

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.

PURPOSE

- 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.
- Create wildlife habitat and establish wildlife corridors.
- 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.
- 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.

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.

Conservation practices needed to stabilize eroding stream channels must be designed during the riparian forest buffer planning stages. Some bank shaping, bank protection or grade control may be required to have adequate and sustaining connectivity between the channel and the floodplain.

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

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

Necessary site preparation and planting shall be done at a time and manner to insure survival and growth of selected species.

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 Tree/Shrub 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 - Standard 528).

Livestock stream crossings and watering facilities shall be located and sized to minimize impacts to the buffer. On established buffers within grazed areas, set utilization rates of key browse species to maintain its intended function. Impaired function by livestock overuse (trampling, compaction, or over-utilization of woody plants, grasses, and sedges) shall require immediate removal of livestock from the riparian area.

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

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

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 maximum	100 feet	

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.

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.

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.

Zone 2 will be expanded in high nutrient, sediment, and animal waste application areas,

where the contributing area is not adequately treated or where an additional level of protection is desired.

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 Filter Strip (Standard - 393) shall be used to design Zone 3.

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.

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

Additional Criteria to Provide Habitat for Aquatic Organisms and Terrestrial Wildlife

Width of Zone 1 and/or Zone 2 will be expanded to meet the minimum requirements of the wildlife or aquatic species and associated communities of concern.

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

To create shade to lower or maintain water temperatures for improvement of habitat for fish and other aquatic organisms:

Buffers will be designed to achieve 60 to 80 % canopy cover over watercourses having an active channel width of less than or equal to 50 feet.

Buffers will be designed to achieve 60 to 80 % canopy cover in water bodies with the canopy cover extending out a minimum of 35 feet.

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

Additional Criteria for Increasing Carbon Storage in Biomass and Soils

Maximize width and length of the riparian forest buffer.

Select plants that have higher rates of carbon sequestration in soils and plant biomass and are adapted to the site to assure strong health and vigor. Plant the appropriate stocking rate for the site.

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 Streambank and Shoreline Protection Standard – 580).

CONSIDERATIONS

Tree and shrub species, which may be alternate hosts to undesirable pests, should be avoided.

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.

Allelopathic impacts of plants should be considered.

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.

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.

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

Avoid layouts and locations that concentrate flood flows or return flows. Low, flexible-stemmed shrubs will minimize obstruction of local flood flows.

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

Consider establishing buffers on both sides of watercourses. This will provide more streambank protection, wildlife cover, less nutrient runoff, and other values. Complex ownership patterns of riparian areas may require group planning for proper buffer design, function and management.

Consider species that resprout when establishing new rows nearest to watercourses or bodies. For detritus and large woody debris, use species that will meet the specific requirements of fish and other aquatic organisms for food, habitat, migration, and spawning.

Avoid using large/tall trees when establishing buffers in locations prone to windthrow.

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 systems. Temporary and local population control methods should be used cautiously and within state and local regulations.

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. For example, avoid using shrubs/trees that block views, and prune low branches along recreation trails.

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 detrimental pests.

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

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 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.

CULTURAL RESOURCES CONSIDERATIONS

NRCS policy is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice or associated practices in the plan could have an effect on cultural resources. The National Historic Preservation Act may require consultation with the California State Historic Preservation Officer.

<http://www.nrcs.usda.gov/technical/cultural.html> is the primary website for cultural resources information. The California Environmental

Handbook and the California Environmental Assessment Worksheet also provide guidance on how the NRCS must account for cultural resources. The e-Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

ENDANGERED SPECIES CONSIDERATIONS

If during the Environmental Assessment NRCS determines that installation of this practice, along with any others proposed, will have an effect on any federal or state listed Rare, Threatened or Endangered species or their habitat, NRCS will advise the client 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 client selects one of the alternative conservation treatments for installation; or with concurrence of the client, NRCS initiates consultations concerning the listed species with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game.

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).

REFERENCES:

National Biology Handbook. Part 614.4. Conservation Corridor Planning at the Landscape Level. USDA-NRCS. August 1999.

Technical Note Engineering - CA-14. Planning and Design Guide For Stream Corridor Restoration. USDA-NRCS-CA. Sept. 2003

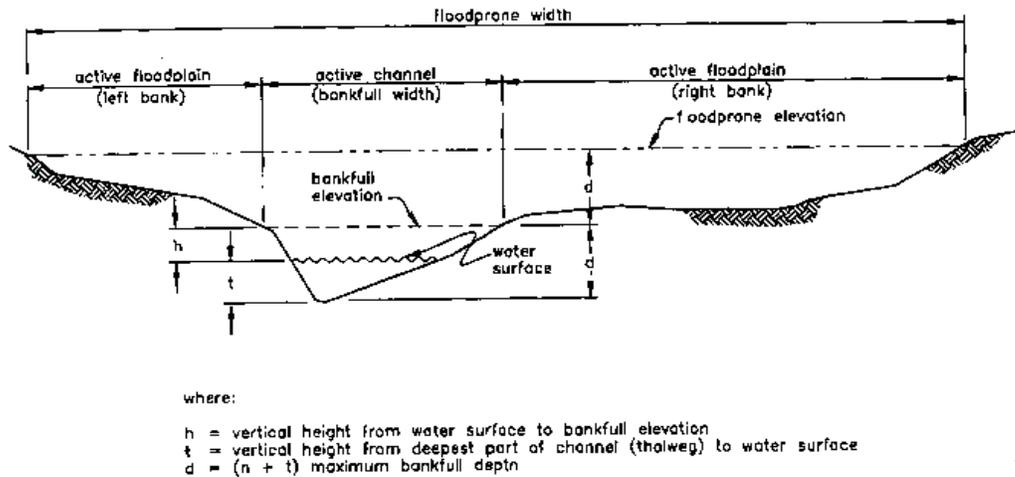


Figure 1. Determination of Active Floodplain Widths (looking downstream)

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 stream 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.

