

**NATURAL RESOURCES CONSERVATION SERVICE
NEW JERSEY**

CONSERVATION PRACTICE STANDARD

RIPARIAN FOREST BUFFER

(Acre)

CODE 391

DEFINITION

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

PURPOSES

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

CONDITIONS WHERE PRACTICE APPLIES

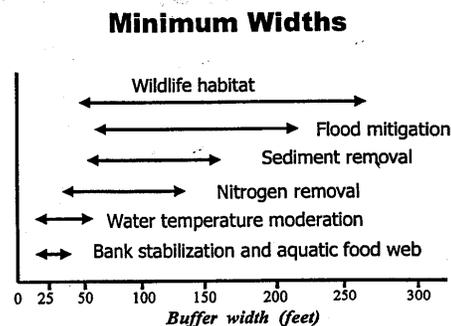
Riparian forest buffers are applied on areas adjacent to permanent or intermittent streams, lakes, ponds, and wetlands. They are not applied to stabilize stream banks or shorelines.

CRITERIA

General Criteria Applicable to All Purposes

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

The following graphic describes the ranges of minimum widths for meeting specific buffer objectives.



Conservation practice standards are reviewed periodically and updated as needed. The most current version of this standard can be obtained on the EFOTG website at <http://www.nrcs.usda.gov/technical/efotg/>

**NRCS, NJ FOTG
September 2010**

THREE ZONE BUFFER SYSTEM

Zone 1 is adjacent to the water body, watercourse, or to a groundwater recharge area and will contain the trees and shrubs needed to provide aquatic shade, insect habitat, bank stability and large woody debris. This Zone should consist of undisturbed forest usually a 15-foot minimum width on each side of the waterbody or watercourse.

Zone 2 is landward and upgradient of Zone 1 and contains the trees and shrubs, as well as ground cover vegetation needed to filter sediments and pollutants from surface water runoff. Together, these areas will provide a travel corridor and habitat for wildlife.

This zone shall be 20 should consist of a managed forest, with a minimum 20 to 60 feet width on each side of the waterbody or watercourse.

Concentrated flow erosion, excessive sheet and rill erosion or mass soil movement shall be controlled in the Zone 2 prior to establishment of the riparian forest buffer.

Dominant vegetation will consist of existing or planted trees and shrubs suited to the site and the intended purpose. Management for and occasional removal of some tree and shrub products such as high value trees is permitted, provided the intended buffer purpose is not compromised by the loss of vegetation or harvesting disturbance.

The minimum combined width of Zones 1 and 2 will be 100 feet or 30 percent of the geomorphic (the natural stream valley) 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 1 illustrates examples of Zone 1 and 2 widths for watercourses and water bodies.

Zone 3 is landward and up gradient of Zone 2 and consists of a strip of herbaceous cover that functions as a filter or buffer protecting Zone 1 and 2 and maximizing sediment trapping. This Zone is provided for runoff control, usually a 20-foot width on each side of the waterbody or watercourse. (See figure 1.) An alternate width consideration for this Zone is a minimum width of 10 feet for slopes less than 1 percent and proportionally add 1-1/2 feet to the flow length for each degree of slope increase.

Dominant vegetation will consist of existing, naturally regenerated, or seeded/planted trees and shrubs suited to the soil and hydrology of the site and the intended purpose(s).

The vegetation will extend a minimum width to achieve the purpose(s). Measurement shall begin at and perpendicular to the normal water line, bank-full elevation, or the top of the bank as determined locally.

Overland flow through the riparian area will be maintained as sheet flow.

For sites to be regenerated or planted, excessive sheet-rill and concentrated-flow erosion will be controlled.

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

Use tree and shrub species that are native and non-invasive. Substitution with improved and locally accepted cultivars or purpose-specific species is allowed. For plantings and seeding, only viable, high-quality and adapted plant materials will be used.

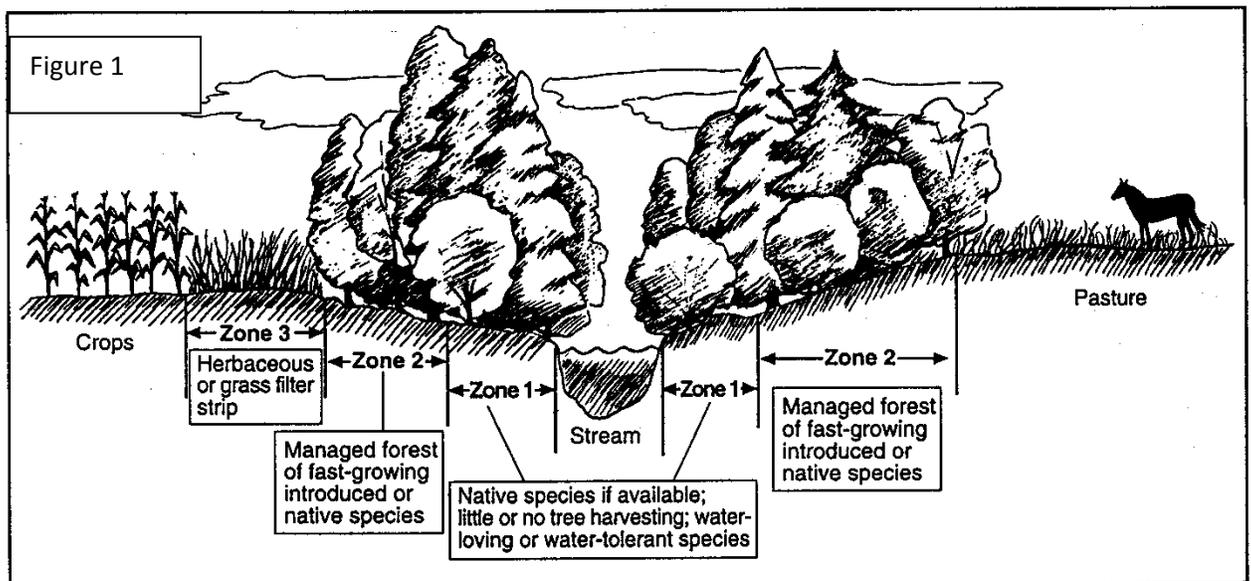
Favor tree and shrub species that have multiple values such as those suited for timber, nuts, fruit, florals, browse, nesting, and aesthetics.

Periodic removal of some forest products such as high value trees, medicinal herbs, nuts, and fruits is permitted provided the intended purpose is not compromised by the loss of vegetation or harvesting disturbance.

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

Livestock shall be controlled or excluded as necessary to achieve the intended purpose. Refer to the standards Prescribed Grazing, 528, and/or Access Control, 472, 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 to the standards 314, Herbaceous Weed Control and 315, Brush Management.



A riparian forest buffer includes zone 1, the area closest to the waterbody or course, and zone 2, the area adjacent to and up gradient of zone 1. Trees and shrubs in zone 1 provide important wildlife habitat, litter fall for aquatic organisms, and shading to lower water temperature. This zone helps stabilize streambanks and shorelines. Trees and shrubs in zone 2 (along with zone 1) intercept sediment, nutrients, pesticides, and other pollutants in surface and subsurface water flows. Zone 2 can be managed to provide timber, wood fiber, and horticultural products. A third zone, zone 3, is established if periodic and excessive water flows, erosion, and sediment from upslope fields or tracts are anticipated. Zone 3 is generally of herbaceous plants or grass and a diversion or terrace, if needed. This zone provides a "first defense" to assure proper functioning of zones 1 and 2.

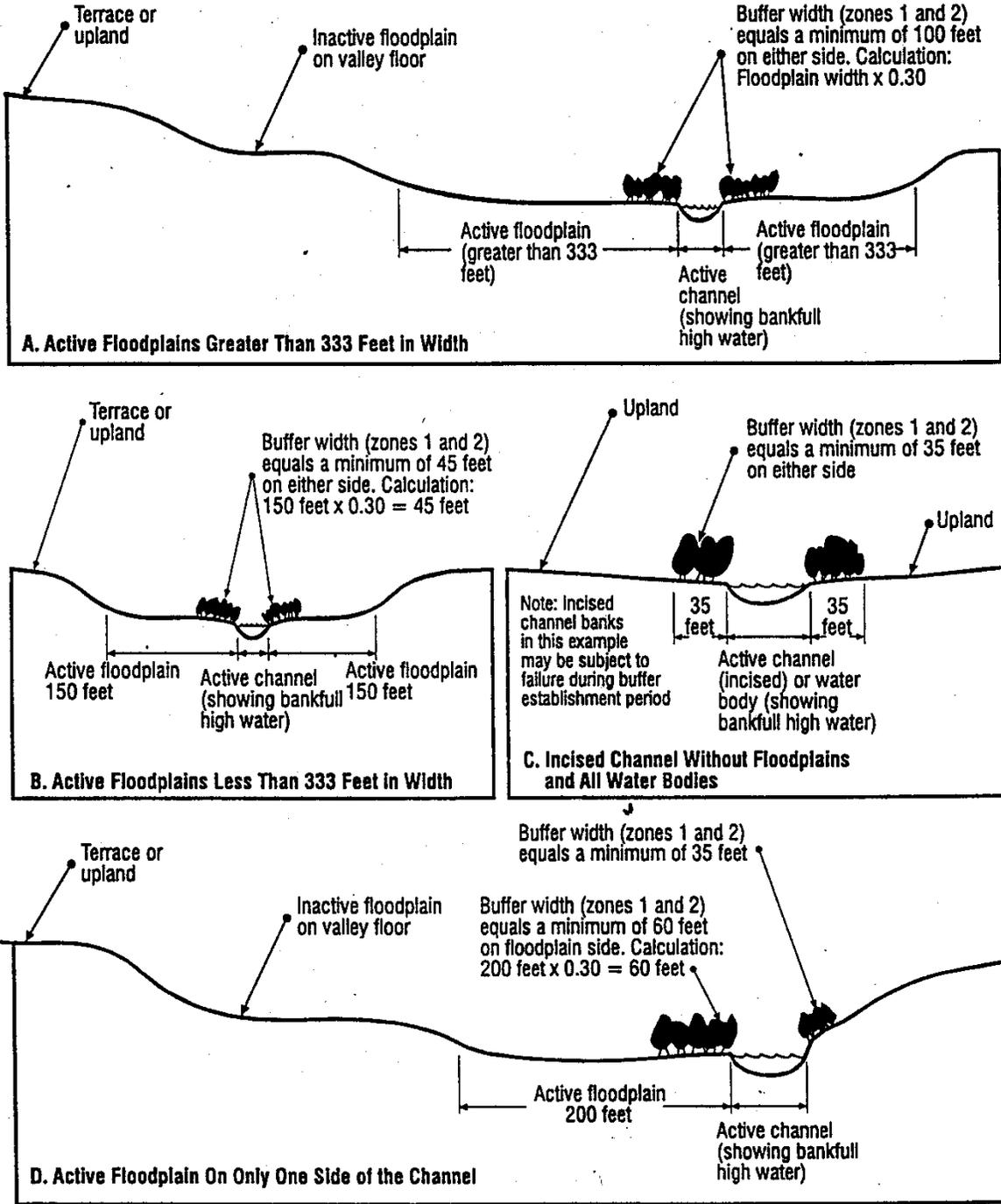


Figure 2. Examples of riparian forest buffer widths for water courses and water bodies.

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

The minimum width shall be at least 35 feet measured horizontally on a line perpendicular to the water body beginning at the normal water line, bank-full elevation, or the top of the bank as determined locally.

The width will be extended 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 needed.

Existing, functional underground drains through the riparian area will pass pollutants directly to the outlet. To filter such pollutants, drains can be plugged, removed or replaced with perforated pipe/end plugs or water control structures (see Structure for Water Control - 587) to allow passage and filtration of drain water through the riparian forest root zone. Caution is advised that saturated conditions in the riparian and adjacent areas may limit existing land use and management.

Additional Criteria to Create or Improve Riparian Habitat and Provide a Source of Detritus and Large Woody Debris.

The width will be extended to meet the minimum habitat requirements of the wildlife or aquatic species of concern.

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

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.

CONSIDERATIONS

Livestock shall be excluded from Zones 1 and 2. Water course crossings and livestock watering shall be located and sized to minimize impact to buffer vegetation and function(s).

Harmful or other harmful pests that may limit the integrity of the buffer to achieve its desired function(s) will be managed as necessary to achieve and maintain the intended purpose. (i.e., deer browsing seedlings). **See the Specifications Section for details.**

Favor native trees, shrubs, & herbaceous plants that have multiple values and meet landowner objectives.

Joining of existing and new buffers increases the continuity of cover and will further moderate water temperatures. A mix of species with growth forms that are tall and wide-crowned or drooping will increase moderation effects. For watercourses, buffers established on both sides will enhance multiple values.

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.

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

Avoid tree and shrub species, which may be alternate hosts to undesirable pests or that, may be invasive or considered noxious or undesirable. Species diversity should be considered to avoid loss of function due to species-specific pests. Do not plant monocultures.

Consider the type of human use (rural, suburban, and urban) and the aesthetic, social and safety aspects of the area to determine the vegetation selection, arrangement and management. For example, avoid shrubs that block views. Prune low tree branches near recreation trails to ease patrolling.

Species selection criteria to improve aesthetics include seasonal foliage color, showy flowers and fruit, foliage texture, form and branching habit. The layout design should be appropriate for the setting as determined by adjacent land uses. A landscape analysis can help determine specific aesthetic requirements

PLANS AND SPECIFICATIONS

Procedures, technical details and other information listed on the following pages provides additional guidance for carrying out selected components of the named practice. This material is referenced from the conservation practice standard for the named practice and supplements the requirements and considerations listed.

PLANTING DENSITIES

Initial plant-to-plant densities for trees and shrubs will depend on their potential height at 20 years of age. Planting density specifications are:

Plant Types / Heights at age 20	Plant-to Plant Spacing in Feet
Shrubs less than 10 feet in height	3 to 6
Shrubs and trees from 10 to 25 feet in height (includes columnar trees)	5 to 8
Trees greater than 25 feet in ht.	8 to 12

Greater spacing between trees and shrubs is permissible in Zone 2, if early successional habitat is desired. A minimum planting density is 200 plants per acre.

NATURAL REGENERATION

Natural regeneration or direct seeding may be used where rapid establishment is not a priority and invasive plant species are absent. A naturally regenerated riparian forest buffer is considered established when plant densities reach the planted buffer recommended density for trees and shrubs. Three growing seasons is a reasonable amount of time in which to determine if natural regeneration would take place. Trees and shrubs are considered to be established when they have begun to dominate herbaceous plants and undesirable shrubs.

PLANT LIST

Table 1 lists woody plant species for Zones 1 and 2 commonly associated with and suited to riparian areas. Key attributes are listed for each plant to assist with the design process for establishing new buffers. Table 2 lists seed mixes for Zone 3.

CARE, HANDLING, SIZE AND PLANTING REQUIREMENTS FOR WOODY PLANTING STOCK

Planting stock will be stored in a cool, moist environment (34-38 degrees F) or heeled in¹. During all stages of handling and storage, keep stock tops dry and free of mold and roots moist and cool. Destroy stock that has been allowed to dry, to heat up in storage (e.g. within a bale, delivery carton or container.) or that has developed mold or other pests. Live cuttings that will not be immediately planted shall be promptly placed in controlled storage conditions (34-38 degrees F) and protected until planting time.

Seedlings shall not be less than 1/4" in caliper at 1" above the root collar. For cuttings, avoid using material less than 1/4" in diameter. Rooted planting stock must not exceed a 2:1 shoot-to-root ratio. See figure 3. Container stock shall normally not exceed a 1-gallon can size.

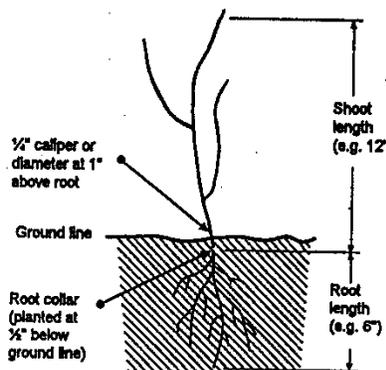


Figure 3. Shoot-to-root ratio is 12" to 6" or 2:1. Plant or stock size requirements.

¹ 'Heeled in' refers to the practice of digging a trench six inches deep by several feet long and placing seedlings in this trench for temporary storage. These seedlings are placed side by side, and soil is placed over the roots to planting depth.

Roots of bareroot stock shall be kept moist during planting operations by placing in a water-soil (mud) slurry, peat moss, super-absorbent (e.g. polyacrylamide) slurry or other equivalent material. Rooting medium of container or potted stock shall be kept moist at all times by periodic watering. Pre-treat stored cuttings with several days of soaking just before planting. Stock shall not be planted when the soil is frozen or dry. Rooted stock will be planted in a vertical position with the root collars approximately 1/2-inch below the soil surface. Insert cuttings to the depth required to reach adequate soil moisture with at least 2-3 buds above ground. The planting trench or hole must be deep and wide enough to permit roots to spread out and down without J-rooting or L-rooting. After planting of rooted stock or cuttings, pack soil around each plant firmly to eliminate air pockets. See figure 4.

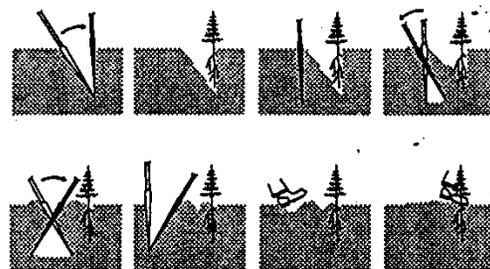


Figure 4. Proper plant and root placement of rooted stock using a planting bar.

BUFFER WIDTH GUIDE FOR SELECTED WILDLIFE SPECIES

Widths below 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 Tree/Shrub Establishment² Standard 612, for design of upland forests).

² NRCS Field Office Technical Guide IV.

Species:	Desired Width in Feet
Bald eagle, cavity nesting ducks, heron rookery, sandhill crane	600
Common loon, pileated woodpecker	450
Beaver, dabbling ducks, mink salmonids	300
Deer	200
Lesser scaup, harlequin duck	165
Frog, salamander	100

PREPARATION OF PLANTING SITES

Planting sites shall be properly prepared based on the soil type and vegetative conditions listed below. For sites to be tilled leave a 3-foot untreated strip at the edge of the bank or shoreline. Competitive weeds, particularly Canada thistle or multiflora rose, should be controlled prior to planting. Avoid sites that have had recent application of pesticides harmful to the woody species to be planted. If pesticides are used, apply only when needed and handle and dispose of properly and within federal, state and local regulations. Follow label directions and heed all precautions listed on the container.

Fabric mulch may be used for weed control and moisture conservation for new plantings on all sites, particularly those with pronounced growing season moisture deficits, or invasive

weeds. Refer to “Mulching”³ standard 484, for installation procedures.

Compacted agricultural soils may need to be loosened using Standard 324, Deep Tillage.

Recommended site preparation methods include:

Tillable sites with loamy/clayey soils:

Sod and alfalfa sites

Sod may be killed by non selective herbicides the year before planting. Plant stock in the residue. On heavy soils, tillage is usually necessary to achieve a satisfactory planting, when a tree planting machine is used.

Tillable sites with sandy soils.

Sod and alfalfa field.

When hand planting without site preparation, scalp or strip an area at least 3 feet in diameter and two to four inches deep. Place plants in the center of the scalped area.

Rototill a 3 foot wide strip and place plants in the center of the tilled area. Where a drip watering system will not be used, rototill the strip the year prior to planting.

Small grain or row crop sites.

If the site is in small grain, corn, or similar clean tilled crops, and it is reasonably free of weeds, plant stock in the stubble without prior preparation. It may be necessary to till a narrow strip with a disk, or other implement to kill weeds or volunteer grain, or to prevent stalks and other residue from clogging the tree planter. If fabric mulch is used, disking may be needed. A cover crop or stubble may be

³ Ibid.

needed between the rows to protect the planting from erosion.

Non-tillable sites and/or erosive sites (including sites with undesirable brushy or herbaceous species):

On sites where it is not practical or possible to operate equipment (steepness, rockiness, etc.) or tillage of the site will cause excessive erosion, the methods listed below may be used. Sites with undesirable brush will need initial treatments that physically remove or kill the brush. Suitable methods include hand-cutting and removal, brush hogging, or herbicides.

Machine or hand scalp an area at least 6 inches in diameter with subsequent plant placement in the center of the scalped area.

Rototill a strip at least 36 inches wide the year prior to tree planting with subsequent plant placement in the center of the tilled strip.

Kill the vegetation in a 36-inch diameter or larger area or in a 36-inch or wider strip with a non-selective herbicide the year prior to planting and plant in the center or along the center-line of the treated area.

SEEDLING PROTECTION from Wildlife

Newly planted seedlings can be damaged by wildlife. Deer-browsing is by far the greatest hazard, although beavers will eat new seedlings in certain locales. In addition, mice and voles can chew on the bark and cambium of new seedlings. Since deer-browsing is the biggest wildlife threat to seedling survival, protection strategies from deer are discussed below. Additional information is available from the NJ State Forest Service, Rutgers Cooperative Extension, and commercial vendors of products that protect tree seedlings. These products are advertised in garden or forestry supply catalogues.

In areas of heavy deer populations, use one of three methods discussed below to protect seedlings from browsing

Fencing – Livestock-type fencing can be installed around the perimeter of the planting site. Non-electric fence should be 8 feet tall to prevent deer from jumping over the fence. Electric fence can be lower in height, since deer first try to go through or under a fence, before they leap. In this case, they get a shock and remember to avoid the area. See Rutgers Cooperative Extension Fact Sheet Number FS888 “Portable Electric Fencing for Preventing Wildlife Damage”

Tree Shelters - Several types of individual seedling protectors are commercially available. These protectors are small diameter cylindrical covers made out of mesh or opaque materials that are placed over each seedling like a chimney. The solid cylinders besides protecting the seedling from predation, also, create a greenhouse effect that increases seedling growth. To create this greenhouse effect, the base of the shelters must be covered by soil.

Tree Stakes - Wooden stakes used for support of the tree or tree shelters shall be rot resistant. Only heartwood from white oak, or cedar, locust, or treated southern yellow pine shall be used. One inch square stakes of sufficient height to perform the intended function shall be used.

Chemical Repellents - There are a number of chemical repellents available commercially, that discourage deer from browsing on seedlings. These products contain substances that are noxious to deer, such as rotten eggs or hot peppers. These products usually last for 1 to 2 months depending on the weather, after which another application is needed. In very heavy deer population areas, this method is not very effective without continuous reapplications.

EXPLANATION OF TERMS

TABLE 1.

Species are grouped by plant type and arranged in alphabetical order by common name. Heights are listed for applicable MLRA's (Major Land Resource Areas, USDA Ag. Handbook 296, Dec.1981. See page 17 or page 12 of this document.) Heights and attributes represent expected performance and characteristics of the individual plant at the reference age in dominant canopy positions on medium-textured, non-saline, neutral pH soils. The reference age for trees is 50 years of age. The reference age for shrubs is 10 years.

1. Saturation Tolerance. The plant's capability to grow in or adjacent to saturated soil conditions. High: can withstand "wet feet"; Medium: some tolerance to saturated conditions.
2. Shade Tolerance. The plant's capacity to grow in a shaded condition. High: can grow in the shade of an overstory; Medium: can grow in partial shade; Low: needs full or nearly full sunlight.
3. Wildlife Value. A rating of "High", "Medium", or "Low" based on the food and/or cover value provided by the plant.
4. Native Species. All indicates the plant is native to all MLRAs in the state. If plant is just native to one or two MLRAs, that MLRA is given. If "no" is listed in this block, then this species is an introduced species.

5. Wetland Indicator Status - The following abbreviations are used:

Obl. - (Obligate) A plant that only occurs naturally in wetland conditions.

Fac. - (Facultative) A plant that naturally occurs in wetland and upland.

FacU - (Facultative Upland) A plant that occurs naturally in wetlands and upland, but is more often found in uplands.

FacW - (Facultative Wetlands) A plant that occurs naturally in wetlands and upland, but is more often found in wetlands.

EXPLANATION OF TERMS

TABLE 2.

GRASS AND FORB SEED MIXES ARE GIVEN IN THIS TABLE FOR PLANTING ZONE 3 OF THE BUFFER. TERMS USED IN THIS TABLE ARE AS FOLLOWS:

1. MLRA – Major Land Resource Areas are shown on page 12 of this document. "All" in this column means that this mix is suitable for all MLRA's in New Jersey. Otherwise, the particular MLRA is listed in this column.
2. Soil Drainage Class – The following abbreviations are used:
 - E – Excessively well drained.
 - W- Well drained.
 - MW – Moderately well drained.
 - SP – Somewhat poorly drained.
 - P – Poorly drained.
3. Shade Tolerance – Same as Table 1.

OPERATION AND MAINTENANCE

The following actions shall be carried out to insure that this practice functions as intended throughout its expected life.

- Inspect the riparian forest buffer periodically. Protect and restore as needed, to maintain the intended purpose from vehicular and pedestrian traffic, pest infestations, pesticide use from adjacent lands, livestock damage and fire. Biological control of undesirable plant species and pest (e.g. using predator or parasitic species) shall be used where available and feasible.
- Replace dead trees and shrubs and control undesirable vegetative competition until the buffer is fully functional.
- Control concentrated flow erosion from upslope areas.
- To moderate water temperature and provide detritus and large woody debris to the stream, manage the buffer to maintain a minimum of 50% canopy cover. Place large

limbs in the watercourse to provide additional large woody debris in the stream, where needed.

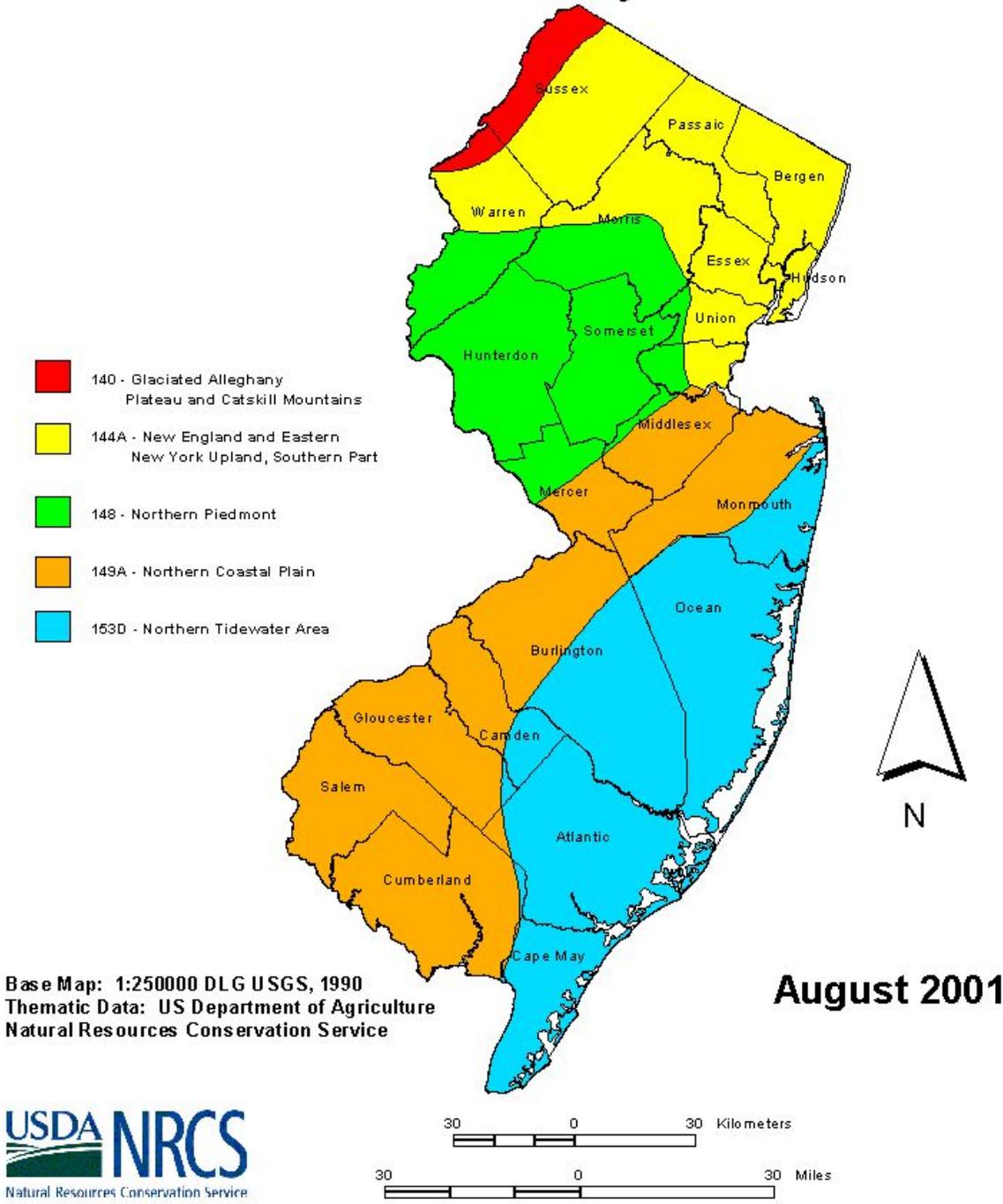
- To provide habitat and corridors for wildlife, manage the buffer to favor food, shelter, and nesting requirements for indicator or target wildlife species. Refer to standards for Wildlife Upland Habitat Management and Wildlife Wetland Habitat Management.
- Additional operation and maintenance requirements shall be developed on a site-specific basis to assure performance of the practice as intended.

REFERENCES

Bentrup, Gary 2008. Conservation buffers: design guidelines for buffers, corridors, and greenways. Gen. Tech. Rep. SRS-109. Asheville, NC: Department of Agriculture, Forest Service, Southern Research Station

Riparian Forest Buffer System Training Program Manual (September 1998). Sponsored by MD Cooperative Extension Service, Rutgers University, and USDA Natural Resources Conservation Service.

Major Land Resource Areas New Jersey



Base Map: 1:250000 DLG USGS, 1990
Thematic Data: US Department of Agriculture
Natural Resources Conservation Service

August 2001



TABLE 1								
<i>Plant Species</i>	<i>RIPARIAN ZONE</i>	<i>MATURE HEIGHT</i>	<i>SATURATION TOLERANCE</i>	<i>SHADE TOLERANCE</i>	<i>WILDLIFE VALUE</i>	<i>NATIVE SPECIES</i>	<i>WET .IND.</i>	<i>COMMENTS</i>
1. EVERGREEN TREES								
American Holly, <i>Ilex opaca</i>	2	40	Medium	High	High	All but 140	FACU	Excellent aesthetic
Atlantic White Cedar <i>Chamaecyparis Thyoides</i>	1	80	High	Low	Low	All but 140	OBL	Plant in sandy wet or mucky soils only. Excellent rot resistance, lumber.
Pitch Pine, <i>Pinus rigida</i>	1 & 2	60	Medium	Low	Medium	All	FACU	Plant in Pine Barrens. Use improved pitch pine.
Eastern White Pine <i>Pinus strobus</i>	2	100	Low	Medium	Medium	All	FACU	Not native to Pine Barrens
2. DECIDUOUS TREES								
Black Gum, <i>Nyssa sylvatica</i>	2	60	Medium	Medium	High	All	FACU	Early brilliant fall coloring
Black Walnut, <i>Juglans nigra</i>	1	80	Medium	High	Medium	All	FACU	Excellent lumber, Mast production
Boxelder, <i>Acer negundo</i>	1 & 2	70	High	Medium	Low	All but 153	FAC+	Fast growth, Yellow fall color
Eastern Cottonwood, <i>Populus deltoides</i>	1	120	High	Low	Medium	All	FAC	Fast growth
Green Ash, <i>Fraxinus pennsylvanicum</i>	1 & 2	100	High	Medium	High	All	FACU	Orange fall color

TABLE 1 (continued)								
<i>Plant Species</i>	<i>RIPARIAN ZONE</i>	<i>MATURE HEIGHT</i>	<i>SATURATION TOLERANCE</i>	<i>SHADE TOLERANCE</i>	<i>WILDLIFE VALUE</i>	<i>NATIVE SPECIES</i>	<i>WET. IND.</i>	<i>COMMENTS</i>
Hackberry, <i>Celtis occidentalis</i>	1 & 2	60	Medium	High	High	All	FAC	Hardy, Yellow fall color
Pin Oak, <i>Quercus palustris</i>	1 & 2	60	High	Medium	All	All	FACW	Perpendicular branching habit. Mast production
Red Maple, <i>Acer rubrum</i>	1 & 2	80	High	High	Low	All	FAC	Red fall color & bloom
Red Oak, <i>Quercus rubra</i>	2	80	Low	Medium	High	All	FAC4	Red fall color
River Birch, <i>Betula nigra</i>	1	80	High	Medium	Low	All	FACW	Exfoliating bark. Yellow fall color
Silver Maple, <i>Acer saccharinum</i>	1	90	High	Medium	Medium	All but 153	FACW	Fast growth. Brittle, weak branching habit
Swamp White Oak, <i>Quercus bicolor</i>	1	60	High	High	High	All	FACW+	Good growth for Oak, Lumber. Mast production.
Sweet Gum, <i>Liquidambar styraciflua</i>	1 & 2	60	High	Medium	Medium	All but 149	FAC	Fast growth. Red fall foliage
Sycamore, <i>Platanus occidentalis</i>	1	80	Medium	Medium	Low	All but 153	FACW	Fast growth. Prone to sycamore anthracnose
Willows (tree-type), <i>Salix</i> sp.	1	70	High	Low	Medium	Y/N	FACW+	<i>Salix nigra</i> is native. Fast growth
White Oak, <i>Quercus alba</i>	2	80	Medium	Low	High	149 & 153	FAC+	Good lumber species. Mast production
White Ash, <i>Fraxinus americana</i>	1 & 2	90	High	Low	High	All	FACU	Good Lumber, good growth Yellow fall foliage

TABLE 1 (continued)								
<i>Plant Species</i>	<i>RIPARIAN ZONE</i>	<i>MATURE HEIGHT</i>	<i>SATURATION TOLERANCE</i>	<i>SHADE TOLERANCE</i>	<i>WILDLIFE VALUE</i>	<i>NATIVE SPECIES</i>	<i>WET. IND.</i>	<i>COMMENTS</i>
3. SHRUBS								
Arrowwood, <i>Viburnum dentatum</i>	2	10	Medium	Medium	High	All	FACW-	Late spring flower
Highbush Blueberry, <i>Vaccinium corymbosum</i>	2	10	High	Medium	High	All	FACW-	Fruit production
Red-Osier Dogwood, <i>Cornus stolonifera</i>	1 & 2	10	High	Medium	High	All	FACW+	Good for streambank stabilization
Silky Dogwood, <i>Cornus amomum</i>	1 & 2	10	High	High	High	All	FACW	Produces fruit at 2-3 years
Spicebush, <i>Lindera benzoin</i>	2	20	Medium	High	Medium	All	FACW	
Sweet Pepperbush, <i>Clethra Alnifolia</i>	2	10	Medium	High	High	All	FAC+	Summer flower
Willows (shrub), <i>Salix sp.</i>	1	10	High	High	Medium	Y/N	FACW	<i>S. exigua</i> and <i>S. sericea</i> are native
Witch Hazel, <i>Hamamelis virginiana</i>	2	20	High	High	Medium	All but 153	FAC	Potential herbal/medicinal use. Yellow fall foliage
Winterberry Holly, <i>Ilex verticillata</i>	1	10	Medium	Medium	High	All	FACW+	Need male & female plants for fruit Potential floral market

TABLE 1 (continued)								
<i>Plant Species</i>	<i>RIPARIAN ZONE</i>	<i>MATURE HEIGHT</i>	<i>SATURATION TOLERANCE</i>	<i>SHADE TOLERANCE</i>	<i>WILDLIFE VALUE</i>	<i>NATIVE SPECIES</i>	<i>WET. IND.</i>	<i>COMMENTS</i>
Shadbush, <i>Amelanchier canadensis</i>	1	20	High	Medium	High	All	FAC	Attractive flower in early spring
Elderberry, <i>Sambucus canadensis</i>	1	12"	High	Medium	High	All	FACW-	Fast growth. Attractive flower and fruit
Smooth Alder, <i>Alnus serrulata</i>	1	10'	High	Low	Meduim	All	FACW-	Nitrogen fixing
Buttonbush, <i>Cephalanthus occidentalis</i>	1	8	High	Medium	Medium	All	OBL	Unusual round white flower

TABLE 2								
Mix	Recommended Cultivar	Seeding Rate (lbs/ac)	MLRA	Soil Drainage Class	Max. Height (feet)	Native Species	Shade Tolerance	Remarks
1. Switchgrass <i>Panicum Virgatum</i>	Shelter	2-4	All	W-SP	6-8	Y	Low	Good mix for wet sites, tolerates periodic flooding. Good summer forage.
Eastern Gamagrass <i>(Tripsacum dactyloides)</i> optional	Pete	4-6				Y		
Redtop <i>Agrostis Gigante &</i>	Streclepi/Fireball	1-2				Y		
Red Fescues <i>Festuca rubra</i>	Common	2-4				Y		

TABLE 2 (continued)

Mix	Recommended Cultivar	Seeding Rate (lbs/ac)	MLRA	Soil Drainage Class	Max. Height (feet)	Native Species	Shade Tolerance	Remarks
2. Switchgrass <i>Panicum virgatum</i>	Shelter	2-4	All	E-MW	6-8	Y	Low	Does well on sites that are droughty and low in fertility. Good wildlife mix.
Indiangrass <i>Sorghastrum nutans</i>	Rumsey	2-3				Y		
Big Bluestem <i>Andropogon gerardii</i>	Niagara or Rountree	2-3				Y		
Little Bluestem <i>Schizachyrium scoparium</i>						Y		
Hard Fescue <i>Festuca trachyphylla</i> OR	Attila/Bighorn	10-15				Y		
Sheep Fescue <i>Festuca ovina</i>						Y		
Partridge Pea, <i>Cassia fasciculata</i>	Common					Y		
OR Mix 6.		1-2						

TABLE 2 (continued)								
Mix	Recommended Cultivar	Seeding Rate (lbs/ac)	MLRA	Soil Drainage Class	Max. Height (feet)	Native Species	Shade Tolerance	Remarks
3 .Orchardgrass	Any	4-6	149A & 153D	W-MW	6-8	N	Low	Good hay/pasture mix.
<i>Dactylis glomerata</i>								
Timothy	Climax	4 - 6				N		
<i>Phalaris pratense</i>								
Bluegrass	Not a turf type	2-4				Y		
<i>Poa pratensis</i>								
White Clover	Common	1-2				N		
<i>Trifolium repens</i> OR								
Alsike Clover OR	Common	1-2				N		
Red Clover	Any	1-2						
<i>Trifolium Pratense</i>		3-5	:			N		

TABLE 2 (continued)

Mix	Recommended Cultivar	Seeding Rate (lbs/ac)	MLRA	Soil Drainage Class	Max. Height (feet)	Native Species	Shade Tolerance	Remarks
4. Hard Fescues <i>Festuca trachphylla</i> Or Sheep Fescues <i>Festuca ovina</i> Switchgrass <i>Panicum virgatum</i> AND Mix 6	Attila Bighorn	8-10 8-10	All	W-MW	0.5-6	N N Y See mix 6	Low	Attractive, wildflower mix. For a low growing mix, select wildflowers and legumes from Mix 6 that are 1-3 feet in height. Good for lawns and aesthetic.
5. Rough Bluegrass <i>Poa trivialis</i> Fowl Bluegrass <i>Poa palustris</i> Virginia Wild Rye <i>Elymus Virginicus</i>	Common Common Common	4-8 2-4 1-2	All	SP-P	3-4	Y Y Y	High	Good mix for wet sites/shade.

TABLE 2 (continued)

Mix	Seeding Rate (lbs/ac)	MLRA	Soil Drainage Class	Max. Height (feet)	Native Species	Shade Tolerance	Remarks – Flower Color
6. Wildflower and Legume Mix Select at least 3 wildflowers and 1 legume from below. Legumes should not comprise more than 25% of the total mix. Add this mix to Mixes 1-5 for added wildlife and aesthetic value.	1/2 lb each						
Wildflowers:							
Black-eyed Susan <i>Rudbeckia hirta</i>		All	W-MW	1-2	Y	Low	Yellow
Bee Balm <i>Monarda didyma</i>		All	W-SP	2-4	Y	Low	Scarlet
Blazing Star <i>Liatris spicata</i>		All	W-SP	2-5	Y	Low	Pink Lavender
Butterflyweed <i>Asclepias tuberosa</i>		All	W-MW	1-2	Y	Low	Bright Orange
Fall Phlox <i>Phlox paniculata</i>		All	W-SP	2-5	Y	Medium	Lavender
Heath Aster <i>Aster pilous</i>		All	E-MW	2-5	Y	Low	Light Purple
Lanceleaved Coreopsis <i>Coreopsis lanceolata</i>		All	M-MW	2-3	Y	Low	Yellow
New York Ironweed <i>Vernonia noveboracensis</i>		All	MW-P	5-8	Y	Low	Purple
New York Aster <i>Aster novi-belgii</i>		All	MW-P	3-5	Y	Low	Violet
Purple Coneflower <i>Echinacea purpurea</i>		All	W-SP	2-3	Y	Medium	Purple

TABLE 2 (continued)

MIX	MLRA	Soil Drainage Class	Max. Height (feet)	Native Species	Shade Tolerance	Remarks – Flower Color
Tickseed <i>Coreopsis tinctoria</i>	All	M-MW	2-3	Y	Low	Yellow
Wild Bergamont <i>Monarda fistulosa</i>	All	W-SP	2-4	Y	Medium	Lavendar
Wild Blue Indigo <i>Baptista australis</i>	All	W-MW	3-5	Y	Low	Blue
Wild Columbine <i>Aquilegia canadensis</i>	All	W-MW	1-2	Y	Medium	Scarlet
Legumes						
American Vetch <i>Vicia americana</i>	All	E-MW	2-3	Y	Low	Purplish Blue
Bush Clover <i>Lespedeza capitata</i>	All	E-MW	2-4	Y	Low	White to Yellow
Partridge Pea <i>Cassia fasciculata</i>	All	W-SP	2-3	Y	Medium	Yellow