

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

RIPARIAN FOREST BUFFER

(Acre)

CODE 391

DEFINITION

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

PURPOSE

- Create shade to lower or maintain water temperatures to improve habitat for aquatic organisms.
- Create or improve riparian habitat and provide a source of detritus and large woody debris.
- 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.
- Reduce pesticide drift entering the water body.
- Restore riparian plant communities.
- Increase carbon storage in plant biomass and soils.

CONDITIONS WHERE PRACTICE APPLIES

Riparian forest buffers are applied on areas adjacent to permanent or intermittent streams, lakes, ponds, and wetlands. They are not applied to stabilize stream banks or shorelines.

CRITERIA

General Criteria Applicable to All Purposes

Use of this standard requires compliance with all applicable federal, state, and local laws and regulations.

The riparian forest buffer will be positioned appropriately and designed to achieve sufficient width, length, vertical structure/density and connectivity to accomplish the intended purpose(s).

Tree and/or shrub plantings will follow site preparation/weed control for establishment, planting dates, planting stock size, planting, and storage guidelines as detailed in Indiana (IN) Field Office Technical Guide (FOTG) Standard (612) Tree/Shrub Establishment. Plant density will be based on the planting rate table for Multiple Resource Benefits.

Only viable, high-quality and adapted plant materials will be used. Species will be adapted to the soils, climate and site conditions. Adapted species are listed in the NRCS Soil Data Mart (Forestland Productivity report) and/or Table 4 of this standard.

Excessive sheet-rill and concentrated-flow erosion will be controlled in the areas immediately adjacent and up-gradient of the buffer site.

Periodic removal of forest products such as timber, medicinal herbs, nuts, and fruits is permitted provided the intended purpose is

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service State Office, or download it from the Field Office Technical Guide for your State.

not compromised by the loss of vegetation or harvesting disturbance.

Livestock will be controlled or excluded as necessary to achieve the intended purpose.

Refer to IN FOTG Standard (528) Prescribed Grazing and/or (472) Access Control as applicable.

Harmful plant and animal pests present on the site will be controlled or eliminated as necessary to achieve and maintain the intended purpose. If pesticides are used, refer IN FOTG Standard (595) Integrated Pest Management.

Woody plants will be established without compromising the integrity of:

1. Property Lines
2. Fences
3. Utilities
4. Roads
5. Legal Drains
6. Other Easement Areas or Right of Ways

Where subsurface drains (tile lines) cross through a tree/shrub planting, and where these drains will remain functional:

1. Trees/shrubs will not be planted within 50 feet on either side of perforated tile.

OR
2. Non-perforated tile will be installed through the planting and extend a minimum of 50 feet on either side of the planting.

Buffer Configuration

All buffers will consist of at least two zones, Zone 1 and Zone 2. Dominant vegetation for Zone 1 and 2 will consist of existing, naturally regenerated, or planted trees and shrubs suited to the soil and hydrology of the site and the intended purpose(s). In addition, Zone 3 is required if needed to control erosion up-gradient of Zone 2. Riparian buffers will be designed to meet the minimum buffer width(s) in Table 1.

Zone 1 Streamside Forest

Tree removal is minimized in this zone to allow trees to grow to maturity. Mature trees are needed to lower water temperatures and to provide a source of detritus for fish and

other aquatic organisms. Occasional removal of trees for forest products is permitted provided that the intent of the buffer is not compromised. Felling and skidding of trees will be directed away from the water course or water body. Skidding will be done in a manner that minimizes soil erosion.

Exception for legal drains (only with written concurrence of the legal entity): Zone 1 can begin 30 feet from the top of bank to provide an access strip for equipment ingress and egress. The access strip is allowable if the primary purpose of the buffer is attainable with the presence of the access strip. The access strip will be maintained in herbaceous plants.

Zone 2 Managed Forest

Criteria for Zone 1 applies except that removal of trees for forest products is permitted on a periodic and regular basis provided the intended purpose is not compromised.

Zone 2 will begin immediately from Zone 1 and extend a minimum distance listed in Table 1.

Table 1. Minimum Zone Widths (in feet)

Stream Order ¹	Zone 1	Zone 2	Total
1,2	15	20	35
3 and larger	25	75	100
Others ²	15	20	35

¹ Stream order is a description of a drainage pattern. It is a measure of the position of a stream in the hierarchy of tributaries. First order streams are those which have no tributaries. Stream order increases when 2 streams of equal order join. For example, it takes 2 second order streams joining to make a third order stream.

² Includes open ditches and streams that have surface flow for less than 6 months out of the year. Also includes buffers around wetlands, lakes, and ponds.

Zone 3

Where ephemeral, concentrated flow or sheet and rill erosion is a concern in the area up-gradient of Zone 2, install a vegetated strip of grasses and/or forbs.

When Zone 3 is used it will be applied in accordance with IN FOTG Standard (327) Conservation Cover with a minimum width of 20 feet.

Additional criteria to create shade to lower or maintain water temperatures to improve habitat for aquatic organisms.

Buffer species will be capable of achieving desired height and crown density required for shade production. The buffer canopy will be established to achieve at least 50% crown cover with an average projected canopy shade length equal to or greater than the planned width of the water body that needs shade protection (Table 2).

Place trees and shrubs with high shade values 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.

Table 2. Shadow Length Table¹

Tree Height (ft.)	June	July	August
40	23	25	32
50	29	31	40
60	35	38	48
70	41	44	56
80	47	50	64
90	52	57	72

¹ Shadow length at 10 AM and 2 PM, from the ASHRE Handbook, 1972

Additional criteria to improve riparian habitat and provide a source of detritus and large woody debris.

Refer to IN FOTG Standards (645) Upland Wildlife Habitat Management or (644) Wetland Wildlife Habitat Management for specific habitat guidance. Planting specifications will meet the requirements in the IN NRCS Seeding Tool and IN Biology Technical Notes. To provide a source of detritus and large woody debris within Zone 1, establish, favor or manage species capable of producing stems and limbs of sufficient size to provide an eventual source of large woody debris (see Table 3).

When disturbance management is necessary to maintain the health of the plant community or habitat needs, see IN FOTG

Standard (647) Early Successional Habitat Development/ Management. Management practices and activities will take into consideration the life cycle needs of target and non-target species to minimize negative impacts, such as nest disturbance or reduction in winter cover.

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

Zone 2, for any stream order classification, may be widened to include areas of overland out-of-bank flow that show evidence of scour erosion, debris deposits, or sediment deposition.

Additional criteria to increase carbon storage in plant biomass and soils.

Maximize the width and length of the buffer. To promote rapid canopy closure and increase carbon storage, plant a minimum of 681 trees per acre (8 feet X 8 feet spacing or equivalent).

Additional criteria to restore riparian plant communities

Restoration will consist of the establishment of herbaceous vegetation, shrub understory, and forested canopy. Plants selected will be native and adapted to the site and soil conditions. Planting/seeding mix will consist of at least:

- One Wild Rye, *Elymus* species, or Sedge (*Carex* species)
- Two Forb
- Two Shrub species
- Four Tree species

Table 3. - Plant List for Riparian Buffers

Common Name/ Scientific Name	Indiana Suitability	Flood Tolerance	Large Debris	Soil Drainage	Shade Value	Mature Height	Wildlife		
							Food	Cavity Nesting	Bat Roost
Baldcypress <i>Taxodium distichum</i>	S,C ¹	T	M	VPD-WD	M	80	M	M	M
Birch, River <i>Betula nigra</i>	All	ST	H	VPD-WD	M	50	M	M	M
Blackgum <i>Nyssa sylvatica</i>	All	ST	M	PD-WD	H	60	H	M	M
Buttonbush <i>Cephalanthus occidentalis</i>	All	T	L	VPD-WD	L	5	H	L	L
Cherry, Black <i>Prunus serotina</i>	All	I	M	MWD-WD	L	70	H	L	M
Chokeberry, Black <i>Aronia melanocarpa</i>	All	ST	L	PD-WD	L	10	H	L	L
Cottonwood, Eastern <i>Populus deltoides</i>	All	ST	H	PD-ED	M	90	L	H	M
Cranberry, Highbush <i>Viburnumopulus var americana</i>	All	T	L	VPD-WD	L	9	H	L	L
Dogwood, Red-Osier <i>Cornus stolonifera</i>	All	T	L	VPD-WD	L	10	H	L	L
Dogwood, Silky <i>Cornus amomum</i>	All	T	L	VPD-WD	L	10	H	L	L
Elderberry <i>Sambucus canadensis</i>	All	T	L	VPD-WD	L	9	H	L	L
Hickory, Shellbark <i>Carya laciniosa</i>	All	ST	M	VPD-WD	H	70	H	M	H
Hackberry <i>Celtis occidentalis</i>	All	ST	M	SPD-WD	M	50	M	M	M
Maple, Red <i>Acer rubrum</i>	All	ST	H	VPD-WD	H	70	M	H	M
Maple, Silver <i>Acer saccharinum</i>	All	T	H	VPD-WD	H	80	M	H	M
Oak, Bur <i>Quercus macrocarps</i>	All	ST	M	PD-ED	H	80	H	H	M
Oak, Pin <i>Quercus palustris</i>	All	ST	H	VPD-WD	M	75	H	H	M
Oak, Overcup <i>Quercus lyrata</i>	S ¹	T	M	VPD-WD	M	70	H	H	M
Oak, Swamp Chestnut <i>Quercus michauxii</i>	S ¹	ST	H	SPD-WD	H	70	H	H	M
Oak, Swamp White <i>Quercus bicolor</i>	All	ST	M	VPD-WD	H	70	H	H	M
Oak, White <i>Quercus alba</i>	All	I	H	MWD-ED	H	90	H	H	M

Pawpaw <i>Asimina triloba</i>	All	I	L	SPD-WD	L	20	M	L	L
Pecan <i>Carya illinoensis</i>	S ¹	T	M	SPD-WD	H	120	H	H	M

Table 3. - Plant List for Riparian Buffers (continued)

Common Name/ Scientific Name	Indiana Suitability	Flood Tolerance	Large Debris	Soil Drainage	Shade Value	Mature Height	Wildlife		
							Food	Cavity Nesting	Bat Roost
Persimmon <i>Diospyros virginiana</i>	All	ST	M	MWD-WD	M	50	H	M	M
Sweetgum <i>Liquidambar styraciflua</i>	S ¹	T	M	PD-WD	M	85	L	M	M
Sycamore, American <i>Platanus occidentalis</i>	All	T	H	PD-WD	H	90	L	H	M
Tuliptree (Yellow Poplar) <i>Liriodendron tulipifera</i>	All	I	M	MWD-WD	M	90	M	M	M
Walnut, Black <i>Juglans nigra</i>	All	I	M	MWD-WD	M	80	H	M	M
Willow, Black <i>Salix nigra</i>	All	T	L	VPD-WD	L	60	L	M	M
Willow, Peachleaf <i>Salix amygdaloides</i>	All	T	L	VPD-WD	L	30	L	L	L
Willow, Pussy <i>Salix discolor</i>	All	T	L	VPD-WD	L	20	L	L	L
Willow, Sandbar <i>Salix interior</i>	All	T	L	VPD-WD	L	10	L	L	L

¹ S= Southern IN, C=Central IN (Conservation Tree and Shrub Group Division Boundaries map, located at the IN NRCS FOTG, Sect. II Windbreaks: http://efotg.nrcs.usda.gov/references/public/IN/shrub_groups.jpg)

Flood Tolerance during the growing season for established trees: Tolerant (T) - can withstand inundation for more than 30 days, Somewhat Tolerant (ST) - can survive saturated soils and inundation for up to 30 days, Intolerant (I) - able to survive only 1 to 5 days of inundation

Letter Definitions

H	High
M	Medium
L	Low

Soil Drainage Class

VPD	Very Poorly Drained
PD	Poorly Drained
SPD	Somewhat Poorly Drained
MWD	Moderately Well Drained
WD	Well Drained
ED	Excessively Drained

CONSIDERATIONS

Consider the landowners objectives for riparian forest buffer, so that the planned objective for the planting is achievable.

Select tree and shrub species that have multiple values such as those suited for timber, biomass, nuts, fruit, browse, nesting, and aesthetics.

Bare root seedlings should be considered as the standard method to establish trees and shrubs. Planting bare root seedlings has proven to be the most economical and successful method to establish trees and shrubs. However, other methods to establish trees and shrubs may be applicable in some circumstances.

Shrub species may be direct seeded to provide wildlife habitat. Refer to IN FOTG Forestry Technical Note - Direct Seeding of Shrubs.

Sites that are frequently flooded or ponded for long or very long duration may be difficult and impractical for tree/shrub establishment. Consider using natural regeneration on these sites to establish woody plants and allow the site to revegetate to herbaceous and/or woody plant cover. Additional information can be obtained from IN FOTG Forestry Technical Note - Tree Planting in Floodplains.

Consider that natural regeneration is often likely to occur, but not guaranteed on sites that have a seed source from a forested floodplain system where seeds are deposited in sufficient quantity to establish woody vegetation. On these sites, natural regeneration of light seeded species (e.g. green ash, silver maple, cottonwood , etc.) may establish large numbers of tree seedlings.

Seed sources for direct seeding and woody planting stock should be locally adapted and come from no more than 200 miles north or south.

Consider planting a mixture of species (5-10 species) adapted to the site (including shrubs) to improve plant diversity.

Seek technical assistance from a professional forester for reforestation or other conservation tree planting projects.

To improve plant growth, consider 2 additional years of chemical weed control after plants are established. Weed control should be performed using narrow bands (2'-3' wide) on each side of a plant row unless the entire site is treated.

Consider using a support stake when planting container trees and balled and burlapped stock.

Consider selecting species from IN FOTG Standard (645) Wildlife Upland Habitat Management and/or (644) Wetland Wildlife Habitat Management to enhance wildlife benefits.

To maximize benefits to specific wildlife species, consider establishing widths based on Table 4.

Table 4. Buffer Widths for Selected Species

Species	Minimum Width (Feet)
Amphibians and aquatic reptiles	950
Hérons	825
Bald eagles	660
General wildlife	330

PLANS AND SPECIFICATIONS

Specifications for this practice will 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.

Plans and specification will include the following:

- Site preparation and weed control measures

For Woody Plants

- Plan view to show planting location and/or tree and shrub row specifications.

- Plant spacing in feet and density per acre
- Species by number and planting dates.

For Herbaceous Plants

- Species, seeding rates and seeding dates.
- Establishment procedures.
- Planned rates and timing of nutrient application.
- Other information pertinent to establishing and managing the species or species of plants to be established.
- If grazed, use a prescribed grazing plan according to NRCS IN FOTG Standard (528) Prescribed Grazing.

OPERATION AND MAINTENANCE

The following actions will be carried out to ensure 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):

The riparian forest buffer will be inspected periodically and managed to maintain the intended purpose from adverse impacts such as excessive vehicular and pedestrian traffic, pest infestations, pesticide use on adjacent lands, livestock and wildlife damage, flooding, scour, erosion, sediment accumulations, and fire.

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.

Any removals of tree and shrub products will be conducted in a manner that maintains the intended buffer purpose.

Any use of fertilizers, pesticides and other chemicals to assure buffer function will not compromise the intended purpose or impact non-target species.

Conduct maintenance activities (periodic harvests or thinning) to keep the riparian zones in a healthy, vigorously growing condition.

Additional operation and maintenance requirements will be developed on a site-specific basis to assure performance of the practice as intended.

Any plant species, whose presence or overpopulation may jeopardize this practice, will be controlled. Spraying or other control methods will be performed on a "spot" basis to protect forbs/legumes that benefit native pollinators and other wildlife.

REFERENCES

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