

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE SPECIFICATION**

**RIPARIAN FOREST BUFFER**

(Acre)

**CODE 391**

**GENERAL SPECIFICATION**

Procedures, technical details and other information listed below provide additional guidance for carrying out selected components of the named practice. This material is referenced from the conservation practice standard for riparian forest buffer and supplements the requirements and considerations listed therein.

**SPECIFICATIONS APPLICABLE TO ALL PURPOSES**

All buffers will consist of a Zone 1 that begins at the normal bankfull or high 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.

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. A minimum of 25 percent canopy cover of woody vegetation will be maintained in Zone 1. Felling and skidding of trees shall be directed away from the water course or body. Skidding will be done in a manner to prevent ephemeral channels perpendicular to the stream.

**PLANT SPACING**

Initial plant-to-plant spacing for trees and shrubs depend on their potential height at 20 years of age. Heights may be estimated on: 1) performance of the individual species (or comparable species) in nearby areas or similar sites, or 2) predetermined and documented heights using Table 6 from [Colorado Plant Materials Technical Note #59, Plant Suitability and Seeding Rates for Conservation Plantings in Colorado](#). The following are recommended spacings for various canopy closures:

Table 1

<b>Tree &amp; Shrub Spacing based on Crown Width and Percent Canopy Closure Desired</b>					
<b>25% Canopy/Crown Closure</b>			<b>50% Canopy/Crown Closure</b>		
Avg. Crown Width-ft.	Trees-shrubs/Ac	Spacing-ft.	Avg. Crown Width-ft.	Trees-shrubs/Ac	Spacing-ft.
25	22.18	44.31	25	44.37	31.33
20	34.66	35.45	20	69.33	25.07
18	42.79	31.90	18	85.59	22.56
15	61.62	26.59	15	123.25	18.80
12	96.29	21.27	12	192.58	15.04
10	138.66	17.72	10	277.31	12.53
8	216.65	14.18	8	433.30	10.03
6	385.15	10.63	6	770.31	7.52
5	554.62	8.86	5	1109.24	6.27

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4	866.60	7.09	4	1733.19	5.01
3	1540.62	5.32	3	3081.23	3.76

75% Canopy/Crown Closure			100% Canopy/Crown Closure		
Avg. Crown Width-ft.	Trees-shrubs/Ac	Spacing-ft.	Avg. Crown Width-ft.	Trees-shrubs/Ac	Spacing-ft.
25	66.56	25.58	25	88.74	22.16
20	103.99	20.47	20	138.66	17.72
18	128.39	18.42	18	171.18	15.95
15	184.88	15.35	15	246.50	13.29
12	288.87	12.28	12	385.15	10.63
10	415.98	10.23	10	554.62	8.86
8	649.96	8.19	8	866.60	7.09
6	1155.49	6.14	6	1540.62	5.32
5	1663.91	5.12	5	2218.49	4.43
4	2599.85	4.09	4	3466.38	3.54
3	4621.96	3.07	3	6162.46	2.66

Notes: Calculations are based on crown width at 20 years of age. Mortality and crown overlap were not included in calculations. Use local knowledge/experience and adjust trees/acre & spacing accordingly. Trees/acre and spacing are given to the nearest 1/100th to decrease error when extrapolating data to larger than one acre plots. For spacing where rows consist of different species, the planner should add the two spacings and divide by two to find the between row spacing.

Approximate crown widths at 20 years in feet for common riparian species

Plains cottonwood	>25	Birch	10
Narrowleaf cottonwood	>25	Serviceberry	10
Fremont cottonwood	>25	Chokecherry	10
Boxelder	20	Dogwood	7
Aspen	15	Willows-shrub type	7
Spruce	15	Shrubby cinquefoil	5
Peachleaf willow	15	Currant	5
Hawthorn	15	Rose	5
Rocky Mtn. maple	10	Snowberry	5
Mountain ash	10	Buffaloberry	5
Alder	10	New Mexico privet	5

**NATURAL REGENERATION**

Where natural regeneration is expected to occur, an average canopy/crown closure of 25% is required in Zone 1 after 3 years.

**SPECIES SELECTION**

Dominant vegetation will consist of existing, naturally regenerated, or planted trees and shrubs suited to the site and the intended purpose. Selection of locally native trees and shrubs will be a priority when feasible. Species selected should normally be found in the part of the state where the buffer will be planted (e.g. aspen should not be planted in Yuma County). Plantings will consist of two or more species with different plant types/heights. Plants must be suited to the seasonal variation of soil moisture status of individual planting sites (see Figure 1).

Plant types and species shall be selected based on their compatibility in growth rates, wetness tolerance, and shade tolerance. Table 6, [Colorado Plant Materials Technical Note #59, Plant Suitability and Seeding Rates for Conservation Plantings in Colorado](#), lists trees and shrubs that are common to riparian areas in Colorado and includes various attributes of each species as well as MLRAs where species are suited. Additional information on typical riparian area species composition may be found in the [Colorado Natural Heritage Program's Field Guide to the Wetland and Riparian Plant Associations of Colorado](#).

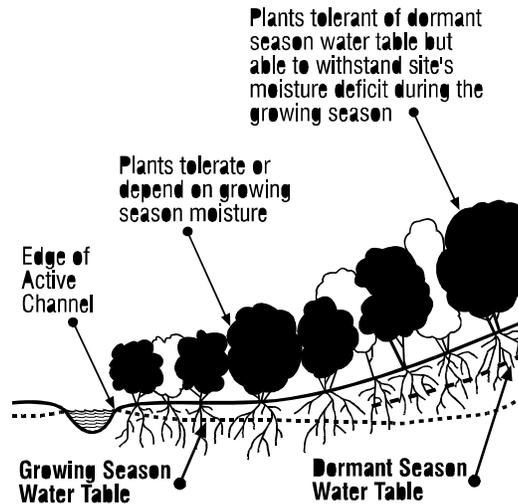


Figure 1. Plant adaptation to soil moisture.

## PRACTICE INSTALLATION

Follow [612, Tree/Shrub Establishment Standard](#) and [Specification](#) for practice installation specifications. Following shrub/tree planting, tree guards may need to be used to protect woody species from rodents and herbivores. Hardware cloth may be used to protect woody species from beaver damage.

Necessary site preparation and planting for establishing new buffers shall be done at a time and manner to ensure survival and growth of selected species. For sites to be tilled, leave a 3-foot untreated strip at the edge of the bank or shoreline.

Either hand or machine planting techniques may be used. The method chosen must be capable of achieving proper depths and placement of planting stock roots, and not impair the intended purpose and function of the buffer.

Where a herbaceous understory must be established, refer to practice standard [512, Pasture and Hay Planting](#), or [550, Range Seeding](#) for guidance.

### **Additional Requirements 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 will be 100 feet or 30 percent of the active geomorphic flood plain, whichever is less, but not less than 35 feet. (Note: The geomorphic flood plain may be

narrower than the valley bottom if the valley formed under different hydrologic conditions.) Figure 2 illustrates examples of Zone 1 and 2 widths for water courses and bodies.

Requirements for Zone 1 shall apply to Zone 2 except that removal of products such as timber, fiber, nuts, fruit and forbs is permitted on a periodic and regular basis provided the intended purpose is not compromised by loss of vegetation or harvesting disturbance. A minimum of 10 percent canopy cover will be maintained in Zone 2.

Where this practice is being applied along intermittent streams, species selection for Zone 2 may be made from Table 6, [Colorado Plant Materials Technical Note #59, Plant Suitability and Seeding Rates for Conservation Plantings in Colorado](#).

In areas where nutrient, sediment, and/or animal wastes contributions to the riparian forest buffer are not adequately treated or where an additional level of protection is desired, Zone 2 will be expanded with appropriate plants to prevent damage to the buffer.

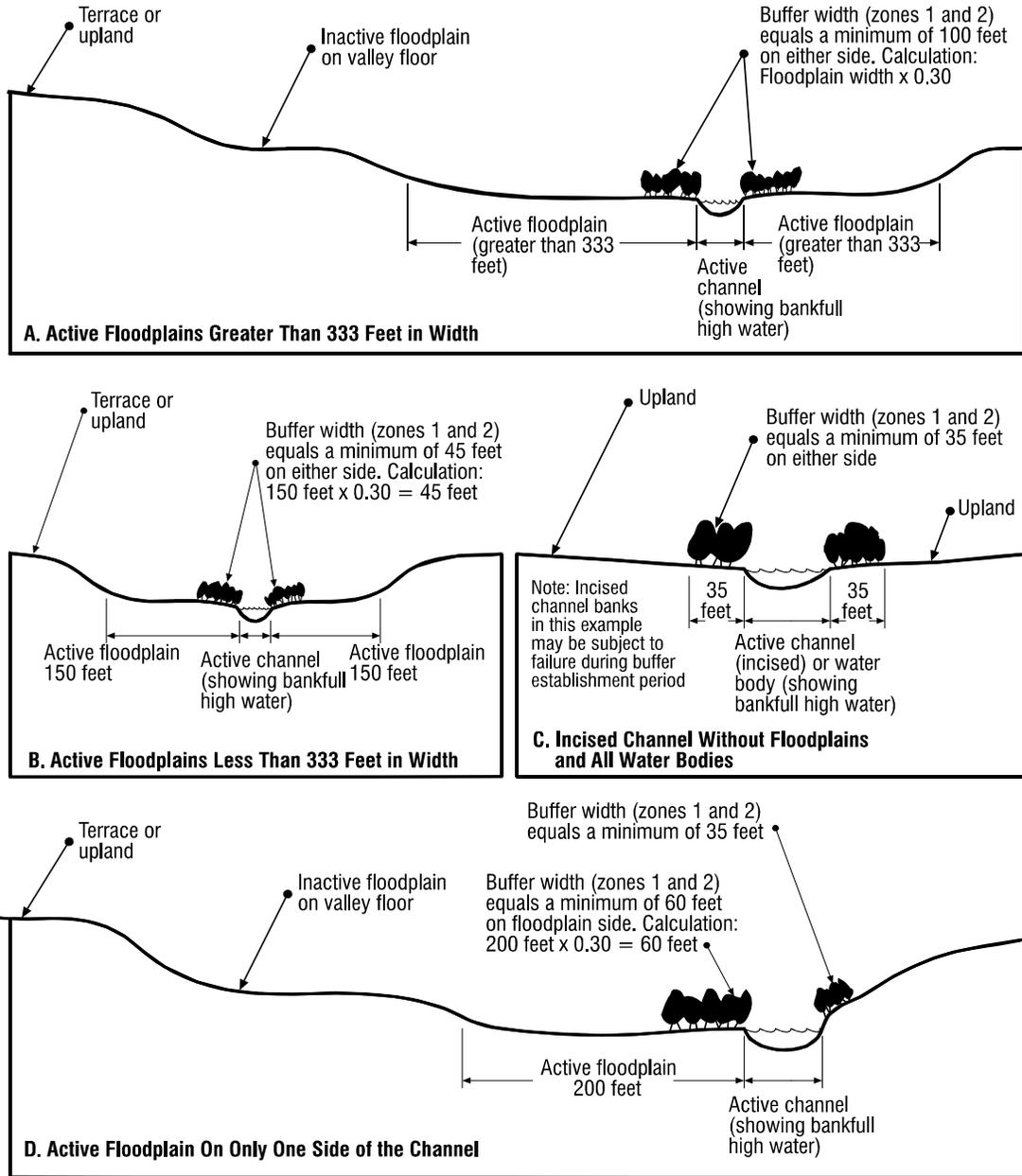


Figure 2. Examples of riparian forest buffer widths for water courses and water bodies.

Concentrated flow erosion or mass soil movement will be controlled in the up-gradient area immediately adjacent to zone 2 prior to establishment of the riparian forest buffer. This area is delineated and identified as zone 3 (see Figure 3). Zone 3 shall be designed in accordance with criteria in the Filter Strip Standard (393).

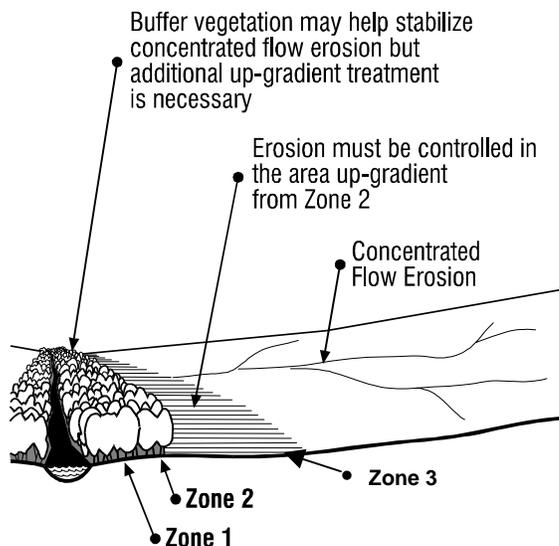


Figure 3. Control of concentrated flow erosion

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

The 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 according to the following:

Species	Desired Width in Feet
Bald eagle, cavity nesting ducks, heron rookery, sandhill crane	600
Swainson's thrush, yellow-billed cuckoo	450
Beaver, dabbling ducks, mink, salmonids	300
Deer	200
Frog, salamander	100

A buffer for lowering warm-season water temperatures shall consist of at least zone 1 for water course reaches or water bodies less than or equal to 30 feet in width or water bodies greater than 30 feet wide but less than 1 acre. To lower water temperatures, buffers shall be established or maintained on south and west sides of water courses and bodies as practical. The buffer canopy will be established to achieve at least 50 percent crown cover with average canopy heights equal to or greater than the width of the water course or 30 feet for water bodies. See figure 4.

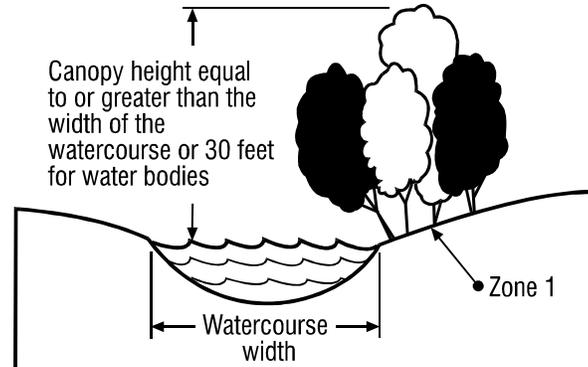


Figure 4. Canopy height for water temperature control.

Species selected for this purpose will include those species which have sufficient height potential. Place drooping or wide-crowned trees and shrubs nearest the water course or body. Shoreline or channel relief (e.g., deeply incised channels) and topographic shading will be taken into account in selecting species. Joining of existing and new buffers increase the continuity of cover and will further moderate water temperatures.

Within zone 1 as a minimum, establish, favor or manage species capable of producing stems and limbs of sufficient size to provide an eventual source of large woody debris for in-stream habitat for fish and other aquatic organisms.

Establish plant communities that address the target wildlife needs and existing resources in the watershed. Use recommendations from regional or other large-scale evaluations and plans when designing, locating and connecting buffers for indicator and/or target species of wildlife, fish and other aquatic organisms.

## REFERENCES

[Carsey, K., G. Kittel, K. Decker, D.J. Cooper, and D. Culver. 2003. Field Guide to the Wetland and Riparian Plant Associations of Colorado. Colorado Natural Heritage Program, Fort Collins, CO.](#)

Colorado Field Office Technical Guide, Section IV. [Range Seeding 550](#), Conservation Practice Standard. 1991. USDA, NRCS. Lakewood, CO.

Colorado Field Office Technical Guide, Section IV. [Pasture and Hay Planting 512](#), Conservation Practice Standard. 2004. USDA, NRCS. Lakewood, CO.

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Colorado State Forest Service, 2000. Trees for conservation. CSFS #115-1196

Colorado NRCS. 2002. [Colorado Plant Materials Technical Note #59, Plant Suitability and Seeding Rates for Conservation Plantings in Colorado.](#)