

**NATURAL RESOURCES CONSERVATION SERVICE**  
**CONSERVATION PRACTICE STANDARD**  
**TREE/SHRUB ESTABLISHMENT**  
(Ac.)

**CODE 612**

**DEFINITION**

Establishing woody plants by planting seedlings or cuttings, direct seeding, or natural regeneration.

**PURPOSE**

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

1. To provide forest products such as timber, pulpwood, etc.;
2. To provide wildlife habitat;
3. To provide long-term erosion control and improvement of water quality;
4. To treat waste;
5. To store carbon in biomass;
6. To reduce energy use;
7. To develop renewable energy systems;
8. To improve or restore natural diversity;
9. To enhance aesthetics.

**CONDITIONS WHERE PRACTICE APPLIES**

Tree/shrub establishment can be applied on any appropriately prepared site where woody plants can be grown.

Utilize other practice standards for specialized tree/shrub establishment situations, e.g., Critical Area Planting (342), Field Border (386), Hedgerow Planting (422), Riparian Forest Buffer

(391), Windbreak/Shelterbelt Establishment (380).

As appropriate, use the conservation practice standard Tree/Shrub Site Preparation (490) to improve site conditions for tree and/or shrub establishment (usually for timber production).

**CRITERIA**

**General Criteria Applicable to All Purposes**

**Selection of Species, Time of Planting, and Establishment Methods.** Select tree and/or shrub species based on their adaptability to the environmental conditions present and to the planned purpose. Use 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.

Site preparation for planting or natural regeneration shall be done at a time and manner to insure survival and growth of selected species. Control competing vegetation by using appropriate mechanical and/or chemical methods. Control noxious weeds as required by state law.

Only viable, high quality seed and planting stock shall be used. Plant materials shall comply with minimum standards such as those as established by the American Nursery and Landscape Association or U.S. Forest Service.

To ensure that planted materials have an acceptable rate of survival, use appropriate planting dates and take care in handling and planting of seed, seedlings, and other plant materials. Refer to the recommended planting dates (see Table 1) and a selected list of native

tree and shrub species that may be used (Tables 2 and 3). Other trees and shrubs 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), may also be suitable.

Evaluate each site to determine if mulching, supplemental water, or other cultural treatments (e.g., tree protection devices, weed mats) will be needed to assure adequate survival and growth.

Utilize hand or machine planting techniques suited to achieving proper depths and placement for the selected plant species. Timing and use of planting equipment shall be appropriate for the site and soil conditions.

**Planting Rates and Spacing.** Planting rates and the spacing of trees and shrubs shall be based on the species, type of planting site, and the purpose of the planting.

Planting or seeding rates shall be adequate to accomplish the planned purpose. Tree arrangement and spacing shall allow for access lanes if needed for future stand management, harvesting, or other purposes.

When using natural regeneration to establish a stand, adequate seed sources or advanced reproduction shall be present or provided. The acceptability and timing of coppice (sapling) regeneration shall be based on tree species, age, and diameter.

Existing Woodland - Interplanting and underplanting are generally used to introduce desirable tree species into a stand of inferior species or for filling voids in a stand. Spacing shall be as follows:

1. Interplanting - Plant between other species, but no closer than 8 feet from existing trees;
2. Underplanting - Plant no closer than four feet by four feet (4' x 4') under existing trees.

Open Areas - Open areas include agricultural fields, cutover areas, and other non-wooded land. Refer to Table 4 for planting rates for water quality and wildlife habitat. For woodland production, spacing shall be as follows, or as

specified by a licensed forester or other qualified resource management professional:

1. Wood crops -
  - a. Conifers - 6' x 9' to 10' x 10';
  - b. Hardwoods - 6' x 7' to 10' x 10';
2. Christmas trees - 5' x 5' to 6' x 6'. Spacing may be as close as 4' x 4' for small trees;
3. Landscaping, site beautification, shade, and other environmental purposes - Varied spacing, according to a landscape plan.

**Protecting Plantings.** Protect the planting from unacceptable impacts from pests, wildlife, livestock, or fire.

Control plant and animal pest species as needed to achieve and maintain the intended purpose of the planting. Refer to the conservation practice standard Integrated Pest Management (595) to assist with site-specific strategies for pest prevention, pest avoidance, pest monitoring, and pest suppression.

Exclude livestock as needed to establish the planting. Fencing, if used, shall be in accordance with the Delaware conservation practice standard for Access Control (472).

Vegetation surrounding the tree or shrub planting shall be sprayed with herbicide or mowed as needed to reduce rodent damage. Follow recommendations from Delaware Cooperative Extension when using repellents or poisons to protect the planting from mice and voles. Weed mats may also be used to control vegetation.

Tree shelters may be used to protect plantings from competition from weeds and from deer damage. Use shelters from an approved manufacturer. Use 2-foot tubes next to streams if flooding is likely, otherwise use 4-foot tubes. (Five-foot tubes tend to result in problems with weak wispy stems, especially in oaks.) Generally, lighter colored tubes transmit more light. Each shelter shall be staked with a wooden stake (minimum 1-inch thickness) or a plastic or fiberglass post that is at least the same height as the tree shelter being used. Do not use metal or bamboo stakes. Bird exclusion netting shall be

used on the tops of tree shelters until the plantings extend out of the tubes.

#### **Additional Criteria for Providing Wildlife Habitat**

Where wildlife habitat is identified as a primary purpose, select trees and/or shrubs that will also provide food, nesting cover, and/or protective cover for the individual wildlife species or groups of desired species. Plantings shall consist of four or more species to provide greater vegetative diversity. Use locally native plant species when feasible.

#### **Additional Criteria for Treating Waste**

Species used to treat waste shall have fast growth characteristics, extensive root systems, high nutrient uptake capacity, and tolerance of the planned effluent.

#### **Additional Criteria for Storing Carbon in Biomass**

Select plants that have higher rates of growth and potential for carbon sequestration in biomass and are adapted to the site. Plant species at the appropriate stocking rate for the site. The species and plant communities that attain biomass more quickly will sequester carbon faster. The rate of carbon sequestration is enhanced as trees and/or shrubs mature and soil organic matter increases.

#### **Additional Criteria to Reduce Energy Use**

To shade a building and reduce summer energy use, plant trees on the building's west side where the greatest daily heat gain occurs. The second priority for planting is on the east side.

Select tree species with a potential height that will be taller than the structure being protected. Use proper planting densities to optimize the shade produced and meet energy reduction needs.

Plant trees at least 10 feet from the structure to avoid damage to foundations or restrict maintenance access to windows and walls. Allow additional space as needed for mature crown spread. Depending on tree height potential, trees planted within 30 to 50 feet of the building generally provide effective shade for windows and walls.

#### **Additional Criteria for Developing Renewable Energy Systems**

Select plant species that can provide adequate kinds and amounts of plant biomass to supply identified bioenergy needs.

Manage the intensity and frequency of energy biomass removals to prevent long-term negative impacts on the ecosystem.

The harvesting of energy biomass shall be accomplished in a manner that will not compromise the other intended purpose(s) and functions of the practice.

#### **Additional Criteria for Improving or Restoring Natural Diversity**

Composition of species selected for planting or those favored for natural regeneration shall be native to the site and create a successional stage that can progress to the potential natural plant community.

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

#### **CONSIDERATIONS**

Assess site conditions including surrounding land uses, soils, residual herbicides (to the extent known), available moisture during the growing season, and existing vegetation on the site and in adjacent areas, including any noxious weeds which may be present.

For landscape and beautification plantings, consider foliage and flower color, season of flowering, and mature plant height and width.

Where multiple species are available to accomplish the establishment purpose, consider selecting species that will provide food and cover for wildlife. Consider using diverse species combinations which best meet locally native wildlife and pollinator needs.

Consider site preparation methods that are cost-effective and will protect wildlife habitat and water quality.

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

*This practice has the potential to affect National Register listed cultural resources or eligible (significant) cultural resources. These may include archeological, historic, or traditional cultural properties. Care should be taken to avoid adverse impacts to these resources. Follow NRCS state policy for considering cultural resources during planning.*

## **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 concerning site preparation and establishment to ensure successful management of the practice and may be recorded in narrative form, on Implementation Requirements (IR) worksheets, or on other approved forms.

Follow the establishment recommendations in the Delaware fact sheets for trees and shrubs and complete the 612 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. Method of site preparation;
2. Species and rates to be seeded/planted;
3. Seeding/planting dates;
4. Rate and type of soil amendments to be applied (if any);
5. Method(s) used to protect plantings from animal damage (e.g., fencing, repellents, tree shelters, etc.) or for weed control (e.g., weed mats).

## **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., forest harvest, 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.*

**SUPPORTING DATA AND DOCUMENTATION**

The following is a list of the minimum data and documentation to be recorded in the case file:

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.

**REFERENCES**

1. American Nursery and Landscape Association. 2004. *American Standard for Nursery Stock*.
2. Delaware Department of Natural Resources and Environmental Control. *The Flora of Delaware Online Database*.  
<http://www.wra.udel.edu/de-flora/Introduction/>
3. Dirr, Michael A. 2011. *Dirr's Encyclopedia of Trees and Shrubs*. Timber Press, 952 pages.
4. Dirr, Michael A. 2009. *Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Propagation and Uses*. 6<sup>th</sup> Edition, Stipes Publishing LLC, 1325 pages.
5. Maryland Cooperative Extension. *Wildlife Damage Control, Resistance of Woody Ornamentals to Deer Damage, Fact Sheet No. 655*. University of Maryland, College Park.
6. USDA, Forest Service. 2008. *The Woody Plant Seed Manual*. Agriculture Handbook 727.
7. USDA, Natural Resources Conservation Service. *Conservation Practice Standards*. Delaware Field Office Technical Guide, Section IV.

**FIGURE 1: USDA Plant Hardiness Zones for Delaware**



<b>TABLE 1. Recommended Planting Dates for Delaware <sup>1/</sup></b>	
<b>Type of Plant Material</b>	<b>Plant Hardiness Zones</b>
	<b>7a and 7b</b>
Dormant Cuttings	Feb 1 to Feb 28 Nov 15 to Nov 30
Bare-Root Seedlings <sup>2/</sup>	Feb 1 to Apr 30 <i>May 1 to Jun 30*</i>
Container Plants; Balled-and-Burlapped Stock	Feb 1 to Apr 30 <i>May 1 to Jun 30*</i> <i>Oct 1 to Dec 15*†</i>

**TABLE 1 NOTES:**

1. The planting dates listed are averages for each zone. These dates may require adjustment to reflect local conditions, especially near the boundaries of the zones.
  2. When planted during the growing season, these materials must be purchased and kept in a dormant condition until planting.
- \* Additional planting dates during which supplemental watering may be needed to ensure plant establishment.
- † Frequent freezing and thawing of wet soils may result in frost-heaving of materials planted in late fall if plants have not sufficiently rooted in place. Large container plants and balled-and-burlapped stock may be planted into the winter months as long as the ground is not frozen and soil moisture is adequate.

<b>TABLE 2. Trees</b>						
<b>Plant Names</b>	<b>Plant Hardiness Zone</b>	<b>Geographic Distribution in Delaware</b>	<b>Soil Drainage Class</b>	<b>Height at 20 Years</b>	<b>Wildlife Value for Food</b>	<b>Remarks</b>
<b>DECIDUOUS TREES</b>						
ASH, GREEN <i>Fraxinus pennsylvanica</i>	All	Statewide	SP - P	35'	Medium: seeds eaten by ducks, gamebirds, songbirds, squirrels; browsed by deer.	Naturally occurring on streambanks and floodplains.
ASH, WHITE <i>Fraxinus americana</i>	All	Statewide	W - SP	35'	Medium: seeds eaten by ducks, gamebirds, songbirds, squirrels; browsed by deer.	Important lumber tree. Attractive fall color (yellow to maroon).
BALDCYPRESS <i>Taxodium distichum</i>	All	Coastal Plain	MW - P	30'	Low: seeds eaten by ducks and marsh birds.	Naturally occurring on streambanks and in swamps.
BIRCH, RIVER <i>Betula nigra</i>	All	Mostly Coastal Plain; Piedmont at lower elevations	W - P	30'	Low: seeds eaten by ducks and songbirds.	Unique peeling reddish bark. Naturally occurring in riparian areas and floodplains.
BLACKGUM <i>Nyssa sylvatica</i>	All	Statewide	W - P	30'	Medium: fruits eaten by squirrels, quail, turkey, and songbirds; browsed by deer.	Foliage turns bright red in early fall.
CHERRY, BLACK <i>Prunus serotina</i>	All	Statewide	W - SP	35'	High: fruits eaten by songbirds, grouse, turkey, quail; browsed by rabbits and deer.	Leaves and branches are poisonous if eaten by livestock.
DOGWOOD, FLOWERING <i>Cornus florida</i>	All	Statewide	W - SP	20'	High: berries eaten by songbirds, grouse, turkey, quail, squirrels; browsed by deer, rabbits.	White flowers and red fruit. Widely planted as an ornamental.

TABLE 2. Trees

Plant Names	Plant Hardiness Zone	Geographic Distribution in Delaware	Soil Drainage Class	Height at 20 Years	Wildlife Value for Food	Remarks
HACKBERRY <i>Celtis occidentalis</i>	All	Statewide	W - SP	30'	High: fruits eaten by quail, turkey, and songbirds.	Adaptable to a wide range of conditions.
HICKORY, MOCKERNUT <i>Carya tomentosa</i>	All	Statewide	W – MW	35'	High: nuts eaten by squirrels, chipmunks, bluejays, deer.	High BTU for firewood, woods used for tool handles, yellow fall foliage.
HICKORY, PIGNUT <i>Carya glabra</i>	All	Statewide	W – MW	35'	High: nuts eaten by squirrels, chipmunks, bluejays, deer.	High BTU for firewood, woods used for tool handles, yellow fall foliage.
HICKORY, SHAGBARK <i>Carya ovata</i>	All	Piedmont	W - SP	30'	High: nuts eaten by squirrels, turkey, quail, deer.	Wood used for furniture, tool handles, charcoal.
MAPLE, RED <i>Acer rubrum</i>	All	Statewide	W - P	35'	Medium: seeds eaten by ducks, gamebirds, songbirds, squirrels; browsed by deer.	Red fall color and blooms.
OAK, CHESTNUT <i>Quercus prinus</i>	All	Mostly Piedmont; infrequent on Coastal Plain	W - MW	35'	High: acorns eaten by quail, turkey, grouse, squirrels, and deer.	Grows well on dry, rocky, or gravelly soils.
OAK, CHINQUAPIN <i>Quercus muehlenbergii</i>	All	Piedmont	W - MW	35'	High: acorns eaten by quail, turkey, grouse, squirrels, and deer.	Under used, native tree. Usually found on dry, limestone outcrops.
OAK, OVERCUP <i>Quercus lyrata</i>	All	Piedmont	SP - P	25'	High: same as above.	Important lumber tree. Withstands flooding.
OAK, PIN <i>Quercus palustris</i>	All	Statewide	MW - P	35'	High: same as above.	Bronze or red fall foliage. Widely planted as an ornamental. Produces small acorns.
OAK, NORTHERN RED <i>Quercus rubra</i>	All	Mostly Piedmont; uncommon on Coastal Plain	W - SP	35'	High: same as above.	Excellent red fall color. Fast growing.

TABLE 2. Trees

Plant Names	Plant Hardiness Zone	Geographic Distribution in Delaware	Soil Drainage Class	Height at 20 Years	Wildlife Value for Food	Remarks
OAK, SOUTHERN RED <i>Quercus falcata</i>	All	Mostly Coastal Plain; infrequent elsewhere	W - SP	35'	High: same as above.	Excellent red fall color. Tolerates poor, dry soil.
OAK, SWAMP CHESTNUT <i>Quercus michauxii</i>	All	Mostly Coastal Plain; infrequent elsewhere	SP - P	30'	High: same as above.	Good choice for wet sites; important lumber tree.
OAK, SWAMP WHITE <i>Quercus bicolor</i>	All	Mostly Coastal Plain; infrequent elsewhere	SP - P	30'	High: same as above.	Good choice for wet sites; important lumber tree. Requires acid soils.
OAK, WILLOW <i>Quercus phellos</i>	All	Mostly Coastal Plain; infrequent elsewhere	MW - P	30'	High: same as above.	Frequently used as an ornamental planting. Produces small acorns. Red fall color.
OAK, WHITE <i>Quercus alba</i>	All	Statewide	W - SP	35'	High: same as above.	Variable fall color, stately tree. Important lumber tree. Slow growing.
REDBUD <i>Cercis canadensis</i>	All	Mostly Piedmont; infrequent elsewhere	MW - SP	20'	Low: seeds eaten by quail, pheasants, and deer.	Nitrogen-fixing. Useful as an ornamental. Bright pink flowers, appearing in early spring before the leaves.
SWEETGUM <i>Liquidambar styraciflua</i>	All	Mostly Coastal Plain; infrequent elsewhere	MW - P	40'	Low: seeds eaten by songbirds, squirrels, and chipmunks.	Excellent yellow-red fall color. Widely planted as an ornamental. Fallen seed heads are a nuisance on lawns. Fruitless types are available.

TABLE 2. Trees

Plant Names	Plant Hardiness Zone	Geographic Distribution in Delaware	Soil Drainage Class	Height at 20 Years	Wildlife Value for Food	Remarks
SYCAMORE <i>Platanus occidentalis</i>	All	Statewide; infrequent at higher elevations of the Piedmont	MW - SP	40'	Low: seeds eaten by songbirds and squirrels.	Unique peeling bark, fast growth rate. Good den tree. Naturally occurring on streambanks and floodplains.
TULIP TREE <i>Liriodendron tulipifera</i>	All	Statewide	W - SP	40'	Low: seeds eaten by squirrels and songbirds; seedlings browsed by deer.	Important lumber tree. Fast growing. Flowers produce abundant nectar, used extensively by bees.
WALNUT, BLACK <i>Juglans nigra</i>	All	Mostly Piedmont; infrequent elsewhere	MW - SP	40'	Low: nuts eaten by squirrels.	Very important lumber tree. Valuable for furniture and nut production.
WILLOW, BLACK <i>Salix nigra</i>	All	Statewide	SP - P	60'	Medium: browsed by grouse, beaver, and deer.	Naturally occurring on streambanks and floodplains. Fast growth rate. Can be invasive.

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Plant Names	Plant Hardiness Zone	Geographic Distribution in Delaware	Soil Drainage Class	Height at 20 Years	Wildlife Value for Food	Remarks
<b>EVERGREEN TREES</b>						
ATLANTIC WHITE-CEDAR <i>Chamaecyparis thyoides</i>	All	Coastal Plain; uncommon	SP - P	25'	Low: seeds eaten by songbirds and deer.	Cannot compete with hardwoods; best planted in solid stands.
EASTERN REDCEDAR <i>Juniperus virginiana</i>	All	Mostly Piedmont	W - SP	20'	Medium: seeds eaten by songbirds, quail, turkey; browsed by deer and rabbits.	Should not be planted near apple orchards; alternate host of cedar-apple rust.
HOLLY, AMERICAN <i>Ilex opaca</i>	All	Mostly Coastal Plain	W - P	20'	Medium: fruits eaten by songbirds, quail, and squirrels.	Need male and female plants for fruit production. Shade tolerant.
PINE, LOBLOLLY <i>Pinus taeda</i>	All	Mostly Coastal Plain	MW - P	45'	Medium: seeds eaten by songbirds, quail, turkey; browsed by deer and rabbits.	Important lumber tree on Coastal Plain; fast growth rate.
PINE, WHITE <i>Pinus strobus</i>	All	Mostly Piedmont	W - MW	40'	Medium: seeds eaten by songbirds, quail, turkey; browsed by deer and rabbits.	Frequently planted statewide as an ornamental.
PINE, VIRGINIA <i>Pinus virginiana</i>	All	Statewide	W - MW	30'	Medium: seeds eaten by songbirds, quail, turkey; browsed by deer and rabbits.	Can be used for pulpwood. Tolerant of adverse site conditions.

Notes for this table are located on page 17.

TABLE 3. Shrubs							
Plant Names	Plant Hardiness Zone	Geographic Distribution in Delaware	Soil Drainage Class	Shade Tolerance	Height at 20 years	Wildlife Value for Food	Remarks
ALDER, SMOOTH <i>Alnus serrulata</i>	All	Statewide; less common on Coastal Plain	SP - P	○ - ◐	10'	Medium: seeds eaten by ducks, quail, doves; browsed by deer, beaver.	Nitrogen-fixing. Attractive catkins. Provides good cover for woodcock.
ARROWWOOD <i>Viburnum dentatum</i>	All	Statewide	W - P	○ - ◐	10'	Medium: berries eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	Suckers freely; wood used to make arrows. White flowers, bluish-black berries.
BAYBERRY, NORTHERN <i>Myrica pensylvanica</i>	All	Coastal Plain	W - SP	○ - ◐	10'	Medium: berries eaten by quail, songbirds. Browsed by deer.	Need male and female plants for fruit production. Salt tolerant. Suckers to form colonies. Wax of berries used in candles.
BLACK-HAW <i>Viburnum prunifolium</i>	All	Statewide	W - SP	○ - ◐	12'	Medium: berries eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	White flower clusters, blue berries, red fall color. Fruits may remain on shrubs for much of the winter.
BLUEBERRY, Highbush <i>Vaccinium corymbosum</i>	All	Coastal Plain	MW - P	○ - ◐	10'	High: berries eaten by songbirds, turkey, squirrel; browsed by deer, rabbits.	Prefers acid soils. Slow growing.
BUTTONBUSH <i>Cephalanthus occidentalis</i>	All	Statewide	SP - P	○ - ◐	8'	Medium: seeds and nectar; food for hummingbirds, ducks, beavers, and rails; browsed by deer.	Unusual, round white flowers. Tolerates flooding and ponding. Prefer permanent saturation.

TABLE 3. Shrubs							
Plant Names	Plant Hardiness Zone	Geographic Distribution in Delaware	Soil Drainage Class	Shade Tolerance	Height at 20 years	Wildlife Value for Food	Remarks
CHOKEBERRY, RED <i>Aronia arbutifolia</i>	All	Statewide; less common in the Piedmont	MW - P	○ - ◐	10'	Medium: fruits eaten by songbirds, grouse, bear, squirrel; browsed by deer, rabbits.	Fruits may remain on shrubs for much of the winter. Tends to sucker.
CRANBERRY BUSH <i>Viburnum trilobum</i>	All	Mostly Piedmont	MW - P	○ - ◐	12'	Medium: berries eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	Yellow to red fall color; white flower clusters. Bright red berries.
DOGWOOD, GRAY <i>Cornus racemosa</i>	All	Mostly Piedmont	MW - SP	○ - ◐	10'	High: berries eaten by songbirds, grouse, turkey, quail, squirrels; browsed by deer, rabbits.	White flowers, white berries with red pedicels. Forms thickets which can provide good wildlife cover.
DOGWOOD, REDOSIER <i>Cornus sericea</i>	All	Statewide; uncommon	MW - P	○ - ◐	8'	High: berries eaten by songbirds, grouse, turkey, quail, squirrels; browsed by deer, rabbits.	Good for streambank stabilization. Attractive red stem color. White flowers and fruit.
DOGWOOD, SILKY <i>Cornus amomum</i>	All	Common on Coastal Plain & Piedmont	MW - P	○ - ◐	10'	High: berries eaten by songbirds, grouse, turkey, quail, squirrels; browsed by deer, rabbits.	Produces fruit at 3-5 years of age. White flowers with blue berries. Prefers some shade.
ELDERBERRY <i>Sambucus nigra ssp. canadensis</i> (formerly <i>S. canadensis</i> )	All	Statewide	MW - P	○ - ◐	12'	High: berries eaten by songbirds, turkey, squirrels; browsed by deer, rabbits.	Large clusters of white flowers followed by purple berries; fast growth rate. Suckers freely.

TABLE 3. Shrubs							
Plant Names	Plant Hardiness Zone	Geographic Distribution in Delaware	Soil Drainage Class	Shade Tolerance	Height at 20 years	Wildlife Value for Food	Remarks
FETTERBUSH <i>Leucothoe racemosa</i>	All	Mostly Coastal Plain; common	SP - P	○ - ◐	12'	Low: seeds eaten by songbirds. Plants browsed by deer.	Small white flowers in drooping racemes. Prefers permanent saturation.
INKBERRY <i>Ilex glabra</i>	All	Coastal Plain	SP - P	○ - ◐	10'	Medium: Berries eaten by songbirds, quail, and squirrels.	Black fruits persist during the winter. Extensive rhizomes, often forms colonies. Prefers permanent saturation.
PAWPAW <i>Asimina triloba</i>	All	Statewide; infrequent	MW - P	○ - ◐	20'	High: important food source for fox, raccoon, and opossum.	Suckers and forms colonies. Purple flowers; large yellow fruit.
PEPPERBUSH, SWEET <i>Clethra alnifolia</i>	All	Coastal Plain	MW - P	○ - ◐	8'	Medium: nectar for butterflies and other insects.	Showy, fragrant white flower spikes in mid-summer, often when other flowers & nectar are less abundant.
POSSUM-HAW <i>Viburnum nudum</i>	All	Mostly Coastal Plain	SP - P	○ - ◐	12'	Medium: berries eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	White flower clusters, red berries, red fall color. Fruits may remain on shrubs for much of the winter.
RAISIN, WILD <i>Viburnum cassinoides</i>	All	Mostly Piedmont	SP - P	○ - ◐	8'	Medium: berries eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	White flower clusters, black berries. Fruits may remain on shrubs for much of the winter. Reddish-purple foliage in fall.

TABLE 3. Shrubs							
Plant Names	Plant Hardiness Zone	Geographic Distribution in Delaware	Soil Drainage Class	Shade Tolerance	Height at 20 years	Wildlife Value for Food	Remarks
ROSE, SWAMP <i>Rosa palustris</i>	All	Statewide: more common on Coastal Plain	SP - P	○ - ◐	6'	Low: Fruits eaten by songbirds. Plants browsed by deer.	Pink flowers, red fruits. Fruits may remain for much of the winter. Prefers permanent saturation.
SPICEBUSH <i>Lindera benzoin</i>	All	Statewide	MW - P	○ - ◐	12'	Low: berries eaten by songbirds.	Fragrant leaves and twigs; yellow fall color. Bright red berries.
SWEETSPIRE, VIRGINIA <i>Itea virginica</i>	All	Coastal Plain	SP - P	○ - ◐	8'	Low: flowers attractive to butterflies.	Small white flowers in elongated clusters up to 6 inches long. Prefers permanent saturation.
WAXMYRTLE, SOUTHERN <i>Myrica cerifera</i>	All	Coastal Plain	W - SP	○ - ◐	10'	Medium: berries eaten by quail, songbirds. Browsed by deer.	Need male and female plants for fruit production. Salt tolerant. Wax of berries used in candles.
WITCH-HAZEL <i>Hamamelis virginiana</i>	All	Statewide; less common on Coastal Plain	W - SP	○ - ◐	15'	Low: seeds eaten by grouse and squirrels; browsed by deer.	Bark is used for making witch-hazel lotion. Fragrant yellow flowers.
WINTERBERRY <i>Ilex verticillata</i>	All	Statewide; less common on Coastal Plain	SP - P	○ - ◐	10'	Medium: fruits eaten by songbirds, quail, and squirrels.	Need male and female plants for fruit production. Bright red berries persist after leaves drop.

**TABLES 2 – 3 NOTES:**

1. All species listed in these tables are “native,” i.e., they occur naturally in the state of Delaware. Due to space limitations, this listing of native species is not all-inclusive. There are many more native plants which occur in Delaware and may be suitable for use in conservation plantings.
2. The **Plant Hardiness Zones** designate where a species can be successfully planted in Delaware, while the **Geographic Distribution** describes where the species usually occurs under natural conditions.
3. **Soil Drainage Class** (refer to the county soil survey for further information):  
E - Excessively Drained; W - Well Drained; MW - Moderately Well Drained; SP - Somewhat Poorly Drained; P - Poorly Drained.
4. **Sun - Shade:** Sunlight and shade tolerance for each species (Table 3).
  - Full Sun - 6 or more hours of light per day or 4 hours of midday sun;
  - ◐ Part Shade - 3 to 6 hours of light per day;
  - Shade - less than 3 hours of light per day.

**TABLE 4. Planting Rates for Trees, Shrubs, and Tree & Shrub Mixes**

Step 1: Identify the primary purpose of the planting and its associated establishment goal. The establishment goal is the number of trees and/or shrubs expected to survive two years after planting.

Step 2: Determine the planting rate based on the type of planting stock used and the expected survival rate. (For more details, refer to the Note at the end of this table). Use the information listed below as a guide to determine the number of plants needed per acre.

<b>Primary Purpose</b>	<b>Establishment Goal</b> (number of trees and/or shrubs per acre after two years)	<b>Type of Planting Stock</b>	<b>Planting Rate (per acre)</b>	<b>Number of Plants Needed (per acre) for Standard Spacings (in feet)</b>	<b>Remarks</b>
Create or Enhance Wildlife Habitat	200 - 300	Bare-root seedlings	308 - 462	363 plants at 10 x 12 436 plants at 10 x 10	Where trees and/or shrubs will be used to provide wildlife cover within or adjacent to herbaceous areas, they should be planted in groups so that the woody cover area is at least 20 feet wide and at least 400 sq. ft. in size.
		Containerized (1 gallon or larger)	211 - 316	302 plants at 12 x 12	
Reduce Soil Erosion and/or Improve Water Quality	300 - 400	Bare-root seedlings	462 - 615	544 plants at 8 x 10	Recommend using cool-season grass Mix 11 from Table 2, Conservation Cover (327), as a ground cover on highly erodible land and on other land where erosion is a concern.
		Containerized (1 gallon or larger)	316 - 421	363 plants at 10 x 12	

**TABLE 4 - NOTE:**

The planting rate is determined by dividing the establishment goal by the expected survival rate. For example, if the establishment goal is 300 - 400, and the expected survival rate is 65% (0.65), then the planting rate is 462 - 615. The planting rates in this table are based on estimated survival rates of 65% for bare-root seedlings and 95% for containerized stock. It may be necessary to adjust planting rates if survival is expected to be significantly different than the 65% or 95% rates.