NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

# RIPARIAN FOREST BUFFER

(Acre)
CODE 391A

## DEFINITION

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

## PURPOSES

* Create shade to lower water temperatures to improve habitat for fish and other aquatic organisms.

* Provide a source of detritus and large woody debris for fish and other aquatic organisms and riparian habitat and corridors for wildlife.

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

## CONDITIONS WHERE PRACTICE APPLIES

On stable areas adjacent to permanent or intermittent streams, lakes, ponds, wetlands and areas with ground water recharge.

## CRITERIA

### General Criteria Applicable To All Purposes Named Above.

The location, layout and density of the riparian forest buffer will accomplish the intended purpose and function. The buffer will consist of a zone (identified as 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 water body.

An adequate upstream or adjacent seed source must be present when using natural regeneration to establish a buffer.

Site preparation will be sufficient for establishment and growth of selected species and will be done in a manner that does not compromise the intended purpose (Refer to Site Preparation – Standard 490).

For recommended plant species see the Vegetative Guide of the Field Office Technical Guide.

Only viable, high quality, adapted planting stock will be used. Herbaceous vegetation will be selected which does not aggressively compete with trees and shrubs but provides erosion protection and filtration.

Livestock will be controlled or excluded as necessary to achieve and maintain the intended purpose (Refer to Use Exclusion – Standard 472 and Prescribed Grazing - 528A).

Harmful pests present on the site will be controlled or eliminated as necessary to achieve and maintain the intended purpose.

### 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 course or water body.

The minimum combined width of Zone 1 and 2 will be 100 feet or 30 percent of the geomorphic flood plain whichever is less, but not less than 35 feet.

**Combined Widths For Zones 1 and 2:**

| Active Floodplain Width | Buffer Width | Determination |
|---|---|---|
| <= 105 feet | 35 feet | minimum |
| >105 feet, but < = 333 feet | 36-99 feet | 30% of the active floodplain |
| > 333 feet | 100 feet | maximum |

**Zone 1:**

Dominant vegetation in Zone 1 will consist of well-distributed existing or planted trees and shrubs suited to the site and the intended purpose(s). The composition of trees and shrubs will be diverse and resemble native stands.

Occasional removal of some tree and shrub products such as high value trees is permitted provided the intended purpose is not compromised by the loss of vegetation or harvesting disturbance.

Plant species in Zone 1 must be able to have their roots reach the water table during the growing season of the year they are planted. If this is not possible, supplemental irrigation may be necessary for plant survival.

When selecting trees for Zone 1, select at least one species that will become at least 18 inches dbh at maturity.

Within the existing buffer, maintain at least 85% of the existing trees that have a diameter at dbh of greater than 18 inches.

**Zone 2:**

Removal of tree and shrub products such as timber, nuts and fruit is permitted on a periodic and regular basis. The loss of vegetation or harvesting disturbance must not comprise the intended purpose(s). Introduced trees may be used in Zone 2. Zone 2 trees and shrubs may be non-native xerophytic species.

**Zone 3:**

Concentrated flow or mass soil movement will be controlled in the up-gradient area immediately adjacent to Zone 2 prior to/or at the same time as the establishment of the riparian forest buffer. This area is identified as Zone 3.

This area will be designed in accordance with criteria contained in the Filter Strip Standard – 393A.

If Zone 3 is applicable the combined width of all zones will not exceed 150 feet.

**Criteria to Protect or Improve Water Quality including Additional Criteria to Create Adequate Shade:**

Pesticide application may be utilized to control noxious weeds or pest outbreaks. However, they will be applied consistent with federal, state, and local regulations.

Buffers will be designed to achieve 60 to 80 % canopy cover over water courses having an active channel width of less than or equal to 35 feet.

Trees should be selected that have a mature canopy height greater than the active channel width. For narrow buffers, select trees that have a broad crown. For vegetation along the waters edge, select tree and shrub species that at maturity will have limbs that will overhang the water.

**Additional Criteria Providing Course Woody Debris (CWD or LWD):**

Where they are adapted select at least one coniferous species for Zone 1. Conifers should be planted to imitate, as much as possible, natural conditions.

Existing trees and snags that have fallen into the water may be retained by cabling, if necessary, to keep them in place (Refer to Stream Corridor Improvement Standard – 745).

**CONSIDERATIONS**

**For Zone 1:**

Large trees that are dead or dying will be left as snags in Zone 1 provided they do not present a threat to life or property and do not harbor pests that would endanger other trees, shrubs, or crops.

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.

Cliffs and steep hills which provide topographic shading maybe considered to be part of the riparian area even though they may not support woody vegetation.

The location, layout and density of the buffer should compliment natural features. Avoid layouts and locations that will concentrate flood flows or return flows.

Avoid tree and shrub species, which may be alternate hosts to undesirable pests.

Woody phreatophytes and hydrophytes that deplete ground water should be used with caution in water-deficit areas.

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

Shade along south and west sides of water bodies will provide more temperature protection than shading the north and east sides.

The location, layout and density of the buffer should compliment natural features. Avoid layouts and locations that would concentrate flood flows or return flows.

Roads, dikes and levees within the riparian buffer can take up a large percentage of the buffer area and potentially create additional water quality problems. It may be feasible to relocate them outside of the buffer area.

The joining of existing and new riparian buffers increases the continuity of cover and will further moderate water temperatures.

A mix of woody species with growth forms that vary from short and drooping to tall erect and wide-crowned will also assist in moderating temperature.

Encourage the growth of woody vegetation or trees along irrigation diversion ditches, drainage ditches, etc. to moderate temperatures, provide shade and food production for aquatic life.

Where possible, consider wildlife travel corridors composed of woody vegetation between the water course or water body and isolated wetlands, constructed farm ponds and sediment basins.

**For Zone 2**:

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

Tall trees will also help shade the water body. These trees can be upland species, especially in the arid portions of the state and/or where water is scarce.

**For Zone 3:**

Stiff, multi-stemmed grasses will assist in improving water quality by accelerating the deposition of sediment.

Where ephemeral, concentrated flow erosion and sedimentation is a concern in Zone 3, consider the application of a vegetated strip consisting of grasses and forbs.

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

**Water Quantity**

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration, deep percolation, and ground water recharge.

2. Effects on downstream flows and aquifers that affect other uses and users.

3. Effects on the water table of adjoining fields.

4. Effects of watershed discharge into streams.

**Water Quality**

1. Filtering effects of vegetation on movement of sediment, and sediment-attached or dissolved substances.

2. Effects on erosion and movement of sediment, and soluble and sediment-attached substances carried by runoff and streamflow.

3. Effects on sediment intrusion into spawning grounds.

4. Effects of phasing and timing of construction and the establishment of vegetation.

5. Effects of changes in water temperatures.

6. Short-term and long-term effects on wetlands, fish habitat, and water-related wildlife habitats.

7. Effects on the visual quality of onsite and downstream water resources.

**Endangered Species Considerations**

Determine if installation of this practice with any others proposed will have any effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS's objective is to benefit these species and others of concern or at least not have any adverse effect on a listed species.

If the Environmental Evaluation indicates the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the landowners, NRCS may initiate consultation with the Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Some species are year-round residents in some streams, such as, freshwater shrimp. Other species, such as steelhead and salmon, utilize streams during various seasons. Be aware that critical periods, such as spawning, eggs in gravels and rearing of young may preclude activities in the stream that may directly affect the stream habitat during those periods. For example, there should be no disturbance of stream gravel beds that may have eggs in them. That could include any equipment in the stream or even walking in the stream or work upstream that may result in sediment depositing in the gravel beds. Document any special considerations for endangered species in the Practice Requirements Worksheet.

**PLANS AND SPECIFICATIONS**

Specifications for this practice shall be prepared for each site. Specifications will be recorded using approved specifications sheets, job sheets, 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. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance).

Inspect the riparian forest buffer periodically and protect it from adverse impacts such as excessive vehicular traffic, pest infestations, pesticide damage, and livestock or fire damage.

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 or mass soil movement shall be continued in the up-gradient area immediately adjacent to Zone 2 to maintain buffer function.

Any removal of tree and shrub products will be conducted in a manner that maintains the intended purpose and meets state regulations.

Any use of fertilizers, pesticides and other chemicals to assure buffer function will not compromise the intended purpose(s).

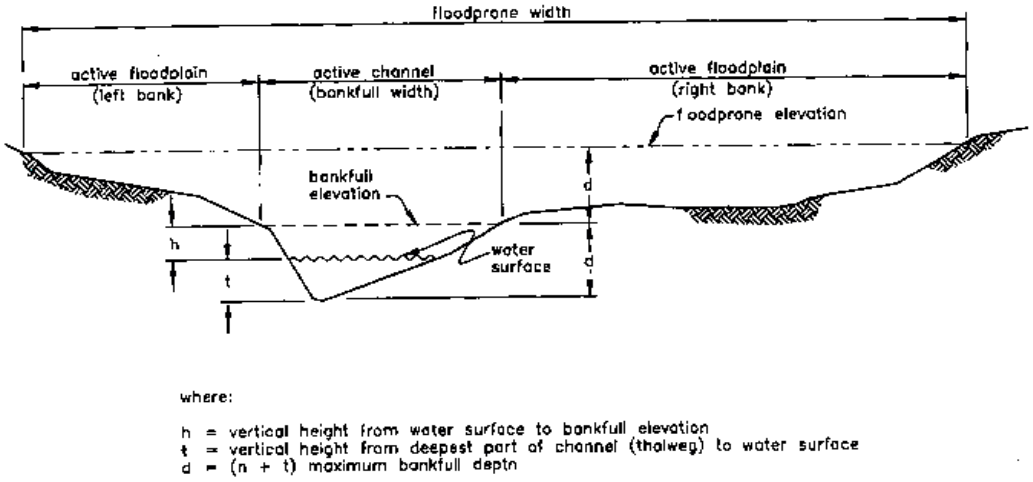


Figure 1. Determination of Active Floodplain Widths (looking downstream)

**DEFINITIONS – (Figure I)**

**Active channel** is the stream width at the bankfull discharge. Bankfull discharge is the flow rate that forms and controls the shape and size of the active channel. Bankfull discharge is approximately the flow rate at which the strewn begins to move onto its floodplain if the stream has an active floodplain. The bankfull discharge is expected to occur every 1.5 year on average. Active channel width is determined by asking the landowner how high the water gets every year, by observing the location of permanent vegetation, and other field indicators. The outside edge of the active channel is also as **the Ordinary High Water Mark (OHWM).**

Floodprone width (Rosgen 1994) is a floodplain value based on the size of the active channel. It includes the widths of the active (geomorphic) **floodplain** that would be inundated along each side of a watercourse during a flood event having a recurrence interval of 35 - 50 years.

Floodprone width has 3 components:

1. active channel (bankfull width),
2. active floodplain (left bank), and
3. active floodplain (right bank).

The active floodplain (left and right bank) are usually different widths.

At most sites along a water course, the active floodplain and resulting riparian areas are generally wider on one side of the channel than on the other. To determine the correct combined width for Zone I and Zone 2 for each side of a channel, using simple equipment such as a hand-level and stadia rod, refer to Figure I and do the following (preferably, at low flow):

1. Pick a cross-section where there is some woody vegetation and the channel is straight - usually at the crossover of a meander.

2. Find the elevation where the bankfull flow intersects the bank - usually found along the root-line of the woody vegetation, or where there is an obvious change in bank materials due to scour erosion, or changes in bank slope, etc.

3. Measure the vertical height (h) from the water surface to this line.

4. Measure the deepest part of the channel (t, for thalweg) at this site.

5. Then; the maximum bankfull depth (d) = h + t.

6. Floodprone elevation = elevation at the bankfull line + d.

7. At this height and perpendicular to the channel, find where a level line intersects the ground up-gradient of the streambank - the horizontal distance from the bankfull line to this intersection point is the active floodplain for that side of the channel.

8. For the opposite bank if the bankfull line is not evident, find it by projecting a level line from the near edge of the water to the bank, at elevation h.

*NOTE:* With the proper surveying equipment, the bankfull line, the intersection of the floodprone elevation, and the active floodplain can be found for the opposite side of the channel without crossing the channel. Although the bankfull (active channel) width is not required for determining the active floodplain width, it should still be recorded.