Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

RIPARIAN FOREST BUFFER

CODE 391

(ac)

DEFINITION

An area predominantly covered by trees and/or shrubs located adjacent to and up-gradient from a watercourse or water body.

PURPOSE

This practice is used to accomplish one or more of the following purposes:

- Reduce transport of sediment to surface water, and reduce transport of pathogens, chemicals, pesticides, and nutrients to surface and ground water
- Improve the quantity and quality of terrestrial and aquatic habitat for wildlife, invertebrate species, fish, and other organisms
- Maintain or increase total carbon stored in soils and/or perennial biomass to reduce atmospheric concentrations of greenhouse gasses
- Lower elevated stream water temperatures
- Restore diversity, structure, and composition of riparian plant communities

CONDITIONS WHERE PRACTICE APPLIES

Apply riparian forest buffers on areas adjacent to permanent or intermittent streams, lakes, ponds, and wetlands where channels and streambanks are sufficiently stable.

CRITERIA

General Criteria Applicable to All Purposes

Position and design the riparian forest buffer to achieve enough width, length, vertical structure/density, and connectivity to accomplish the intended purpose(s).

Design for dominant vegetation that consists of existing, naturally regenerated, or seeded/planted trees and shrubs suited to the soil and hydrology of the site and the intended purpose(s).

Extend the vegetation to the minimum width needed to achieve the intended purpose(s). Width of buffer refers to one side of the watercourse. Begin measurement at and perpendicular to the normal water line, bank-full elevation, or the top of the bank as determined locally.

Control excessive sheet, rill, and concentrated flow erosion through the riparian forest buffer site and in the areas immediately adjacent and up-gradient of the buffer site.

Use tree and shrub species that are native and noninvasive. Substitution with improved locally adapted species, or with species suited for a specific purpose, is allowed. For plantings and seeding, use only viable, high quality, and adapted plant materials. Where available, use the ecological site description to

guide restoration to an appropriate vegetative community phase. Species selection should be based on specific restoration purpose as recommended by state-approved references (eVegGuide).

Select plant species that are adapted to site and hydrologic conditions and provide the structural and functional diversity preferred by fish and wildlife species likely to benefit from the installation of the practice, provided the intended purpose is not compromised.

Favor tree and shrub species that have multiple values, such as those suited for timber, nuts, fruit, florals, browse, nesting, and aesthetics, provided the intended purpose is not compromised.

Periodic removal of some forest products such as high value trees and medicinal herbs, nuts, and fruits is permitted provided the intended purpose is not compromised by the loss of vegetation or harvesting disturbance. Refer to criteria in NRCS Conservation Practice Standards (CPSs) Forest Stand Improvement (Code 666) and/or Multi-Story Cropping (Code 379).

Herbaceous vegetation will be selected which does not aggressively compete with trees and shrubs but provides erosion protection and filtration.

Perform necessary site preparation and planting at a time and manner that ensures the survival and growth of species selected for achieving the intended purpose(s). Refer to criteria in NRCS CPSs Tree and Shrub Site Preparation (Code 490) and/or Tree and Shrub Establishment (Code 612) as applicable.

Control or exclude livestock as necessary to achieve the intended purpose. Refer to criteria in NRCS CPSs Access Control (Code 472) and/or use Prescribed Grazing (Code 528) as applicable to support managed and timed grazing of the riparian area.

Livestock stream crossings and riparian off-site 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 pressure (trampling, compaction, or over- utilization of woody plants, grasses, and sedges) shall require immediate removal of livestock from the riparian area, with re-entry timing to be determined based on plant recovery and phenology.

Control or exclude harmful plant and animal pests present on the site as necessary to achieve and maintain the intended purpose. If pesticides are to be applied, refer to Windows Pesticide Screening Tool (WIN-PST) Criteria in NRCS CPS Pest Management Conservation System (Code 595) and comply with applicable State and local laws and product labels. Refer to criteria in NRCS CPSs Brush Management (Code 314) and/or Herbaceous Weed Treatment (Code 315) as applicable.

For stabilization of stream banks or shorelines, use NRCS CPSs Streambank and Shoreline Protection (Code 580) and/or Critical Area Planting (Code 342).

Stream type and site hydrology will determine buffer design and layout to ensure purpose is achieved.

Use plant species adapted to the projected duration of site saturation and inundation.

Design tree and shrub stem densities to assure the established riparian forest buffer is predominantly covered by trees and/or shrubs by the end of the practice lifespan.

Additional Criteria to Reduce Transport of Sediment to Surface Water, and Reduce Transport of Pathogens, Chemicals, Pesticides, and Nutrients to Surface and Ground Water

To reduce overland flow transport of sediment and organic material the minimum slope width shall be 35 feet. For conifer forestlands use buffer widths in the California Forest Practice Rules.

To treat waterbodies threatened by transport of pathogens, chemicals, pesticides, or nutrients in surface runoff or ground water flows, either extend the minimum slope width to 50 feet or add an associated practice that treats the targeted resource concerns. Use NRCS CPSs Filter Strip (Code 393) or Field Border (Code 386).

Filter pollutants from underground drains that bypass the riparian area by plugging, removing, or replacing drains with perforated pipe/end plugs or water control structures. Saturated conditions in the riparian and adjacent areas may limit existing land use and management.

Additional Criteria to Improve the Quantity and Quality of Terrestrial and Aquatic Habitat for Wildlife, Invertebrate Species, Fish, and Other Organisms

The minimum width to improve terrestrial and aquatic habitat shall be 35 feet.

Extend the width to meet the habitat requirements of the wildlife or aquatic species of concern.

Establish plant communities to meet the needs of target aquatic and terrestrial wildlife and provide multiple values such as habitat, nutrient uptake, and shading. The establishment of diverse native species will enhance wildlife and pollinator values.

Existing trees and snags that have fallen into the water may be retained if they present no significant threat downstream.

The Wildlife Habitat Evaluation Guide (WHEG) will be utilized for assessing existing habitat, and guiding prescriptions for wildlife.

Additional Criteria to Maintain or Increase Total Carbon Stored in Soils and/or Perennial Biomass to Reduce Atmospheric Concentrations of Greenhouse Gasses

The minimum width to maintain or increase total carbon stored in soils and or plant biomass and to reduce atmospheric concentrations of greenhouse gasses shall be 35 feet.

Maximize width and length of the riparian forest buffer.

Select adapted plants known to sequester high rates of carbon in soils and plant biomass. Use the appropriate stocking, seeding, or planting rate for the site.

Additional Criteria to Lower Elevated Stream Water Temperatures

Establish plant communities capable of reaching adequate heights to provide shade over stream channel water surfaces.

Incorporate topography and bank shade in the riparian forest buffer site design.

CONSIDERATIONS

Maximize widths, lengths, and connectivity of riparian forest buffers.

Avoid tree and shrub species that are alternate hosts to pests. Consider species diversity to avoid loss of function due to species-specific pests.

Use seed and/or seedlings collected or propagated from multiple sources to increase genetic diversity.

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.

A drainage class assessment and depth to groundwater should determine suitability for plant selection to ensure success. Plant species adjacent to the active channel should be able to have their roots reach the water table during the growing season.

Woody plants that are known to deplete groundwater should be used with caution in water-deficit areas.

Consider selecting species with tolerance to herbicide runoff or spray drift from adjoining fields.

Consider allelopathic impacts of plants and/or ability to host pests of crops.

The species and plant communities that attain biomass more quickly will sequester carbon faster. The rate of carbon sequestration is enhanced as riparian plants mature and soil organic matter increases.

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

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.

Concentrated flow or mass soil movement should be controlled in the up-gradient area immediately adjacent to the planned buffer and address incoming eroding drainages or stream channels using conservation practices such as Grade Stabilization (410) or Streambank Stabilization (580) as applicable.

A Filter Strip (393) should be added adjacent to the riparian buffer when adjacent to cropland or a cleared food safety buffer, sparsely vegetated or highly erosive areas to filter sediment, address concentrated flow erosion, and maintain sheet flow.

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.

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.

Design riparian vegetation buffer in high fire hazard areas to incorporate basic fuel reduction principles when compatible with Purposes of the practice. Principles included, but are not limited to, planting to create wide spacing between trees, remove excess surface fuels, and maintaining established riparian forests to reduce ladder fuels and create horizontal space between shrub and trees crowns.

Large trees that are dead or dying should be left as snags provided they do not present a threat to life or property and do not harbor detrimental pests.

Where possible, consider wildlife travel corridors composed of woody vegetation between the water course or water body and wetlands, ponds, seasonal wet area, and sediment basins.

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

Shade along south and west sides of water bodies will provide more temperature protection than shading the north and east sides. Tall shading trees on the outer edges of the buffer can be upland species, especially in the arid areas and/or where water is scarce. Cliffs and steep hills can also provide topographic shading.

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.

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

Consider extending the minimum width depending on wildlife/aquatic species habitat needs. Buffer widths shown in Table 1 generally provide for wildlife/aquatic species habitat needs.

Table 1 – Recommended riparian forest buffer widths for various watercourse types

	Class 1	Class II	Class III dry	Class III wet	Wet meadow
Total buffer width	100 ft.	50 ft.	35 ft.	50 ft.	100 ft.

For sites where continued function of drains is desired, woody root penetration may eventually plug the underground structure. In these cases, setback woody vegetation from the drain and use herbaceous cover or rigid nonperforated pipe.

When applied near current or historic Native American or other Tribal lands, consider consulting regional Tribes for any traditional ecological knowledge that may be applicable or advantageous to implement.

Materials and methods used to implement the standard on organic and transitioning to organic operations must comply with National Organic Program (NOP) rules and follow the NRCS National Organic Farming Handbook (Title 190), Part 612.

This practice can be included in a NOP applicant's organic system plan as part of the plan for meeting NOP requirements for resource conservation.

Consider how this practice will complement the functions of adjacent riparian, terrestrial, and aquatic habitats.

Consider the effects of upstream and downstream conditions, structures, facilities, and constraints on the planned activities.

Establish alternative water sources or controlled access stream crossings to manage livestock access to the stream and riparian area.

Corridor configuration, establishment procedures, and management should enhance habitats for threatened, endangered, State Species of Greatest Conservation Need, and other plant or animal species of concern, where applicable.

PLANS AND SPECIFICATIONS

Prepare plans and specifications that describe requirements for applying the practice to achieve its intended purpose and obtain any required permits.

Use implementation requirements or other acceptable documentation. At a minimum, provide—

- Objective(s) for establishment.
- Conservation plan map.
- Map showing the location of plantings and/or natural regeneration areas.
- Establishment method by species or vegetation type.
- Number and spacing of trees/shrubs per acre by vegetation type.
- Timing of planting relative to seasonal factors, plant physiology, disease, insects, and wildlife impacts.
- Methods of plant protection used during plant establishment.

Plans must recognize the complexity of riparian systems and 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

Prepare an operation and maintenance plan for the riparian forest buffer site. As a minimum, include—

- Limiting access or damage from vehicles, equipment, livestock, and wildlife, during tree planting and until riparian buffer establishment to protect new plants and minimize erosion, compaction, and other site impacts.
- Inspecting the site at an appropriate time following planting to determine whether the survival rate for tree and shrubs meets practice and client objectives.
- Replacing dead trees or shrubs and controlling undesirable vegetative competition until the buffer is or will progress to a fully functional condition.
- Controlling undesirable plant species that may include but not be limited to those on the Federal or State invasive species and noxious weed lists.
- Any manipulation of species composition, stand structure and stocking by cutting or killing selected trees and understory vegetation shall sustain the intended purpose(s). Refer to CPS Forest Stand Improvement (666).
- Inspecting the trees, shrubs, and site periodically, and protecting the plantings and site from adverse impacts of insects, diseases, competing vegetation, fire, livestock, excessive vehicular and pedestrian traffic, wildlife, concentrated flows, nonfunctioning tree shelters and/or weed barriers, etc. Control or exclusion of livestock and harmful wildlife shall continue. Refer to CPS Prescribed Grazing (528) and/or Access Control (472) as applicable.
- Applying fertilizers, pesticides, and other chemicals used to maintain buffer function in a way that will not impact water quality.

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