

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
RIPARIAN FOREST BUFFER

(Ac.)

CODE 391

DEFINITION

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

PURPOSE

This practice may be applied for one or more of the following purposes:

1. To reduce excess amounts of sediment, organic material, nutrients, pesticides, and other pollutants in surface runoff and reduce excess nutrients and other chemicals in shallow groundwater flow;
2. To create or improve riparian habitat and provide a source of detritus and large woody debris for fish and other aquatic organisms;
3. To create shade to lower or maintain water temperatures to improve habitat for aquatic organisms;
4. To reduce pesticide drift entering the water body;
5. To restore riparian plant communities;
6. To increase carbon storage in plant biomass and soils.

CONDITIONS WHERE PRACTICE APPLIES

This practice may be applied on stable areas adjacent to perennial or intermittent streams and ditches, lakes, ponds, and wetlands. For areas with unstable banks, refer to the Delaware conservation practice standard for Streambank and Shoreline Protection (580).

CRITERIA

General Criteria Applicable to All Purposes

The riparian forest buffer shall be located appropriately and designed to achieve sufficient width, length, vertical structure/density, and connectivity to meet the intended purpose(s) of the practice, conditions of the site, and the objectives of the land user. Dominant vegetation shall consist of existing, naturally regenerated, or planted trees and/or shrubs.

The riparian forest buffer shall consist of an area that begins at the top of the bank and extends a minimum distance of 35 feet measured horizontally on a line perpendicular to the water body.

Overland flow through the riparian area shall be maintained as sheet flow to the extent feasible.

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

All plantings shall consist of a mixture of two or more species to achieve greater diversity. Select plant species that are native to Delaware, or are introduced and are non-invasive (i.e., not likely to spread beyond the planted area and displace native species). Selection of native species shall be a priority when feasible. No plant listed by the state of Delaware as an invasive species shall be established in the buffer.

Species selected for planting shall be suited to the seasonal variation of soil moisture on the planting site. Select plant types and species based on their compatibility in growth rates, shade tolerance, and other characteristics.

Natural regeneration may be used to establish a buffer, if the following conditions are met:

1. There is an adequate natural seed source of desired species in adjacent areas;
2. Site conditions are favorable for establishing the desired number and distribution of seedlings within a specified time period; and,
3. Noxious or invasive species are not likely to jeopardize the stand.

Site preparation for planting or natural regeneration shall be done at a time and manner to insure survival and growth of selected species.

Control or exclude livestock as needed to establish and maintain the buffer. Water course crossings and livestock watering facilities shall be located and sized to minimize impact to buffer vegetation and function. Refer to the Delaware conservation practice standards for Access Control (472), Fence (382), and Stream Crossing (578).

Control plant and animal pest species to the extent feasible to achieve and maintain the intended purpose of the practice. Control noxious weeds as required by state law. If pesticides are used, refer to the Delaware conservation practice standard for Pest Management (595).

After the buffer is established, limit disturbance to occasional removal of tree and shrub products. Harvested materials may include high value trees, medicinal herbs, nuts, and fruits, provided the intended purpose of the buffer is not compromised by the loss of vegetation or harvesting disturbance.

Additional Criteria for Water Quality

To reduce excess amounts of sediment, organic material, nutrients, pesticides and other pollutants in surface runoff and reduce excess nutrients and other chemicals in shallow groundwater flow.

In order to adequately address water quality, the buffer width may need to be expanded to include important resource features such as wetlands, steep slopes, areas that are occasionally or seasonally flooded, or critical habitats.

Extend the width in high nutrient, sediment, and animal waste application areas, where the contributing area is not adequately treated or an additional level of protection is needed.

Additional Criteria for Riparian Habitat

To provide wildlife habitat, including travel corridors for wildlife, and to provide a source of detritus and large woody debris for fish and other aquatic organisms.

Wildlife Habitat. Establish plant communities that address the target terrestrial and aquatic wildlife and pollinator needs and have multiple values such as food, cover, shelter, nutrient uptake, and shading. The establishment of diverse native woody and herbaceous species will enhance wildlife and pollinator values.

Select trees and shrubs that provide habitat for the desired wildlife species. Refer to the Delaware conservation practice standard for Tree/Shrub Establishment (612), Tables 2 and 3, for more information.

Select buffer widths for wildlife habitat based on the individual wildlife species or groups of species desired. Widths in the following table include the sum of buffer widths on one or both sides of water courses or water bodies and may extend beyond riparian boundaries. In such cases, refer to the conservation practice standard for Tree/Shrub Establishment (612) for design of upland forests.

Table 1. Minimum buffer widths for wildlife habitat.

Wildlife Species	Minimum Buffer Width in Feet
Bald eagle nesting, cavity nesting ducks, heron rookery	600
Beaver, dabbling ducks, mink, salmonids	300
Neotropical migrants	300
Deer	200
Frog, salamander	100

Woody Debris. Within the first 15 feet at a minimum, establish or manage native 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.

Additional Criteria for Water Temperature

To create shade to lower or maintain water temperatures to improve habitat for fish and other aquatic organisms.

A buffer for controlling warm-season water temperatures shall be established or maintained on south and west sides of water courses and water bodies, to the extent feasible. The buffer canopy shall have 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. Note: Buffers for water courses wider than 30 feet may be valuable but will only have site-specific effects.

Buffer species shall include those trees and/or shrubs with sufficient height potential. Place drooping or wide-crowned trees and shrubs nearest the water course or water body. Shoreline or channel relief (e.g., deeply incised channels) and topographic shading shall be taken into account in selecting species.

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.

Note: Specific programs may dictate criteria in addition to, or more restrictive than, those specified in this standard.

CONSIDERATIONS

Assess the severity of bank erosion and its influence on existing or potential riparian trees and shrubs. Watershed-level treatment or bank stabilization activities may be needed before establishing a riparian forest buffer. Refer to the conservation practice standard for Streambank and Shoreline Protection (580) and to Chapter 18 of the Engineering Field Handbook. Complex

ownership patterns of riparian areas may require group planning for proper buffer design, function, and management.

Consider the need for a vegetated filter strip up-gradient of a planned woody buffer when ephemeral, concentrated flow, or sheet and rill erosion and sedimentation are a concern. Consider the use of structural practices when vegetative measures alone will not provide sufficient erosion control.

Consider connecting existing and new buffers to increase the continuity of cover and further moderate water temperatures, improve habitat, and enhance water quality functions.

Consider using a mix of species with growth forms that are tall and wide-crowned or drooping in order to increase the shading effect. Protecting the south or southwest side of the watercourse will provide the greatest temperature control. Buffers established on both sides of watercourses will provide multiple values.

Select tree and shrub species that are native to Delaware and have multiple values such as those suited for timber, biomass, nuts, fruit, browse, nesting, aesthetics, and tolerance to locally used herbicides. Consider species that re-sprout when establishing species 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 tree and shrub species that may be alternate hosts to undesirable pests or that may be considered invasive or undesirable. Species diversity should be considered to avoid loss of function due to species-specific pests.

When considering natural regeneration vs. planting, a number of regeneration factors should be evaluated before determining that natural regeneration is appropriate for a site. These factors include, but are not limited to, the presence of sufficient seed trees, prevailing wind direction and other seed dispersal factors, seedbed requirements, potential for seed germination, and shade tolerant vs. intolerant species.

Planting is usually preferred over natural regeneration because it is easier to control the mix and distribution of species and it takes less time for woody plants to become established and reach maturity.

The location, layout, and density of the buffer should complement natural features in riparian areas. Avoid layouts and locations that would concentrate flood flows or return flows. Low, flexible-stemmed shrubs will minimize obstruction of local flood flows.

Consider the positive and negative impacts beaver, muskrat, deer, rabbits, groundhogs, and other local species may have on the successful management of the riparian area and stream system.

Allelopathic impacts of plants should be considered.

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.

Existing, functional underground drains and open ditches through the riparian area will pass pollutants directly to the outlet. To filter such pollutants, drains or ditches may be plugged, removed, or replaced with perforated pipe/end plugs or water control structures to allow passage and filtration of drain water through the riparian forest root zone. Caution is advised that saturated conditions in the riparian buffer and shade on adjacent areas may limit existing land use and management.

Consider that for sites where continued function of drains is desired, woody root penetration may eventually plug the underground structures.

Identify and evaluate any constraints such as economic feasibility, management options, and regulatory and cost-share program requirements.

PLANS AND SPECIFICATIONS

Plans and specifications for this practice shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail to ensure successful

implementation of this practice and may be recorded in narrative form, on Implementation Requirements (IR) worksheets, or other approved forms.

Tree and/or shrub species shall be specified and established in accordance with the Delaware conservation practice standard for Tree/Shrub Establishment (612). Tree/shrub establishment goals shall be based on the primary purpose of the buffer, using the planting rates as shown in Table 4 of that standard.

In addition, follow the establishment recommendations provided in the Delaware fact sheets for tree and shrub plantings, and complete the 391 IR worksheet. The appropriate fact sheet(s) and IR worksheet can serve as the planting plan and specifications for the practice.

The following items shall be addressed, as appropriate:

1. Purpose of riparian forest buffer;
2. Length and width of the planting;
3. Method of site preparation;
4. Species selected for establishment, seeding/planting rates, and planting dates;
5. Rate and type of soil amendments to be applied (if any);
6. Method(s) used to protect plantings from animal damage (e.g., fencing, repellents, etc.) or for weed control.

OPERATION AND MAINTENANCE

An Operation and Management (O&M) plan shall be prepared and is the responsibility of the client to implement. The appropriate fact sheet(s) and IR worksheet may serve as the management plan, as well as supporting documentation, and shall be reviewed with and provided to the client.

At a minimum, the following components shall be addressed in the O&M plan, as applicable:

1. Inspect the trees and shrubs at least annually during the first and second years. If survival is less than expected, replant as needed to

achieve the intended purpose of the practice. If native trees and/or shrubs (other than what was planted) become established, and this cover meets the intended purpose of the practice and the client's objectives, the cover should be considered adequate;

2. If tree shelters are used, remove them before they impede the growth of the trunk. Removal should not occur until the seedling has adequate girth to support itself (usually 3 to 5 years after planting);
3. Check for insects and diseases and if an incidence threatens stand survival, take corrective action to keep the pest under control;
4. Control undesirable plants by pulling, mowing, or spraying with a selective herbicide. Control noxious weeds as required by state law;
5. Protect trees and shrubs from wildfire and damage from livestock and wildlife to the extent feasible;
6. Trees and shrubs should not be fertilized in the first year, because the plants will develop too much top growth compared to the roots. If nutrients will be applied later, refer to the conservation practice standard for Nutrient Management (590);
7. Describe the acceptable uses (e.g., occasional removal of some tree and shrub products, etc.) and time of year or frequency of use restrictions, if any. *Pay particular attention to program requirements as they relate to acceptable vs. restricted uses and other management restrictions.*

Record Keeping

It is the responsibility of the landowner/client to maintain records as needed to document plan implementation. Records will include actual implementation details of all applicable components under Plans and Specifications.

SUPPORTING DATA AND DOCUMENTATION

1. Extent of planting in acres, field number where the practice located, and the location of the practice marked on the conservation plan map;
2. Assistance notes. The notes shall include dates of site visits, name or initials of the person who made the visit, specifics as to alternatives discussed, decisions made, and by whom;
3. Copy of the appropriate fact sheet(s) and completed IR worksheet, or other specifications and management plans.

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