waterfowl (cavity-nesting) | 35 feet | 300 feet |
| Raptors, Bald Eagles, Sandhill Crane, Herons | 300 feet | 600 feet |

**Design Considerations (cont.)**

Alternatives can vary from simple, when creating areas where water quality is the landowner's primary objective, to complex when designing and managing riparian forest buffers for specific wildlife species. The habitat contribution of a riparian forest buffer is determined by the width of the buffer, the vegetation selected, and the maintenance/management techniques selected. Ideally the trees, shrubs, and herbaceous plants used in a riparian forest buffer should mimic those that occurred naturally on the site, but a number of alternatives are available to meet the landowner's objectives. Although Zone 3 is not always required in a riparian forest buffer, it should be included in all designs with a wildlife objective. The addition of this filter strip, composed of grasses, legumes, and forbs, adds vegetation complexity and a transition zone to the buffer.

- Recommended Widths

Buffer width = Zone 1 + Zone 2 + Zone 3 (when applicable). Wide widths are preferred. They are more effective for the listed purposes and more feasible to manage. Additional width is important when designing a riparian forest buffer for wildlife. Wider riparian corridors provide nesting habitat for a greater variety of migratory songbirds and are more attractive to larger animals such as the white-tailed deer and wild turkey. See Table 1 for recommended widths by purposes for riparian forest buffers. Narrower widths within this job sheet recognize the value of streamside land for farming and limited bottomland acreage in many locations. Maximum widths may be limited by USDA policy on lands enrolled in conservation cost-share programs.

**Design Considerations (cont.)**

- Vegetation Selection
  For existing or naturally regenerated buffers, allow the buffer to grow up in native plants, if suitable species for targeted purposes are available in the seed bank or adjacent areas.

  Favor tree and shrub species that are native, non-invasive and have multiple values such as those suited for timber, biomass, nuts, fruit, browse, nesting, aesthetics and tolerance to locally used herbicides. See Table 2 for approved species list.

**Table 2. SUGGESTED PLANT LIST (Not limited to)**

| GRASSES: | SHRUBS/FORBS: |
|---|---|
| Switch grass | Partridge Pea |
| Bluestem spp. | American Plum |
| Weeping love grass | Wild Plum |
| Bahia grass | Crab Apple |
| Dallisgrass | Shrub Lespedeza |
| Legumes (with grasses): | Bicolor |
| White Clover | Japonica |
| Red Clover | Thundergii |
| Crimson Clover | Native Holly spp. |
| **TREES:** | |
| Basswood | Yellow Poplar |
| Black Cherry | Oak species: |
| Blackgum | Cherrybark |
| Black Walnut | Chinkapin |
| Chinese Chestnut | Northern Red |
| Cottonwood | Nuttall |
| Cypress | Overcup |
| Dogwood | Pin |
| Green Ash | Sawtooth |
| Hickory | Scarlet |
| Native Pecan* | Shumard |
| Persimmon | Southern Red |
| Pine (only in Zone 2) | Swamp White |
| Sugarberry | Swamp Chestnut |
| Sweetgum | Water |
| Sycamore | White |
| White Ash | Willow |

*No commercial varieties of pecans planted in an orchard fashion are allowed under CRP.

Avoid use of species identified in the USDA, Forest Service Technical Report SRS-62 on invasive plants of southern forests.

Species diversity should be considered to avoid loss of function due to species-specific pests.

**Additional Wildlife Considerations**

To provide habitat and corridors for wildlife, plan to connect a buffer with existing perennial vegetation, such as old fields, old fence rows, forested areas, or hedgerows. Manage the buffer to favor food, shelter and nesting cover that would satisfy the habitat requirements of the indicator or target wildlife species. Consult with a Wildlife Biologist.

**Additional General Considerations**

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

When livestock are to be excluded, stream crossings and livestock watering facilities shall be located and designed to minimize impact on buffer vegetation and shall be fenced.

Harmful pests present on the site will be controlled or eliminated as necessary to achieve and maintain the intended purpose. Tree and shrub species which may be alternate hosts to undesirable pests or that may be considered noxious or undesirable should be avoided. Allelopathic impacts of plants should be considered.

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.

Consider the positive and negative impacts beaver, muskrat, deer, rabbits and other local species may have on the successful

management of the riparian and stream system.

**Additional General Considerations (cont.)**
Consider the type of human use (rural, suburban, urban) and the aesthetic, social and safety aspects of the area to determine the vegetation selection, arrangement and management.

Before applying chemicals for any purpose(s), read and follow all label directions for the selected chemicals.

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

**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 livestock damage and destructive fire. Inspect after heavy storms. Check for areas where water is concentrating.
- As applicable, adequate erosion control shall be maintained within the buffer and in the up-gradient area immediately adjacent to Zone 2 to maintain buffer function.
- Buffer with trees to be established through natural regeneration should be inspected periodically until establishment of desired species and stocking is ensured.
- Replacement of dead trees or shrubs and control of undesirable vegetative competition will be continued until the buffer is, or progresses to, a fully functional condition.
- Excess use of fertilizers, pesticides, or other chemicals, and vehicular traffic or excessive animal traffic must be avoided.
- In Zone 1 vegetation, undergrowth, forest floor, duff layer, and leaf litter shall remain undisturbed except for removal of trees that represent a hazard to streambank stability and individual trees of high economic value.
- Logging and other overland equipment shall be excluded from Zone 1, except for stream crossings and stabilization work. For unstable areas, streambank protection measures will be planned and conducted as needed in accordance with the standard for Streambank and Shoreline Protection (Code 580). Felling and skidding of trees shall be directed away from the watercourse or water body. Skidding will be done in a manner to prevent creation of ephemeral channels perpendicular to the stream.
- In Zone 1 after establishment, dead trees should be left to eventually recruit large woody material into the water body and to provide food and shelter for birds and mammals.
- As the buffer matures, periodic harvesting (forest stand improvement) of some of the trees becomes an important activity for maintaining plant health and buffer function. Harvesting should be planned for Zone 2 in a manner that maintains the intended purpose of the buffer. Any removals of tree and shrub products from Zone 2 shall be conducted in compliance with Mississippi's Best Management Practices for Forestry.
- For all riparian forest buffers, the area (regardless if located in buffer Zone 1 and/or 2) extending a minimum average distance of 35 feet, measured horizontally on a line perpendicular to the watercourse/body will be designated as a restrictive area. Activities conducted within these restrictive areas will meet the following guidelines.

**Operation and Maintenance (cont.)**

**Activities Allowed In the 35-Foot Restrictive Area:**

- o Partial Harvest – For purposes of moderating water temperatures and providing detritus and large woody debris, a minimum of 50 percent canopy cover must be maintained.
- o Individual stem treatment with herbicides to control undesired invasive species and release desirable regeneration.
- o For regeneration purposes, use of site preparation, planting, and other silviculture practices will meet the same criteria for establishment in Zones 1 and 2 as described on page 2 of this job sheet.

**Activities Not Allowed In the 35-Foot Restrictive Area:**

- o Roads (except perpendicular stream crossings). Minimize the number of stream or drain crossing points. Cross streams and drains only at a right angle. Never use a stream or drain channel as a skid trail or road.
- o Excessive rutting. Avoid rutting through streams or drains.
- o Log decks or landings
- o Blocking the flow of water through a stream or drain channel.
- o Damage to streambank. Harvest of any stems on the edge of a stream channel should be accomplished in such a manner as to minimize impact to the stream bank.
- o Prescribed burning.
- o Mechanical site preparation, except as noted on page 2 of this job sheet.
- o Fertilization and aerial application or mist blowing of herbicides and insecticides.

- Additional operation and maintenance requirements shall be developed on a site-specific basis to assure performance of the practice as intended.

**Specifications**

Site-specific requirements are listed on the specifications sheet. Additional provisions maybe entered on a job sketch sheet. Specifications are prepared in accordance with this job sheet and the Mississippi NRCS Field Office Technical Guide, Practice Standard Code 391 - Riparian Forest Buffer.

**USDA program policies and procedures may restrict or supercede information in this job sheet. Therefore, check with the appropriate agency for guidelines pertaining to lands under USDA programs.**

# Riparian Forest Buffer - Specifications Sheet

Landowner _____ Field Number _____

| Purpose (check all that apply) | |
|---|---|
| ☐ Intercept sediment, nutrients, pesticides, other contaminants | ☐ Wildlife habitat |
| ☐ Create shade to lower water temperature | ☐ Other (specify): |
| ☐ Provide source of detritus and woody debris | |

| Location and Layout | | |
|---|---|---|
| Water body/course type and name, other: | | |
| Minimum buffer zone widths (ft.) - specify left and right of stream (facing upstream) for a two-side buffer; use left only for water bodies, such as lakes and ponds; include herbaceous species on Zone 3 notes or refer to other job sheets: | | |
| **Zone 1** | **Zone 2** | **Zone 3** |
| Left: Right: | Left: Right: | Left: Right: |
| Notes: | Notes: | Notes: |
| Buffer zone length (ft): | Buffer zone area (ac): | |
| Additional location and layout requirements: | | |

| Woody Plant Materials Information | | | | |
|---|---|---|---|---|
| Species/cultivars: | Plants/acre: | Kind of stock[1]: | Planting dates: | Average Spacing[2]: |
| *Zone #1* | | | | |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| *Zone #2* | | | | |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |

[1] BAreroot, COntainer, CUtting; include size, caliper, height, and age as applicable. [2] Average spacing between plants to achieve plants/acre.

**Temporary Storage Instructions**

Planting stock that is dormant may be stored temporarily in a cooler or protected area. For stock that is expected to begin growth before planting, dig a V-shaped trench (heeling-in bed) sufficiently deep and bury seedlings so that all roots are covered by soil. Pack the soil firmly and water thoroughly.

**Site Preparation**

Remove debris and control competing vegetation to allow enough spots or sites for planting and planting equipment. Additional requirements:

**Planting Method(s)**

For container and bareroot stock, plant stock to a depth even with the root collar in holes deep and wide enough to fully extend the roots. Pack the soil firmly around each plant. Cuttings are inserted in moist soil with at least 2 to 3 buds showing above ground. Additional requirements:

**Buffer Maintenance**

The buffer must be inspected periodically and protected from damage so proper function is maintained. Replace dead or dying tree and shrub stock and continue control of competing vegetation to allow proper establishment. Periodic harvesting of trees and shrubs in Zones 1 and 2 may be necessary to maintain the health and vigor of mature stands. Additional requirements: