United States Department of Agriculture

MARYLAND CONSERVATION PLANTING GUIDE

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Natural Resources Conservation Service (NRCS) – Maryland

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Introduction

The information contained in the Maryland Conservation Planting Guide is an official part of the Field Office Technical Guide (FOTG), and is incorporated by reference into many conservation practice standards contained in Section IV of the FOTG. This Planting Guide provides additional information, recommendations, and specifications for most planting, seeding, or revegetation operations performed as stand-alone, permanent cover practices, or as components of other conservation practices.

Specifications for annual agronomic practices such as cover crop are not included in this guide, but are located with the appropriate practice standards in Section IV of the FOTG.

This Planting Guide is organized as follows:

Section 1 - General Specifications and Reference Tables Applicable to All Plantings - contains general criteria for species selection, planting dates, rates, methods, and care in handling and planting of the seed or planting stock. It also contains the USDA Plant Hardiness Zone Map for Maryland, and a table that cross-references Maryland conservation practices with recommended planting types.

Section 2 - Upland Herbaceous Conservation Plantings: Low-Medium Density (Conservation Cover Plantings) - contains recommended seed mixes for permanent herbaceous cover with low to medium plant density. Depending on the species, these conservation cover mixes may need a year or more to become fully established, and may eventually become dense with maturity, especially without periodic disturbance. These mixes are generally used for wildlife habitat and water quality purposes, and can provide protection from erosion when site conditions are not severe. Some mixes are also suitable for areas that receive light to moderate human use, such as for paths, walkways, and travel lanes. Plantings are generally not harvested, hayed, or grazed for agricultural production.

Section 3 - Upland Herbaceous Conservation Plantings: High Density (Critical Area Plantings) - contains recommended seed mixes for temporary and permanent herbaceous cover with high plant density. These critical area planting mixes are designed to provide cover that establishes relatively quickly and is very durable. These mixes are typically used on sites that have, or are expected to have, high erosion rates, as well as on sites with limiting factors that make plants especially difficult to establish (e.g., on construction sites) and/or maintain (e.g., on heavily used areas). Plantings are generally not harvested, hayed, or grazed for agricultural production.

Section 4 - Tree and Shrub Plantings - contains recommended trees and shrubs (and several woody vines) that can be planted for native cover, hedgerows, windbreaks/shelterbelts, forest production, wetland restoration, and other purposes.

Section 5 - Streambank and Shoreline Plantings - contains recommended woody and herbaceous plantings for streambank and shoreline stabilization and protection.

Section 6 - Wetland Herbaceous Plantings - contains recommended herbaceous plantings for wetlands and shallow water areas. (See Section 4 to select trees and shrubs for wetlands.)

Section 7 - Forage and Biomass Plantings - contains recommendations for establishing adapted and/or native species, varieties, or cultivars of herbaceous plants suitable for pasture, hay, or biomass production.

Using this Planting Guide

1. Start with Section 1. The general specifications at the beginning of this section are applicable to all plantings in the Guide.

2. Using Table 1.1, identify the appropriate conservation practice and type of planting. Most practices have an option for more than one planting type, depending on site conditions and/or how the planting will be used.

3. Use Figure 1.1 to identify the Plant Hardiness Zone where the planting will be established.

4. Go to the Planting Guide section (as directed in Table 1.1) for additional specifications and tables of recommended species/mixes for planting. Select vegetative cover to accomplish the intended purpose of the practice and the objectives of the client. Select plant types and species based on their compatibility in growth rates, moisture requirements, and other characteristics.

5. Return to Section 1, and use Table 1.2 to determine the appropriate planting dates for the type of plant materials (e.g., warm-season grasses, cool-season grasses, trees, etc.) selected for permanent cover. Planting dates for temporary cover, when applicable, are included in separate tables in sections with the permanent cover plantings.

SECTION 1 – GENERAL SPECIFICATIONS AND REFERENCE TABLES APPLICABLE TO ALL PLANTINGS

These specifications supplement the applicable conservation practice standards (see Table 1.1), and contain additional criteria for species selection, planting dates, rates, methods, and care in handling and planting of the seed or planting stock.

Specifications for Selection of Species, Time of Planting, and Establishment Methods

Select vegetative cover based on the planned purpose(s) of the cover, preferences of the client, and conditions of the site. Plant materials shall either be native to Maryland or introduced and non-invasive (i.e., not likely to spread beyond the planted area and displace native species). For best results, use species and varieties with proven conservation traits. When feasible, select locally native plant species and/or species that are beneficial to wildlife and pollinators. Do not plant species considered noxious or invasive according to state law or the Maryland Invasive Species Council.

Vegetation may be established by using seed, bare-root plants, dormant cuttings, bulbs, rhizomes, corms, tubers, containerized plants, and balled-and-burlapped stock, as appropriate. Only viable, high quality seed and planting stock shall be used. Younger planting stock is generally preferred to older stock because younger plants adapt more readily to new conditions. Plant materials shall be obtained from commercial sources, or in the case of unrooted woody materials (e.g., whips, live stakes), may be harvested locally from native stands during the dormant period (generally November - March, depending on location). The method of planting shall include hand or machine planting techniques, suited to achieving proper depths and placement for the selected plant species.

Inoculate legume seeds with the proper, viable *Rhizobium* bacteria before planting. Keep inoculant as cool as possible until use and do not use it later than the date indicated on the package.

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. In general, all materials shall be planted as soon as possible after receiving them from the supplier. For rooted plants, keep the roots moist at all times and keep the plants out of direct sunlight as much as possible. Keep seed and other unrooted plant materials cool and dry until planting. To the extent feasible, provide supplemental moisture if and when necessary to assure early survival and establishment of selected species.

Control competing vegetation by using appropriate mechanical and/or chemical methods. Control noxious weeds as required by state law. Control undesirable invasive species and nuisance species to the extent feasible to establish desired vegetation.

Use Table 1.1 to find the location in this Planting Guide of recommended plantings for each listed conservation practice.

Use Figure 1.1 and Table 1.2 to determine the appropriate planting dates for the different types of plant materials for permanent cover. Planting dates for temporary cover, when applicable, are included in separate tables in sections with the permanent cover plantings.

Planting Seeds of Different Sizes and Types in a Grass/Forb Mixture. Seeds of grasses, legumes, and wildflowers have a wide variety of seed sizes. Some of the native grasses and wildflowers are also “chaffy” -- that is, they have awns (stiff or fluffy bristles) attached to the seeds that prevent them from flowing smoothly through a traditional drill or broadcast seeder. Grasses with chaffy seeds include big bluestem, little bluestem, broomsedge, Indiangrass, Canada wild rye, and Virginia wild rye. Smooth-seeded native grass species include deertongue, beaked panicgrass, coastal panicgrass, redtop panicgrass, purpletop, and switchgrass. Although the seeds of native legume and wildflower species are often smooth, some such as goldenrods and asters are chaffy. Native wildflower and legume seeds also vary greatly in size.

Mixes with seeds of different types and sizes require special equipment and/or methods for planting. Native seed drills (i.e., drills with a chaffy seed box) can be used to plant mixes with chaffy seed. For mixes with different size seeds, a drill with a small seed box is required to provide proper seed distribution. Traditional drills, drop seeders, and broadcast seeders require the use of a carrier (e.g., pelletized lime, fertilizer with no nitrogen or a low nitrogen content, sand, sawdust, a nurse crop such as oats, etc.) when planting variable seed mixes. Generally, a drop seeder is a better choice than a broadcast seeder because seed variability can affect the distribution of the seed and result in a non-uniform stand. Broadcast and drop seeders also require additional seedbed cultivation to promote good seed-to-soil contact, which can be accomplished using a cultipacker (preferred), rake, harrow, or drag. When using a broadcast seeder, use a high ratio of carrier to seed and calibrate the seeder to put down only half the amount in one pass. Then apply the seed in two passes -- one horizontal and one vertical -- to enhance seed distribution.

If the seed is mixed with a carrier, select the type of the carrier with the type of seeding equipment in mind, and calibrate the equipment to deliver a specific amount of carrier with a specific amount of seed per acre. Many seeders and spreaders will not deliver less than a certain amount of material, so the type of equipment available may dictate the carrier weight to seed weight ratio. For example, if a fertilizer spreader is used, it may be designed to deliver no less than 100 pounds per acre, which is significantly higher than most seeding rates. A minimum ratio of 1:1 carrier weight to seed weight should be used, but the ratio should be high enough to make the seed flow through the seeder/spreader and mix the different kinds of seed well.

For seed mixes with smooth seeds of different sizes, a minimum 5:1 ratio (carrier weight to seed weight) is recommended to bulk up the mix, especially for small seeds that tend to separate in the hopper of the seeder. For chaffy seeds, use a 15:1 to 20:1 ratio (carrier weight to seed weight). A 40:1 ratio is recommended for seeds with very stiff awns, such as the wild ryes.

Concerning carriers, pelletized lime is readily available and is seldom applied in high enough amounts to alter the pH. For example, a 20:1 ratio with a 5-pound per acre seed mix only adds 100 pounds of lime per acre, which is a negligible amount. Oats as a carrier may be especially useful on sites with steeper slopes, where the oats will also serve as a nurse crop.

TABLE 1.1: Conservation Practices and Location of Recommended Plantings in the Planting Guide

Conservation Practice	Planting Guide Section for Recommended Plantings					
	2	3	4	5	6	7
Alley Cropping (311)			■			
Conservation Cover (327)	■					
Constructed Wetland (656)						
Herbaceous cover in the buffer – conservation cover/wildlife habitat	■					
Herbaceous cover in the buffer – severe sites		■				
Trees/shrubs in the buffer			■			
Herbaceous vegetation in the pool area					■	
Contour Buffer Strips (332)						
Herbaceous cover – conservation cover/wildlife habitat	■					
Herbaceous cover – severe sites		■				
Contour Orchard and Other Perennial Crops (331)						
Permanent herbaceous cover between rows	■					
Temporary erosion control		■				
Critical Area Planting (342)						
Herbaceous cover		■				
Trees/shrubs			■			
Early Successional Habitat Development-Management (647)						
Herbaceous cover	■					
Shrubs			■			
Field Border (386)						
Herbaceous cover – conservation cover/wildlife habitat	■					
Herbaceous cover – severe sites/uses		■				
Shrubs			■			
Filter Strip (393)		■				
Firebreak (394)						
Herbaceous cover – conservation cover/wildlife habitat	■					
Herbaceous cover – severe sites/uses		■				
Forest Trails and Landings (655)						
Herbaceous cover – conservation cover/wildlife habitat	■					
Herbaceous cover – severe sites/uses		■				
Herbaceous cover – wetlands					■	
Fuel Break (383)						
Herbaceous cover – conservation cover/wildlife habitat	■					
Herbaceous cover – severe sites/uses		■				
Hedgerow Planting (422)						
Stiff-stemmed grasses	■					
Trees/shrubs			■			
Pasture and Hay Planting (512)						■
Restoration of Rare or Declining Natural Communities (643)						
Herbaceous cover	■					
Trees/shrubs			■			

TABLE 1.1: Conservation Practices and Location of Recommended Plantings in the Planting Guide

Conservation Practice	Planting Guide Section for Recommended Plantings					
	2	3	4	5	6	7
Riparian Forest Buffer (391)			■			
Riparian Herbaceous Cover (390)						
Herbaceous cover – conservation cover/wildlife habitat	■					
Forage/biomass						■
Road-Trail-Landing Closure and Treatment (654)						
Herbaceous cover – conservation cover/wildlife habitat	■					
Herbaceous cover – severe sites/uses		■				
Herbaceous cover – wetlands					■	
Trees/shrubs			■			
Shallow Water Development and Management (646)						
Herbaceous cover in the buffer – conservation cover/wildlife habitat	■					
Herbaceous cover in the buffer – severe sites		■				
Trees/shrubs in the buffer			■			
Herbaceous vegetation in the pool area					■	
Silvopasture (381)						
Trees/shrubs			■			
Forage						■
Streambank and Shoreline Protection (580)						
Bioengineering, tidal marsh, and dune plantings				■		
Herbaceous cover – severe sites (other than listed above)		■				
Tree-Shrub Establishment (612)			■			
Wetland Creation (658)						
Herbaceous cover in the buffer – conservation cover/wildlife habitat	■					
Herbaceous cover in the buffer – severe sites		■				
Trees/shrubs in the buffer and pool area			■			
Herbaceous vegetation in the pool area					■	
Wetland Enhancement (659)					■	
Wetland Restoration (657)						
Herbaceous cover in the buffer – conservation cover/wildlife habitat	■					
Herbaceous cover in the buffer – severe sites		■				
Trees/shrubs in the buffer and pool area			■			
Herbaceous vegetation in the pool area					■	
Wildlife Habitat Planting (420)						
Herbaceous cover	■					
Shrubs			■			
Windbreak-Shelterbelt Establishment and Renovation (380)			■			
Vegetative Stabilization for Structural Practices (other than listed above)		■	Or as specified in the structural practice			

Note: Severe sites or uses – locations where establishing and/or maintaining herbaceous vegetation is difficult due to natural conditions (e.g., steep slopes, highly erodible soils) or heavy use by people or livestock.

FIGURE 1.1: USDA Plant Hardiness Zones for Maryland and the District of Columbia

http://planthardiness.ars.usda.gov/PHZMWeb/

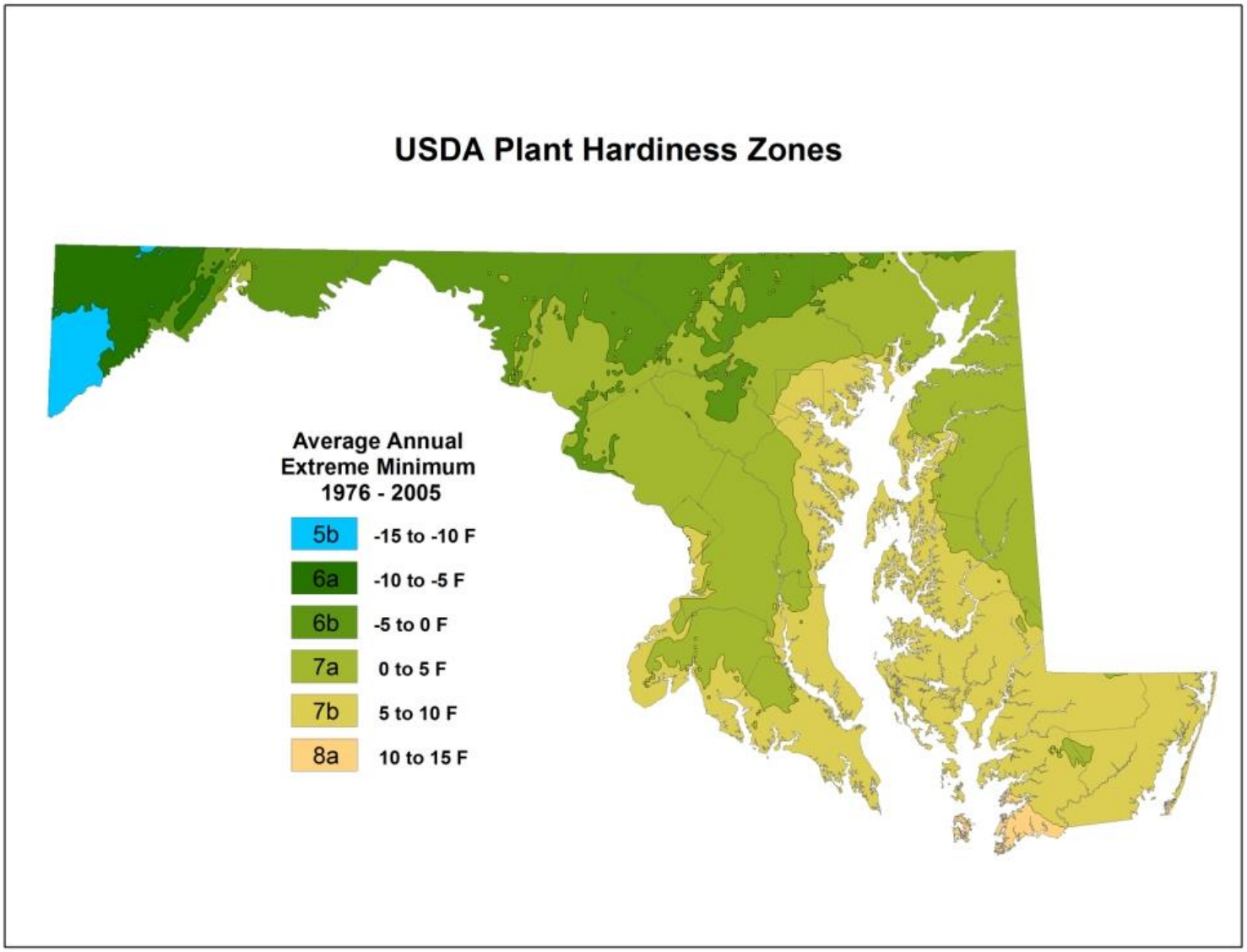

FIGURE 1.1 NOTE: This map is intended for general guidance. For more specific county-level Plant Hardiness Zone information, refer to local GIS data.

TABLE 1.2: Recommended Planting Dates for Permanent Cover in Maryland [1/]			
	Plant Hardiness Zones		
Type of Plant Material	**5b and 6a**	**6b**	**7a, 7b and 8a**
Seeds - Cool-Season Grasses (includes mixes with forbs and/or legumes)	Mar 15 to May 31 Aug 1 to Sept 30	Mar 1 to May 15 Aug 1 to Oct 15	Feb 15 to Apr 30 Aug 15 to Oct 31
Seeds - Warm-Season/Cool-Season Grass Mixes (includes mixes with forbs and/or legumes)	Mar 15 to May 31♦ *Jun 1 to Jun 15**	Mar 1 to May 15♦ *May 16 to Jun 15**	Feb 15 to Apr 30♦ *May 1 to May 31**
Seeds - Warm-Season Grasses (includes mixes with forbs and/or legumes)	May 15 to Jun 15♦ *Jun 15 to Jun 30** *Nov 1 to Jan 31***	May 1 to Jun 15♦ *Jun 15 to Jun 30** *Nov 15 to Jan 31***	Apr 15 to May 31♦ *Jun 1 to Jun 30** *Dec 1 to Jan 31***
Sprigs – Warm-Season Grasses	May 1 to June 1	April 15 to June 1	April 1 to May 15
Sod - Cool-Season	Mar 15 to May 31 *Jun 1 to Aug 31** *Sep 1 to Nov 1** ✦	Mar 1 to May 15 *May 16 to Sep 14** *Sep 15 to Nov 15** ✦	Feb 15 to Apr 30 *May 1 to Sep 30** *Oct 1 to Dec 1** ✦
Dormant Cuttings [2/]	Mar 15 to Apr 15 Oct 15 to Oct 31	Mar 1 to Apr 1 Nov 1 to Nov 15	Feb 15 to Feb 28 Nov 15 to Nov 30
Bare-Root Plants; Bulbs, Rhizomes, Corms, and Tubers [3/]	Mar 15 to May 31 *Jun 1 to Jun 30**	Mar 1 to May 15 *May 16 to Jun 30**	Feb 15 to Apr 30 *May 1 to Jun 30**
Container Plants; Balled-and-Burlapped Stock	Mar 15 to May 31 *Jun 1 to Jun 30** *Sep 1 to Nov 15** ✦	Mar 1 to May 15 *May 16 to Jun 30** *Sep 15 to Nov 30** ✦	Feb 15 to Apr 30 *May 1 to Jun 30** *Oct 1 to Dec 15** ✦

TABLE 1.2 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. When seeding toward the end of the listed planting dates, or when conditions are expected to be less than optimal, add an appropriate nurse crop to permanent seeding mixes. Some legumes such as white/ladino and red clover can be seeded into cool-season grass stands using a frost seeding from January 15 to March 1. Success is dependent on receiving freeze-thaw cycles and adequate rainfall to germinate the legume seed.

2. Planting dates are approximate for locally harvested dormant cuttings that will be planted immediately. Dormant cuttings that are harvested and properly stored by commercial vendors can be planted during the spring and early summer, using the same dates as bare-root plants.

3. When planted during the growing season, most of these materials must be purchased and kept in a dormant condition until planting. Bare-root grasses are the exception—they may be supplied as growing (non-dormant) plants.

♦ In general, planting during the latter portion of this period allows more time for weed emergence and weed control prior to planting. When selecting a planting date, consider the need for weed control vs. the likelihood of having sufficient moisture for later plantings, especially on droughty sites.

* Additional planting dates during which supplemental watering may be needed to ensure plant establishment.

** Dormant season plantings of warm-season grasses – starting approximately 2 weeks after the first hard freeze (average date based on air temperature reading of 28 degrees F or lower, 50% probability of occurrence). Warm-season grasses need a soil temperature of at least 50 degrees F in order to germinate. If soil temperatures are colder than 50 degrees, or moisture is not adequate, the seeds will remain dormant until conditions are favorable. Recommend increasing the seeding rate by 25% to account for some loss of seed during the winter.

✦ 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.

SECTION 2 - UPLAND HERBACEOUS CONSERVATION PLANTINGS: LOW-MEDIUM DENSITY (CONSERVATION COVER PLANTINGS)

This section contains recommended seed mixes for permanent herbaceous cover with low to medium plant density. Depending on the species, these conservation cover mixes may need a year or more to become fully established, and may eventually become dense with maturity, especially without periodic disturbance. These mixes are generally used for wildlife habitat and water quality purposes, and can provide protection from erosion when site conditions are not severe. Some mixes are also suitable for areas that receive light to moderate human use, such as for paths, walkways, and travel lanes. Plantings are generally not harvested, hayed, or grazed for agricultural production.

Specifications for Selecting Mixes and Establishing Plantings

These specifications supplement the applicable conservation practice standards (see Section 1, Table 1.1), and contain additional criteria for species selection, planting rates, and methods of establishment.

Plantings shall consist of two or more species to provide vegetative diversity.

Refer to Table 2.1 to select appropriate mixes for specific purposes.

Refer to Table 2.2 for recommended herbaceous cover mixes and seeding rates. Other herbaceous species that are native to Maryland, or are introduced and are non-invasive, may also be suitable.

Soil moisture characteristics are an important consideration for selection of any planting – some plants are better adapted to dry sites while others are found more frequently in wet sites. Some mixes in Table 2.2 are described based on the amount of moisture needed or tolerated by species in the mix:

1. Dry - excessively drained to well-drained soil.

2. Mesic - moderately well to somewhat poorly drained soil.

3. Wet - poorly to very poorly drained soil.

Maryland Native Wildflower-Only Mixes. Table 2.2 includes four native forb mixes that can be added to grass plantings to enhance forb diversity:

1. Mixes 8a - 8c are low to medium diversity mixes that can be added to selected grass mixes, as indicated elsewhere in Table 2.2.

2. Mix 8d can be used for interseeding into existing grass stands on dry and mesic sites. This is a high diversity mix that can be used to enhance the stand for pollinators and other wildlife. This mix meets the habitat requirement thresholds for monarch butterflies -- the larval food source in this mix is 2% (the minimum requirement for monarchs is 1.5%) and the nectar source is 73% (the minimum is 60%).

Maryland Native Grass and Wildflower Pollinator Mixes. Mixes 15 – 17 are designed to establish high-diversity herbaceous stands containing native grasses and wildflowers for wildlife and pollinator habitat. Maryland native grasses are matched with Maryland native wildflowers for dry, mesic, and wet soil moisture conditions.

The composition of Mixes 15 – 17 was selected to provide a target diversity-to-cost ratio, while planting approximately 30 seeds per square foot. These mixes are approximately 10 to 15 percent grasses and 85 to 90 percent wildflowers, depending on the mix.

The grasses are generally 3 feet in height or shorter, and tend to be less competitive than non-native grasses and tall-statured native grasses. This makes them more compatible with native wildflowers. All of the grasses tend to have a bunch-type growth form and are suitable for sites with low fertility.

The wildflower components of Mixes 15 - 17 are species that occur throughout Maryland. They support pollinators, other beneficial insects, and early successional wildlife; provide flowering throughout most of the growing season (as a mix); and are commercially available. These mixes meet the habitat requirement thresholds for monarch butterflies -- the larval food source is at least 1.5% and the nectar source is at least 60%.

Mix 18 is similar to Mixes 15 - 17 but contains a slightly higher proportion of grasses to wildflowers (ratio of 25 to 75). All species generally are 3 feet tall or less: This mix is designed to provide wildlife and pollinator habitat on drained hydric soils in part shade (3 to 6 hours of direct sunlight per day). However, it does not meet the requirements for monarch habitat because it lacks milkweed (the larval food) and has only 45% composition of monarch nectar sources (not the required minimum 60%).

Table 2.3 provides a list of native grasses, grass-like plants, and their characteristics.

Table 2.4 provides a list of native wildflowers and legumes, and their characteristics. Information in these tables may be used to select alternative species to substitute for species that are not currently available, or when desired by the client or planner. They may also be used to develop custom mixes.

Warm-Season Grass Plantings. Refer to the Maryland NRCS Fact Sheet *Warm-Season Grasses for Erosion Control, Water Quality, and Wildlife Habitat* for establishment, maintenance, and management recommendations.

Cool-Season Grass Plantings. Refer to the Maryland NRCS Fact Sheet *Cool-Season Grasses for Erosion Control, Water Quality, and Wildlife Habitat* for establishment, maintenance, and management recommendations.

Native Herbaceous Plantings (Wildlife and Pollinator Habitat). Refer to the Maryland NRCS Fact Sheet *Native Herbaceous Plantings* for establishment, maintenance, and management recommendations.

TABLE 2.1: Recommended Upland Herbaceous Seeding Mixes (Low-Medium Density) by Purpose or Primary Use of the Planting																
Purpose or Primary Use of the Planting	**Recommended Mix* (see Table 2.2)**															
	1	**2**	**3**	**4**	**5**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Reduce sheet, rill, and wind erosion (provide perennial cover)	✓	✓	✓	✓	✓	◆	✓	✓	✓	✓	✓	✓	◆	◆	◆	◆
Improve surface water quality (by nutrient uptake and reduced sedimentation)	✓	✓	✓	✓	✓	◆	✓	✓	✓	✓	✓	✓	◆	◆	◆	◆
Improve groundwater quality (by nutrient uptake)	✓	✓														
Reduce dust (provide vegetated travel lanes for light to moderate use in perennial crop systems, such as orchards and vineyards)							◆	◆		◆						
Enhance wildlife, pollinator, and beneficial organism habitat (provide diverse mixes of grasses and forbs)			◆	◆	◆	✓	◆	◆	◆	◆		◆	✓	✓	✓	✓
Improve soil health (provide high volumes of organic matter)	✓	✓	◆	◆	✓	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆
Firebreak (cool-season grass strips adjacent to flammable vegetation, such as warm-season grasses, woodland, etc.)							✓	✓	✓	✓	✓					
Paths/Walkways (low-growing, low-maintenance grasses for light to moderate use)										✓						
Companion planting (low-growing, non-competitive grasses to control erosion in conjunction with tree/shrub plantings)										✓						

TABLE 2.1 NOTES:

✓ Recommended mix for this purpose.

◆ Alternative mix, depending on site conditions and preferences of the client.

* Mixes 6 & 7 (Reserved) are omitted from this table.

TABLE 2.2: Permanent Upland Herbaceous Cover Mixes: Low - Medium Density (Conservation Cover)

Mix [1]	Recommended Cultivar	Seeding Rate (lbs/ac) [2]	Plant Hardiness Zones [3]	Soil Drainage Class [4]	Max. Height (feet)	All Native Species [5]	Type of Grass in Mix	Remarks
1. SELECT THREE GRASSES:								**This mix is suitable for dry to mesic sites.**
Big Bluestem *Andropogon gerardii*	Niagara, Rountree	2 - 4						All of these grasses, except Little Bluestem, are tall-statured and can be aggressive, especially on W - MW drained sites.
Coastal Panicgrass *Panicum amarum*	Atlantic	2 - 4						
Indiangrass *Sorghastrum nutans*	Rumsey	2 - 4	All				Warm season grasses	Coastal Panicgrass is primarily a coastal species.
Little Bluestem *Schizachyrium scoparium*	Aldous, Blaze	3 - 5	(See Remarks)	E - MW	6 - 8	Y		Big Bluestem, Indiangrass, and Little Bluestem have fluffy seeds, which require a native seed drill.
Switchgrass *Panicum virgatum*	Shelter	2 - 4						
OPTIONAL, SELECT ONE:								Because the grasses tend to dominate a stand, wildflowers may not persist. Wildflowers may be more persistent on very dry sites.
Partridge Pea *Chamaecrista fasciculata*		1						
Mix 8a		Varies						
2. SELECT THREE GRASSES:								**This mix is suitable for mesic sites.**
Switchgrass *Panicum virgatum*	Kanlow	1 ½ - 3						All of these grasses, except Little Bluestem and Red Fescue, are tall-statured and can be aggressive on sites with good moisture.
Coastal Panicgrass *Panicum amarum*	Atlantic	1 - 2						
Florida Paspalum *Paspalum floridanum*	Common	1 ½ - 3						Little Bluestem prefers drier sites. Red Fescue is a cool-season grass, and can be used on wetter sites.
Indiangrass *Sorghastrum nutans*	Rumsey, Suther	2 - 4						
Little Bluestem *Schizachyrium scoparium*	Aldous, Blaze	3 - 5	All				Warm and cool season grasses	Coastal Panicgrass and Florida Paspalum are primarily coastal species.
Red Fescue *Festuca rubra*	Common	1 - 2	(See Remarks)	W - SP	6 - 8	Y		Can add Eastern Gamagrass 'Meadowcrest' as a 4th species at 5 - 10 lb/ac. Eastern Gamagrass has large seed that must be planted separately from the other species.
OPTIONAL, SELECT ONE:								
Partridge Pea *Chamaecrista fasciculata*		1						
Mix 8a		Varies						Indiangrass and Little Bluestem have a fluffy seed that requires a native seed drill. 'Suther' Indiangrass is only suitable in PHZs 7a, 7b, 8a.

TABLE 2.2: Permanent Upland Herbaceous Cover Mixes: Low - Medium Density (Conservation Cover)								
Mix [1]	**Recommended Cultivar**	**Seeding Rate (lbs/ac) [2]**	**Plant Hardiness Zones [3]**	**Soil Drainage Class [4]**	**Max. Height (feet)**	**All Native Species [5]**	**Type of Grass in Mix**	**Remarks**
3. SELECT THREE GRASSES, USING AT LEAST TWO WARM-SEASON GRASSES:								**This mix is suitable for dry to mesic sites.**
Warm-Season Grasses								All of these grasses are short-statured, except Indiangrass, the seedheads of which can reach 6 - 8 feet.
Little Bluestem *Schizachyrium scoparium*	Aldous, Blaze	4 - 6						Canada Wildrye prefers dry sites; Virginia Wildrye prefers mesic sites.
Purpletop *Tridens flavus*	Common	1 ½ - 3						Splitbeard Bluestem is a Coastal Plain species.
Broomsedge *Andropogon virginicus*	Common	1 - 2						
Splitbeard Bluestem *Andropogon ternarius*	Common	3 - 4	All				Warm and cool season grasses	
Indiangrass *Sorghastrum nutans*	Local ecotype	2	(See Remarks)	E - MW	3 - 4	Y		
Purple Lovegrass *Eragrostis spectabilis*	Common	½ - 1						
Cool-Season Grasses								
Canada Wildrye *Elymus canadensis*	Common	4 - 6						
Virginia Wildrye *Elymus virginicus*	Common	5 - 8						
AND ONE OF THE FOLLOWING:								
Partridge Pea *Chamaecrista fasciculata*		1						
Mix 8a or 8b		Varies						
4. SELECT THREE GRASSES, USING AT LEAST TWO WARM-SEASON GRASSES:								**This mix is suitable for mesic sites.**
Warm-Season Grasses								All of these grasses are short-statured, except Indiangrass, the seedheads of which can reach 6 - 8 feet, and Florida Paspalum, which can reach 5 feet.
Little Bluestem *Schizachyrium scoparium*	Aldous, Blaze	3 - 5						Little Bluestem prefers drier sites.
Purpletop *Tridens flavus*	Common	1 - 2						Splitbeard Bluestem is a Coastal Plain species.
Broomsedge *Andropogon virginicus*	Common	½ - 1						Use River Oats in the Mountains and Piedmont, and Slender Woodoats on the Coastal Plain.
Splitbeard Bluestem *Andropogon ternarius*	Common	2 - 3						
Indiangrass *Sorghastrum nutans*	Local ecotype	2	All				Warm and cool season grasses	
Purple Lovegrass *Eragrostis spectabilis*	Common	½ - 1	(See Remarks)	W - SP	3 - 4	Y		
Florida Paspalum *Paspalum floridanum*	Common	1 ½ - 3						
Cool-Season Grasses								
Virginia Wildrye *Elymus virginicus*	Common	4 - 8						
River Oats *Chasmanthium latifolium*	Common	4 - 8						
Riverbank Wildrye *Elymus riparius*	Common	4 - 8						
Slender Woodoats *Chasmanthium laxum*	Common	4 - 8						
AND ONE OF THE FOLLOWING:								
Partridge Pea *Chamaecrista fasciculata*		1						
Mix 8a or 8b		Varies						

TABLE 2.2: Permanent Upland Herbaceous Cover Mixes: Low - Medium Density (Conservation Cover)

Mix [1/]	Recommended Cultivar	Seeding Rate (lbs/ac) [2/]	Plant Hardiness Zones [3/]	Soil Drainage Class [4/]	Max. Height (feet)	All Native Species [5/]	Type of Grass in Mix	Remarks
5. SELECT THREE SPECIES, USING AT LEAST ONE WARM-SEASON GRASS AND ONE CAREX OR GLYCERIA SPECIES:								**This mix is suitable for wet sites.**
Warm-Season Grasses								All but Florida Paspalum and Riverbank Wildrye are short-statured grasses.
Redtop Panicgrass *Panicum rigidulum*	Common	0.5 - 1						Florida Paspalum is a Coastal Plain species.
Bushy Broomsedge *Andropogon glomeratus*	Common	0.5 - 1						For Switchgrass, do not use cultivars in this mix -- they can be too aggressive. Use a local ecotype.
Beaked Panicgrass *Panicum anceps*	Common	1 - 2						Use River Oats in the Mountains and Piedmont, and Slender Woodoats on the Coastal Plain.
Florida Paspalum *Paspalum floridanum*	Common	2 - 4						Rattlesnake Grass occurs in the Mountain and Piedmont regions.
Switchgrass *Panicum virgatum*	Local ecotype	1 ½ - 2						
Cool-Season Grasses							Warm and cool season grasses, and sedges	
Virginia Wildrye *Elymus virginicus*	Common	4 - 8	All (See Remarks)	P - VP	3 - 5	Y		
River Oats *Chasmanthium latifolium*	Common	5 - 7						
Riverbank Wildrye *Elymus riparius*	Common	5 - 7						
Slender Woodoats *Chasmanthium laxum*	Common	5 - 7						
Carex and Glyceria Species								
Fox Sedge *Carex vulpinoidea*	Common	0.25 - 0.5						
Hop Sedge *Carex lupulina*	Common	4 - 6						
Lurid Sedge *Carex lurida*	Common	1 ½ - 3						
Fowl Mannagrass *Glyceria striata*	Common	0.25 - 0.5						
Rattlesnake Grass *Glyceria canadensis*	Common	0.25 - 0.5						
AND ADD:								
Mix 8c		Varies						
6. - 7. (Reserved)								

TABLE 2.2: Permanent Upland Herbaceous Cover Mixes: Low - Medium Density (Conservation Cover)		
8. Maryland Native Wildflowers and Legumes These mixes can be added to grass mixes as indicated elsewhere in Table 2.2. For the highest diversity grass/wildflower mixes that have a predominant wildflower component, use Mix 15, 16, or 17, as appropriate for site conditions.		
Mix [1/]	**Seeding Rate (lbs/ac) [2]**	**Remarks**
8a. Low Diversity Wildflowers and Legumes		**Use in combination with a grass mix on dry or mesic sites, as indicated elsewhere in Table 2.2.**
SELECT AT LEAST 4 OF THE FOLLOWING WILDFLOWERS:		
Asclepias syriaca Common Milkweed	1	
Asclepias tuberosa Butterfly Milkweed	1	Prefers dry sites
Echinacea purpurea Purple Coneflower	0.6	
Eutrochium purpureum Sweet-scented Joe-pye Weed	0.1	
Helenium autumnale Yellow Sneezeweed	0.04	Prefers wetter sites
Helenium flexuosum Purple Sneezeweed	0.03	
Heliopsis helianthoides Smooth Oxeye	0.6	
Monarda fistulosa Wild Bergamot	0.05	
Monarda punctata Spotted Bee-balm	0.05	Prefers dry sites; MD Eastern Shore ecotype is available.
Penstemon digitalis Tall White Beard-tongue	0.2	
Pycnanthemum incanum Hoary Mountain Mint	0.02	
Pycnanthemum tenuifolium Narrow-leaf Mountain Mint	0.02	
Rudbeckia hirta Black-eyed Susan	0.04	Biennial
Rudbeckia triloba Brown-eyed Susan	0.1	
SELECT AT LEAST 1 OF THE FOLLOWING LEGUMES:		
Chamaecrista fasciculata Partridge Pea	1	
Desmodium paniculatum Panicled Tick-Trefoil	0.3	
Lespedeza capitata Round-head Bush-clover	0.4	
Senna hebecarpa American Senna	0.5	On dry sites use *Senna marilandica*; on wetter sites use *Senna hebecarpa*.
Senna marilandica Maryland Senna	0.5	
8b. Medium Diversity Wildflowers and Legumes Select at least 9 wildflowers and 1 legume from Table 2.4.	Use seeding rate column for Grass Mix in Table 2.4.	**Use in combination with a grass mix on dry or mesic sites, as indicated elsewhere in Table 2.2.** Select species based on region of occurrence (i.e., Mountains, Piedmont, Coastal Plain), soil moisture (i.e., dry, mesic, wet), and bloom period, such that at least 3 species bloom in each period May-June, July-August, and September-October.

TABLE 2.2: Permanent Upland Herbaceous Cover Mixes: Low - Medium Density (Conservation Cover)

8. Maryland Native Wildflowers and Legumes (continued)
These mixes can be added to grass mixes as indicated elsewhere in Table 2.2. For the highest diversity grass/wildflower mixes that have a predominant wildflower component, use Mix 15, 16, or 17, as appropriate for site conditions.

Mix [1/]	Seeding Rate (lbs/ac) [2]	Remarks
8c. Wet Site Wildflowers **SELECT AT LEAST 5 OF THE FOLLOWING:**		**Use in combination with a grass mix on wet sites, as indicated elsewhere in Table 2.2.**
Asclepias incarnata Swamp Milkweed	1	Obligate wetland species.
Bidens cernua Nodding Bur Marigold	0.5	Obligate wetland annual that will readily reseed.
Bidens frondosa Beggar Ticks	0.8	Annual that will readily reseed.
Eupatorium perfoliatum Boneset	0.02	
Eutrochium fistulosum Joe-Pye Weed	0.03	
Eutrochium purpureum Sweet-scented Joe-Pye Weed	0.1	
Monarda didyma Scarlet Beebalm	0.05	Scarlet Beebalm is primarily a Western Maryland species.
Penstemon digitalis Tall White Beard-tongue	0.2	
Pycnanthemum tenuifolium Narrow-leaf Mountain Mint	0.01	
Thalictrum pubescens Tall Meadow Rue	0.4	
Tradescantia virginiana Virginia Spiderwort	0.04	
Verbena hastata Blue (Swamp) Vervain	0.04	
Vernonia noveboracensis New York Ironweed	0.2	

TABLE 2.2: Permanent Upland Herbaceous Cover Mixes: Low - Medium Density (Conservation Cover)

8d. High Diversity Native Wildflower and Legume Mix for Interseeding

Use for interseeding into existing grass stands on dry and mesic sites to enhance forb diversity for wildlife habitat and pollinators.

Scientific Name	Common Name	% by Weight	% by Seed	Duration	Legume	Flowering Period and Flower Color								
						M	A	M	J	J	A	S	O	N
Asclepias tuberosa	Butterfly Milkweed	8.7%	2.0%	Perennial										
Chamaecrista fasciculata	Partridge Pea	9.3%	2.0%	Annual	■									
Conoclinium coelestinum	Mistflower	0.8%	4.0%	Perennial										
Coreopsis tinctoria	Golden Tickseed	0.5%	5.0%	Annual										
Desmodium paniculatum	Panicled Tick-Trefoil	13.7%	9.0%	Perennial	■									
Doellingeria umbellata var. *umbellata*	Flat-topped White Aster	0.8%	2.0%	Perennial										
Helenium flexuosum	Purple Sneezeweed	1.4%	9.0%	Perennial										
Heliopsis helianthoides	Smooth Oxeye	23.5%	9.0%	Perennial										
Lespedeza capitata	Round-head Bush-Clover	12.2%	7.0%	Perennial	■									
Monarda fistulosa	Wild Bergamot	2.9%	12.0%	Perennial										
Monarda punctata	Spotted Bee-Balm	2.5%	12.0%	Perennial										
Penstemon digitalis	Tall White Beard-Tongue	6.1%	8.0%	Perennial										
Pycnanthemum incanum	Hoary Mountain Mint	0.6%	9.0%	Perennial										
Rudbeckia hirta	Black-eyed Susan	1.0%	5.0%	Biennial										
Senna hebecarpa	American Senna	14.8%	1.0%	Perennial	■									
Solidago nemoralis	Gray Goldenrod	0.6%	2.0%	Perennial										
Symphyotrichum oblongifolium	Aromatic Aster	0.9%	2.0%	Perennial										

Seeds per Square Foot: 40
Pounds of Pure Live Seed (PLS) per Acre: 5.5*

Monarch Larval Food Source: 2%** ☑
Monarch Nectar Source: 73%** ☑
Grasses by Seed: 0%
Forbs by Seed: 100%

Mix 8d Notes: Use all species listed. Substitutions: Use Table 2.4 to select substitute species, based on occurrence, adaptation, and bloom period. If appropriate substitutes are not available, increase the percentage of other species currently in the mix.

* Seeding rates are subject to change when substitute species are used, or when species are removed from the mix.

** This mix meets habitat requirement thresholds for monarch butterflies: the larval food source is ≥1.5% and the nectar source is ≥60%.

TABLE 2.2: Permanent Upland Herbaceous Cover Mixes: Low - Medium Density (Conservation Cover)								
Mix [1]	**Recommended Cultivar**	**Seeding Rate (lbs/ac) [2]**	**Plant Hardiness Zones [3]**	**Soil Drainage Class [4]**	**Max. Height (feet)**	**All Native Species [5]**	**Type of Grass in Mix**	**Remarks**
9. Orchardgrass *Dactylis glomerata*	Any	3 - 4	All	W - MW	2 - 3	N	Cool season grasses	Once well-established, orchardgrass may tend to dominate the stand.
Red Fescue *Festuca rubra*	Common	3 - 4						
Alsike Clover *Trifolium hybridum*	Common	1 - 2						Alsike clover can be toxic to horses.
White Clover *Trifolium repens*	Common	1 - 2						
10. Orchardgrass *Dactylis glomerata*	Any	2 - 4	All	W - MW	2 - 3	N	Cool season grasses	Timothy does not perform well in PHZs 7a, 7b and 8a.
Bluegrass *Poa pratensis* **AND/OR**	Not a turf type	1 - 2						Once well-established, orchardgrass may tend to dominate the stand.
Timothy *Phleum pratense*	Climax	2 - 4						
AND ONE OF THE FOLLOWING:								
White Clover *Trifolium repens*	Common	1 - 2	(See remarks)					
Red Clover *Trifolium pratense*	Any	1 - 2						
Common Lespedeza *Lespedeza striata*	Kobe	3 - 5						
Korean Lespedeza *Lespedeza stipulacea*	Climax or Rowan	3 - 5						
11. Riverbank Wildrye *Elymus riparius*	Common	4 - 6	All	MW - P	3 - 4	Y	Cool season grasses	All native, shade-tolerant CSG grass mix for mesic to wet sites.
Virginia Wildrye *Elymus virginicus*	Common	4 - 6						
River Oats *Chasmanthium latifolium*	Common	5 - 10						Use River Oats in the Mountains and Piedmont, and Slender Woodoats on the Coastal Plain.
OR								
Slender Woodoats *Chasmanthium laxum*	Common	5 - 10						
OPTIONAL ADDITION:								Add Mix 8c to provide a grass-forb mix for wildlife habitat.
Mix 8c		Varies						

TABLE 2.2: Permanent Upland Herbaceous Cover Mixes: Low - Medium Density (Conservation Cover)								
Mix [1/]	**Recommended Cultivar**	**Seeding Rate (lbs/ac)** [2/]	**Plant Hardiness Zones** [3/]	**Soil Drainage Class** [4/]	**Max. Height (feet)**	**All Native Species** [5/]	**Type of Grass in Mix**	**Remarks**
12. Chewings Fescue *Festuca rubra ssp. fallax*	Common	1 - 2	All	W - MW	2 - 3	N	Cool season grasses	Attractive, low-growing grass and wildflower (or clover) mix. Select the clover option when using this mix for travel lanes and companion plantings. Clover may be omitted when using this mix for paths/walkways.
Hard Fescue *Festuca brevipila*	Beacon, Gotham, Spartan II, Sword	1 - 2						
Sheep fescue *Festuca ovina*	Common or Bighorn	1 - 2						
AND ADD WILDFLOWER MIX:								
Mix 8a		Varies						
OR ADD CLOVER MIX:								
White Clover *Trifolium repens*	Common	1 - 2						
Red Clover *Trifolium pratense*	Any	1 - 2						
13. Rough Bluegrass *Poa trivialis*	Common	1 - 2	All	SP - P	4 - 5	N	Cool season grasses	Use Red Fescue on drier soils and Fowl Meadowgrass on wetter soils.
Virginia Wildrye *Elymus virginicus* **OR**	Common	5 - 8						
Riverbank Wildrye *Elymus riparius*		4 - 6						
Fowl Meadowgrass *Poa palustris* **OR**	Common	1 - 2						
Red Fescue *Festuca rubra*	Common	1 - 2						
14. Fowl Meadowgrass *Poa palustris*	Common	1 - 2	All	SP - P	2 - 3	Y (See Remarks)	Cool season grasses	Low-growing mix of native grasses for wet sites. Use Partridge Pea if an all-native mix is desired. (Alsike and White Clover are not native to Maryland.) Alsike Clover can be toxic to horses.
Virginia Wildrye *Elymus virginicus*	Common	4 - 6						
Red Fescue *Festuca rubra*	Common	1 - 2						
AND ADD:								
Partridge Pea *Chamaecrista fasciculata*	Common	1 - 2						
OR ADD CLOVER MIX:								
Alsike Clover *Trifolium hybridum*	Common	1 - 2						
White Clover *Trifolium repens*	Common	1 - 2						

TABLE 2.2: Permanent Upland Herbaceous Cover Mixes: Low - Medium Density (Conservation Cover)

15. High Diversity Native Grass/Forb Mix for Dry Sites
This mix has a predominant wildflower component for optimum wildlife and pollinator habitat.

Scientific Name	Common Name	% by Weight	% by Seed	Duration	Grass/ Forb	Legume	Flowering Period and Flower Color								
							M	A	M	J	J	A	S	O	N
Asclepias tuberosa	Butterfly Milkweed	9.8%	3.0%	Perennial											
Chamaecrista fasciculata	Partridge Pea	7.1%	2.0%	Annual		■									
Coreopsis lanceolata	Lanceleaf Tickseed	6.2%	6.0%	Perennial											
Desmodium paniculatum	Panicled Tick-Trefoil	6.9%	6.0%	Perennial		■									
Elymus canadensis	Canada Wildrye	10.1%	5.0%	Perennial											
Heliopsis helianthoides	Smooth Oxeye	15.8%	8.0%	Perennial											
Lespedeza capitata	Round-head Bush-Clover	10.6%	8.0%	Perennial		■									
Monarda punctata	Spotted Bee-balm	1.3%	8.0%	Perennial											
Penstemon digitalis	Tall White Beard-Tongue	4.6%	8.0%	Perennial											
Pycnanthemum tenuifolium	Narrow-leaf Mountain Mint	0.4%	8.0%	Perennial											
Rudbeckia hirta	Black-eyed Susan	0.7%	5.0%	Biennial											
Schizachyrium scoparium	Little Bluestem	8.0%	5.0%	Perennial											
Senna marilandica	Maryland Senna	11.2%	1.0%	Perennial		■									
Solidago juncea	Early Goldenrod	0.5%	5.0%	Perennial											
Solidago nemoralis	Gray Goldenrod	1.1%	5.0%	Perennial											
Symphyotrichum laeve var. *laeve*	Smooth Blue Aster	1.4%	6.0%	Perennial											
Symphyotrichum pilosum	White Oldfield Aster	2.0%	6.0%	Perennial											
Tridens flavus	Purpletop	2.5%	5.0%	Perennial											

Seeds per Square Foot: 30
Pounds of Pure Live Seed (PLS) per Acre: 5.5*

Monarch Larval Food Source: 3%** ☑
Monarch Nectar Source: 60%** ☑

Grasses by Seed: 15%
Forbs by Seed: 85%

Mix 15 Notes: Use all species listed. Substitutions: Use Tables 2.3 and 2.4 (Forb Mix column) to select substitute species for grasses and wildflowers, respectively. To the extent possible, select substitute species based on occurrence, adaptation, and bloom period. Recommended substitute grass species are *Andropogon virginicus* (Broomsedge), *Dicanthelium clandestinum* (Deertongue), and *Sorghastrum nutans* (Indiangrass).

* Seeding rates are subject to change when substitute species are used, or when species are removed from the mix.

** This mix meets habitat requirement thresholds for monarch butterflies: the larval food source is ≥1.5% and the nectar source is ≥60%.

TABLE 2.2: Permanent Upland Herbaceous Cover Mixes: Low - Medium Density (Conservation Cover)

16. High Diversity Native Grass/Forb Mix for Mesic Sites
This mix has a predominant wildflower component for optimum wildlife and pollinator habitat.

Scientific Name	Common Name	% by Weight	% by Seed	Duration	Grass/ Forb	Legume	Flowering Period and Flower Color								
							M	A	M	J	J	A	S	O	N
Andropogon virginicus	Broomsedge	1.1%	4.0%	Perennial	♈										
Asclepias syriaca	Common Milkweed	6.0%	2.0%	Perennial	❁										
Chamaecrista fasciculata	Partridge Pea	6.5%	2.0%	Annual	❁	■									
Coreopsis lanceolata	Lanceleaf Tickseed	6.7%	7.0%	Perennial	❁										
Desmodium canadense	Showy Tick Trefoil	20.4%	7.0%	Perennial	❁	■									
Doellingeria umbellata var. *umbellata*	Flat-topped White Aster	0.8%	3.0%	Perennial	❁										
Elymus virginicus	Virginia Wildrye	6.3%	3.0%	Perennial	♈										
Eutrochium purpureum	Sweet-scented Joe-Pyeweed	1.6%	5.0%	Perennial	❁										
Helenium flexuosum	Purple Sneezeweed	1.0%	9.0%	Perennial	❁										
Heliopsis helianthoides	Smooth Oxeye	16.3%	9.0%	Perennial	❁										
Lespedeza capitata	Round-head Bush-Clover	10.9%	9.0%	Perennial	❁	■									
Monarda fistulosa	Wild Bergamot	1.5%	9.0%	Perennial	❁										
Penstemon digitalis	Tall White Beard-Tongue	4.8%	9.0%	Perennial	❁										
Rudbeckia hirta	Black-eyed Susan	0.7%	5.0%	Biennial	❁										
Senna hebecarpa	American Senna	10.3%	1.0%	Perennial	❁	■									
Solidago nemoralis	Gray Goldenrod	1.0%	5.0%	Perennial	❁										
Symphyotrichum oblongifolium	Aromatic Aster	1.8%	6.0%	Perennial	❁										
Tridens flavus	Purpletop	2.3%	5.0%	Perennial	♈										

Seeds per Square Foot: 30
Pounds of Pure Live Seed (PLS) per Acre: 6.0*

Monarch Larval Food Source: 2%** ☑
Monarch Nectar Source: 60%** ☑
Grasses by Seed: 12%
Forbs by Seed: 88%

Mix 16 Notes: Use all species listed. Substitutions: Use Tables 2.3 and 2.4 (Forb Mix column) to select substitute species for grasses and wildflowers, respectively. To the extent possible, select substitute species based on occurrence, adaptation, and bloom period. Recommended substitute grass species are *Eragrostis spectabilis* (Purple Lovegrass) and *Tridens flavus* (Purpletop). *Schizachyrium scoparium* (Little Bluestem) may be used as a substitute on mesic sites that are well-drained.

* Seeding rates are subject to change when substitute species are used, or when species are removed from the mix.

** This mix meets habitat requirement thresholds for monarch butterflies: the larval food source is ≥1.5% and the nectar source is ≥60%.

TABLE 2.2: Permanent Upland Herbaceous Cover Mixes: Low - Medium Density (Conservation Cover)

17. High Diversity Native Grass/Forb Mix for Wet Sites
This mix has a predominant wildflower component for optimum wildlife and pollinator habitat.

Scientific Name	Common Name	% by Weight	% by Seed	Duration	Grass/ Forb	Legume	Flowering Period and Flower Color								
							M	A	M	J	J	A	S	O	N
Asclepias incarnata	Swamp Milkweed	15.6%	3.0%	Perennial											
Bidens cernua	Nodding Bur Marigold	8.4%	3.0%	Annual											
Bidens frondosa	Beggar Ticks	9.1%	2.0%	Annual											
Carex vulpinoidea	Fox Sedge	1.4%	5.0%	Perennial											
Doellingeria umbellata var. *umbellata*	Flat-topped White Aster	2.7%	6.0%	Perennial											
Elymus virginicus	Virginia Wildrye	18.1%	5.0%	Perennial											
Eupatorium perfoliatum	Boneset	0.9%	7.0%	Perennial											
Eutrochium fistulosum	Joe-Pye Weed	1.3%	7.0%	Perennial											
Helenium autumnale	Yellow Sneezeweed	1.7%	7.0%	Perennial											
Helianthus angustifolius	Swamp Sunflower	3.6%	5.0%	Perennial											
Mimulus ringens	Square-stemmed Monkeyflower	0.1%	6.0%	Perennial											
Panicum rigidulum	Redtop Panicgrass	3.2%	7.0%	Perennial											
Pycnanthemum tenuifolium	Narrow-leaf Mountain Mint	0.6%	7.0%	Perennial											
Senna hebecarpa	American Senna	17.7%	1.0%	Perennial		■									
Symphyotrichum lateriflorum var. *lateriflorum*	Calico Aster	2.9%	6.0%	Perennial											
Symphyotrichum novae-angliae	New England Aster	2.0%	6.0%	Perennial											
Tradescantia virginiana	Virginia Spiderwort	0.6%	3.0%	Perennial											
Verbena hastata	Blue (Swamp) Vervain	1.7%	7.0%	Biennial											
Vernonia noveboracensis	New York Ironweed	8.5%	7.0%	Perennial											

Seeds per Square Foot: 30
Pounds of Pure Live Seed (PLS) per Acre: 3.5*

Monarch Larval Food Source: 3%** ☑ **Grasses/Sedges by Seed: 17%**
Monarch Nectar Source: 71%** ☑ **Forbs by Seed: 83%**

Mix 17 Notes: Use all species listed. Substitutions: Use Tables 2.3 and 2.4 (Forb Mix column) to select substitute species for grasses and wildflowers, respectively. To the extent possible, select substitute species based on occurrence, adaptation, and bloom period. Recommended substitute grass species are *Chasmanthium laxum* (Slender Woodoats), *Elymus riparius* (Riverbank Wildrye), *Panicum anceps* (Beaked Panicgrass), and *Glyceria striata* (Fowl Mannagrass). Recommended substitute sedge species are *Carex lupulina* (Hop Sedge) and *Carex lurida* (Lurid Sedge). On drier sites, substitute *Chasmanthium latifolium* (River Oats), *Chasmanthium laxum (Slender Woodoats),* or *Elymus riparius* (Riverbank Wildrye) for *Carex vulpinoidea* (Fox Sedge).

* Seeding rates are subject to change when substitute species are used, or when species are removed from the mix.

** This mix meets habitat requirement thresholds for monarch butterflies: the larval food source is ≥1.5% and the nectar source is ≥60%.

TABLE 2.2: Permanent Upland Herbaceous Cover Mixes: Low - Medium Density (Conservation Cover)

18. Short Native Grass/Forb Mix for Shady Mesic Sites
This mix consists of species that generally are 3 feet tall or less, and provide wildlife and pollinator habitat in part shade (3 to 6 hours of direct sunlight per day).

Scientific Name	Common Name	% by Weight	% by Seed	Duration	Grass/ Forb	Legume	Flowering Period and Flower Color								
							M	A	M	J	J	A	S	O	N
Andropogon virginicus	Broomsedge	2.0%	6.0%	Perennial	♈										
Chamaecrista fasciculata	Partridge Pea	8.2%	2.0%	Annual	❁	■									
Chasmanthium laxum	Slender Woodoats	18.7%	6.0%	Perennial	♈										
Conoclinium coelestinum	Mistflower	1.4%	8.0%	Perennial	❁										
Coreopsis tinctoria	Golden Tickseed	0.7%	8.0%	Annual	❁										
Desmodium canadense	Showy Tick Trefoil	25.6%	7.0%	Perennial	❁	■									
Elymus virginicus	Virginia Wildrye	15.9%	6.0%	Perennial	♈										
Monarda fistulosa	Wild Bergamot	1.7%	8.0%	Perennial	❁										
Panicum anceps	Beaked Panicgrass	3.3%	7.0%	Perennial	♈										
Penstemon digitalis	Tall White Beard-tongue	5.3%	8.0%	Perennial	❁										
Pycnanthemum tenuifolium	Narrow-leaf Mountain Mint	0.5%	8.0%	Perennial	❁										
Symphyotrichum lateriflorum var. *lateriflorum*	Calico Aster	2.1%	6.0%	Perennial	❁										
Symphyotrichum pilosum	White Oldfield Aster	2.7%	7.0%	Perennial	❁										
Tradescantia virginiana	Virginia Spiderwort	0.9%	6.0%	Perennial	❁										
Zizia aurea	Golden Alexanders	11.0%	7.0%	Perennial	❁										

Seeds per Square Foot: 30
Pounds of Pure Live Seed (PLS) per Acre: 5.0*

Monarch Larval Food Source: 0% ☐
Monarch Nectar Source: 45% ☐

Grasses by Seed: 25%
Forbs by Seed: 75%

Mix 18 Notes: This mix was designed for drained hydric soils on the Coastal Plain but may be used elsewhere in Maryland under appropriate conditions. Use all species listed. Substitutions: Use Tables 2.3 and 2.4 (Forb Mix column) to select substitute species for grasses and wildflowers, respectively. To the extent possible, select substitute species based on occurrence, adaptation, and bloom period. In the Mountains and Piedmont, substitute *Chasmanthium latifolium* (River Oats) for *Chasmanthium laxum* (Slender Woodoats), which is a Coastal Plain species.

* Seeding rates are subject to change when substitute species are used, or when species are removed from the mix.

** This mix does not meet habitat requirements for monarch butterflies because the larval food source is 0% (no milkweed) and the nectar source is only 45% (not at least 60%).

TABLE 2.2 NOTES:

1. **Mix:** Where “OR” is shown, select from one of the two species or mixes separated by “OR” based on site conditions and desirability.

2. **Seeding Rate:** Seeding rates for the native grasses, sedges, legumes, and other wildflowers are in pounds of Pure Live Seed (PLS). Order seed from the supplier based on the PLS rate; the seed supplier will adjust the bulk amount to be planted based on percent seed germination and purity, as tested.

   Adjustments are not usually needed for the introduced grasses and legumes. However, be aware that some seed may be polymer-coated. This coating can double the weight of the seed, so that a bag of seed may contain only 50% seed by weight (e.g., a 10-pound bag of grass seed may contain only 5 pounds of seed, with the other 5 pounds consisting of the polymer coating). Be sure to read the seed analysis label when purchasing seed, and adjust the per acre weight to be planted accordingly.

   Legume seeds shall be inoculated before planting with the appropriate *Rhizobium* bacteria. When feasible, hard-seeded legumes should be scarified to improve germination.

   When a seeding rate is expressed as a range (i.e., 4 - 6), the lower rate should be used if erosion is not a concern. Where erosion is a concern, use the higher seeding rate and add one of the following nurse crops with the selected mix: 20 - 40 lbs/ac of oats or barley. This can be planted with the selected mix at the time of seeding. If using a conservation tillage method, plant the small grain as a cover crop in the fall, mow in early spring, and drill the permanent planting into the remaining stubble. Do not use cereal rye as a nurse crop. It has allelopathic properties that inhibit the germination and growth of other plants.

   Oats are the recommended nurse crop for warm-season grasses.

3. The **Plant Hardiness Zones** designate where a species can be successfully planted in Maryland, while the geographic distribution describes where the species usually occurs under natural conditions.

4. **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; VP - Very Poorly Drained.

5. **Native Species:** The term "native" refers to species that occur naturally in one or more geographic regions of Maryland. Native mixes may include non-native nurse crops (which are short-lived) for site stabilization during establishment of the permanent planting.

TABLE 2.3: Selected List of Native Grasses and Grass-like Plants

Scientific Name	Region [1]			Soil Drainage Class [2]	Moisture [3]			Wetland AGCP EMP [4]	Est. Seeds/lb	PLS Lbs/Ac [5]		Height	Drought Tolerant	Shade Tolerant	Remarks
	M	P	CP		D	M	W			Grass Mix	Forb Mix				
WARM-SEASON GRASSES															
Andropogon gerardii Big Bluestem	■	■	■	E - SP	■	■		FAC FAC	144,000	2.5	0.3	5 - 8	■		One of the taller species. Can be aggressive.
Andropogon glomeratus Bushy Broomsedge	■	■	■	SP - P			■	FACW FACW	800,000	0.4	0.05	1½ - 3			Often volunteers in wet, idle crop fields in association with *Andropogon virginicus*.
Andropogon ternarius Splitbeard Bluestem			■	E - SP	■	■		FACU FACU	216,000	1.5	0.2	1½ - 3	■		Blooms earlier than other bluestem species. Highly drought tolerant.
Andropogon virginicus Broomsedge	■	■	■	E - SP	■	■		FAC FACU	800,000	0.4	0.05	1½ - 3	■		Often volunteers in idle crop fields with low fertility and low pH.
Dichanthelium clandestinum Deertongue	■	■	■	E - SP	■	■		FACW FAC	350,000	1	0.1	1½ - 3	■		Tolerates a wide range of site conditions. Tendency to fall over.
Eragrostis spectabilis Purple Lovegrass	■	■	■	MW - SP	■	■		FACU UPL	1,059,100	0.3	0.04	1 - 3	■		Prefers sandy sites. Seed is extremely small.
Panicum amarum Coastal Panicgrass			■	E - SP	■	■		FAC FACU	325,000	1	0.15	3 - 6	■		Similar to *Panicum virgatum*, but with a closed panicle. Found naturally on dunes and sandy, droughty sites. Can be aggressive.
Panicum anceps Beaked Panicgrass	■	■	■	SP - P			■	FAC FAC	570,000	0.6	0.08	2 - 4			Spreads from short rhizomes to form dense clumps. Prefers some shade. Use Maryland ecotype.
Panicum rigidulum Redtop Panicgrass	■	■	■	SP - VP			■	FACW FACW	800,000	0.4	0.05	2 - 3			Prefers wet sites. Seed is extremely small, so seeding rate should be proportionally smaller in a mix.
Panicum virgatum Switchgrass	■	■	■	E - VP	■	■	■	FAC FAC	259,000	1.5	0.15	4 - 6	■		Common native species that has been cultivated for wildlife, biomass, and erosion control. Can be aggressive. Site adaptability varies with cultivar.
Panicum virgatum Switchgrass 'Cave-in-Rock'	■	■	■	W - P		■	■		259,000	1.5	0.15		■		Midwestern variety with high biomass production.
Panicum virgatum Switchgrass 'Kanlow'		■	■	SP - VP			■		259,000	1.5	0.15				Midwestern plains variety. Adapted to wet soils.
Panicum virgatum Switchgrass 'Shelter'	■	■	■	E - SP	■	■			259,000	1.5	0.15		■		Northeast variety selected for its stiff stems, which allow it to remain standing under snow loads and provide winter cover.
Paspalum floridanum Florida paspalum			■	W - P	■	■	■	FACW FACW	259,000	1.5	0.15	3 - 5			Tolerates a wide range of soils. Relatively large seeds are used by wildlife. Deteriorates rapidly after maturity

TABLE 2.3: Selected List of Native Grasses and Grass-like Plants

Scientific Name	Region [1]			Soil Drainage Class [2]	Moisture [3]			Wetland AGCP EMP [4]	Est. Seeds/lb	PLS Lbs/Ac [5]		Height	Drought Tolerant	Shade Tolerant	Remarks
	M	P	CP		D	M	W			Grass Mix	Forb Mix				
WARM-SEASON GRASSES (cont'd)															
Schizachyrium scoparium Little Bluestem	■	■	■	E - W	■			FACU FACU	144,000	2.5	0.3	2 - 3	■		Prefers dry sites. Similar in appearance to *Andropogon virginicus*.
Sorghastrum nutans Indiangrass	■	■	■	E - SP	■	■		FACU FACU	175,000	2	0.25	4 - 6	■		May be somewhat aggressive on sites with normal moisture or fertility. Golden flower panicle is very attractive.
Tridens flavus Purpletop	■	■	■	E - SP	■	■		FACU FACU	465,000	0.7	0.09	3 - 4	■		Best suited for dry, sandy areas or sites with shallow soils.
Tripsacum dactyloides Eastern Gamagrass	■	■	■	W - P		■	■	FAC FACW	7,000	10	1	3 - 5			Can be found on roadsides in both dry and wet locations. A distant relative to corn, it has large seeds that can be planted with a conventional drill. Planted as a forage crop.
COOL-SEASON GRASSES															
Agrostis scabra Rough Bentgrass	■	■	■	W - P		■	■	FAC FAC	5,000,000	0.07	0.009	2 - 3			Short-lived, perennial bunchgrass. Can be used for quick cover on disturbed areas.
Chasmanthium latifolium River Oats	■	■		W - SP		■	■	FAC FACU	85,000	4	0.5	2 - 4		■	Can be used for soil erosion control in shaded areas and along streams. Flood tolerant. Attractive seed heads.
Chasmanthium laxum Slender Woodoats			■	MW - SP		■	■	FACW FAC	85,000	4	0.5	2 - 3	■	■	Shade tolerant. Can be used in riparian areas and floodplains.
Cinna arundinacea Wood Reedgrass	■	■	■	MW - P		■	■	FACW FACW	1,300,000	0.25	0.03	3 - 5		■	Found in shaded riparian areas and forested wetlands.
Elymus canadensis Canada Wildrye	■	■	■	E - MW	■			FAC FACU	114,000	3	0.4	3 - 4	■	■	Prefers partial shade. Seedlings establish quickly, but are not highly competitive with other grasses. Not compatible with prescribed burning.
Elymus histrix Bottlebrush Grass	■	■	■	W - SP		■		UPL UPL	75,000	4.5	0.6	2 - 4		■	A woodland grass with a conspicuous panicle.
Elymus riparius Riverbank Wildrye	■	■	■	MW - P		■	■	FACW FACW	125,000	2.5	0.35	3 - 5		■	Shade tolerant. Occurs on stream banks and in forested wetlands. Used for soil stabilization.
Elymus virginicus Virginia Wildrye	■	■	■	MW - P		■	■	FAC FACW	100,000	3.5	0.45	3 - 4		■	See remarks for *Elymus canadensis*. Prefers moist sites.
Poa palustris Fowl Meadowgrass	■	■	■	SP - P			■	FAC FACW	1,900,000	0.15	0.02	2 - 4			A native bluegrass of wet meadows.

TABLE 2.3: Selected List of Native Grasses and Grass-like Plants

Scientific Name	Region [1]			Soil Drainage Class [2]	Moisture [3]			Wetland AGCP EMP [4]	Est. Seeds/lb	PLS Lbs/Ac [5]		Height	Drought Tolerant	Shade Tolerant	Remarks
	M	P	CP		D	M	W			Grass Mix	Forb Mix				
GRASS-LIKE WETLAND OBLIGATE PLANTS															
Carex lupulina Hop Sedge	■	■	■	P - VP		■		OBL OBL	94,700	3.5	0.45	1½ - 3		■	Obligate wetland sedge. Provides food and cover for wildlife. MD ecotype available.
Carex lurida Lurid Sedge	■	■	■	P - VP		■		OBL OBL	250,000	1.5	0.15	1 - 3			Obligate wetland sedge. Provides food and cover for wildlife.
Carex vulpinoidea Fox Sedge	■	■	■	P - VP		■		FACW OBL	1,300,000	0.25	0.03	1½ - 3			Provides food and cover for wildlife. Can be aggressive. Seed is extremely small.
Glyceria canadensis *Rattlesnake Grass*	■	■		SP - VP		■		OBL OBL	1,184,000	0.3	0.04	2 - 3			Obligate wetland bunchgrass found in marshes and swamps.
Glyceria striata *Fowl Mannagrass*	■	■	■	SP - VP		■		OBL OBL	1,540,000	0.2	0.03	3 - 5		■	Obligate wetland bunchgrass found in forests and marshes.
Schoenoplectus tabernaemontani Softstem Bulrush	■	■	■	P - VP		■		OBL OBL	496,000	0.65	0.09	5 - 10			Provides food and cover for wildlife. Found in and around the edges of waterbodies, including flooded wetlands.
Scirpus cyperinus Woolgrass	■	■	■	P - VP		■		OBL OBL	36,000,000	0.009	0.001	4 - 5			A tall, bunch type sedge of wet meadows and marshes.
Sparganium americanum Eastern Bur Reed	■	■	■	P - VP		■		OBL OBL	50,000	6.5	0.85	2½ - 3			An herbaceous emergent aquatic plant with distinct ball-like seed heads.

TABLE 2.3 NOTES:

1. **Region:** The physiographic region where the species usually occurs in Maryland, under natural conditions. M - Mountains, Ridge & Valley, Allegheny Plateau; P - Piedmont; CP - Coastal Plain.

2. **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; VP - Very Poorly Drained.

3. **Moisture:** The amount of moisture the species needs or tolerates. D - Dry (excessively drained to well-drained soil); M - Mesic (moderately well to somewhat poorly drained soil); W – Wet (poorly to very poorly drained soil).

4. **Wetland:** Wetland indicator status for the Atlantic and Gulf Coastal Plain (AGCP) and Eastern Mountains and Piedmont (EMP).

5. **PLS Lbs/Ac:** The value listed is the seeding rate in pure live seed (PLS) for the individual species within a Grasses with Wildflowers mix (a predominantly grass planting; column header “Grass Mix”) and a Wildflower Meadow mix (a predominantly wildflower planting; column header “Forb Mix”). Rates are based 30 PLS/SF with 3 spp grass and 5 spp forbs at a 75:25 ratio in the Grass Mix, and 30 PLS/SF with 3 spp grass and 10 spp forbs at 10:90 in the Forb Mix.

TABLE 2.4: Selected List of Native Wildflowers and Legumes

Scientific Name	Common Name	Region [1]			Duration [2]	Moisture [3]			Wetland [4]		Est. Seeds/Lb	PLS Lbs/Ac [5]		Traits [6]	Flowering Period and Flower Color								
		M	P	CP		D	M	W	AGCP	EMP		Grass Mix	Forb Mix		M	A	M	J	J	A	S	O	N
Asclepias incarnata	Swamp Milkweed	■	■	■	P			■	OBL	OBL	70,000	0.45	1.5	T									
Asclepias syriaca	Common Milkweed	■	■	■	P	■	■		UPL	FACU	70,000	0.45	1.5	T									
Asclepias tuberosa	Butterfly Milkweed	■	■	■	P	■	■		NI	NI	70,000	0.45	1.5	D,T									
Baptisia tinctoria	Yellow False Indigo	■	■	■	P	■	■		NI	NI	300,000	0.1	0.4	D,T									
Bidens aristosa	Bur Marigold			■	A			■	FACW	FACW	130,000	0.25	0.9										
Bidens cernua	Nodding Bur Marigold	■	■	■	A			■	OBL	OBL	130,000	0.25	0.9										
Bidens frondosa	Beggar Ticks	■	■	■	A			■	FACW	FACW	80,000	0.4	1.5										
Caltha palustris	Marsh Marigold	■	■	■	P			■	OBL	OBL	554,000	0.06	0.2										
Chamaecrista fasciculata	Partridge Pea	■	■	■	A	■	■		FACU	FACU	65,000	0.25	1	T									
Chelone glabra	White Turtlehead	■	■	■	P			■	OBL	OBL	1,472,000	0.02	0.08	S									
Conoclinium coelestinum	Mistflower		■	■	P		■	■	FAC	FAC	1,500,000	0.02	0.08	A									
Coreopsis lanceolata	Lanceleaf Tickseed				P		■		UPL	FACU	221,000	0.15	0.55										
Coreopsis tinctoria	Golden Tickseed	■	■	■	A		■		FAC	FAC	3,222,222	0.01	0.04										
Coreopsis verticillata	Whorled Tickseed	■	■	■	P	■	■		NI	NI	200,000	0.15	0.6	D									
Desmodium canadense	Showy Tick-Trefoil		■		P		■		FAC	FAC	72,500	0.45	1.5	T									
Desmodium paniculatum	Panicled Tick-Trefoil	■	■	■	P	■	■		FACU	FACU	200,000	0.15	0.6	D,T									
Doellingeria umbellata var. *umbellata*	Flat-topped White Aster	■	■	■	P		■	■	FACW	FACW	800,000	0.04	0.15										
Echinacea purpurea	Purple Coneflower				P		■		NI	NI	116,000	0.3	1										
Eupatorium perfoliatum	Boneset	■	■	■	P			■	FACW	FACW	2,800,000	0.01	0.04	S									
Euthamia graminifolia	Grass-leaved Goldenrod	■	■	■	P	■	■	■	FAC	FAC	5,600,000	0.006	0.02	A,D									
Eutrochium dubium	Coastal Plain Joe-Pye Weed		■	■	P		■	■	FACW	FACW	2,000,000	0.02	0.06										
Eutrochium fistulosum	Joe-Pye Weed	■	■	■	P		■	■	FACW	FACW	2,000,000	0.02	0.06	S									
Eutrochium purpureum	Sweet-scented Joe-Pye Weed	■	■	■	P		■	■	FAC	FAC	672,000	0.05	0.2										
Helenium autumnale	Yellow Sneezeweed	■	■	■	P		■	■	FACW	FACW	1,464,000	0.02	0.08	T									
Helenium flexuosum	Purple Sneezeweed	■	■	■	P		■		FACW	FAC	2,000,000	0.02	0.06	T									
Helianthus angustifolius	Swamp Sunflower			■	P		■	■	FACW	FACW	500,000	0.07	0.25										

TABLE 2.4: Selected List of Native Wildflowers and Legumes

Scientific Name	Common Name	Region [1/]			Duration [2/]	Moisture [3/]			Wetland [4/]		Est. Seeds/Lb	PLS Lbs/Ac [5/]		Traits [6/]	Flowering Period and Flower Color								
		M	P	CP		D	M	W	AGCP	EMP		Grass Mix	Forb Mix		M	A	M	J	J	A	S	O	N
Heliopsis helianthoides	Smooth Oxeye		■	■	P	■	■		UPL	FACU	116,410	0.3	1										
Lespedeza capitata	Round-head Bush-Clover		■	■	P	■	■		FACU	FACU	174,000	0.2	0.7	D,T									
Lespedeza hirta	Hairy Bush-Clover	■	■	■	P	■	■		NI	NI	175,000	0.2	0.65	D,T									
Liatris pilosa	Grass-leaf Blazing Star		■	■	P	■	■		NI	NI	290,000	0.1	0.4	D									
Liatris scariosa	Large Blazing Star	■	■	■	P		■		UPL	FACU	100,000	0.35	1										
Lobelia cardinalis	Cardinal Flower	■	■	■	P			■	FACW	FACW	11,292,758	0.003	0.01	S									
Lobelia siphilitica	Blue Lobelia	■	■		P			■	OBL	FACW	8,000,000	0.004	0.01	S									
Mimulus ringens	Square-stemmed Monkeyflower	■	■	■	P			■	OBL	OBL	22,900,000	0.001	0.005										
Monarda didyma	Scarlet Bee-balm	■			P		■	■	FAC	FAC	1,272,500	0.03	0.09	S									
Monarda fistulosa	Wild Bergamot	■	■	■	P		■		FACU	UPL	1,272,500	0.03	0.09	S									
Monarda punctata	Spotted Bee-balm	■	■	■	P	■	■		FACU	UPL	1,440,000	0.02	0.08										
Penstemon canescens	Gray Beard-tongue	■	■		P	■			NI	NI	400,000	0.08	0.3										
Penstemon digitalis	Tall White Beard-tongue	■	■	■	P	■	■		FAC	FAC	400,000	0.08	0.3	D,S									
Pycnanthemum incanum	Hoary Mountain Mint	■	■	■	P	■	■		NI	NI	4,500,000	0.007	0.03	S									
Pycnanthemum muticum	Big-leaf Mountain Mint			■	P	■	■	■	FAC	FAC	4,500,000	0.007	0.03	S									
Pycnanthemum tenuifolium	Narrow-leaf Mountain Mint	■	■	■	P	■	■	■	FACW	FACW	4,500,000	0.007	0.03	A,S									
Rudbeckia fulgida var. *fulgida*	Orange Coneflower		■	■	P		■		FAC	FAC	500,000	0.07	0.25										
Rudbeckia hirta	Black-eyed Susan	■	■	■	B	■	■		FACU	FACU	1,575,760	0.02	0.07	D									
Rudbeckia triloba	Brown-eyed Susan	■	■	■	P		■		FACU	FACU	536,000	0.06	0.2										
Senna hebecarpa	American Senna	■	■	■	P		■	■	FAC	FAC	20,500	0.25	1	T									
Senna marilandica	Maryland Senna	■	■	■	P	■	■		FAC	FAC	20,500	0.25	1	D,T									
Silphium perfoliatum	Cup Plant	■	■		P		■		FAC	FAC	100,000	0.35	1	A									
Solidago juncea	Early Goldenrod	■	■	■	P	■	■		NI	NI	2,500,000	0.01	0.05	D									
Solidago nemoralis	Gray Goldenrod	■	■	■	P	■	■		NI	NI	1,008,000	0.03	0.1	D									
Solidago patula	Rough-leaved Goldenrod		■		P			■	OBL	OBL	700,000	0.05	0.15										
Solidago rugosa	Wrinkle-leaf Goldenrod	■	■	■	P	■	■		FAC	FAC	1,000,000	0.03	0.1	A,D									
Symphyotrichum ericoides	White Heath Aster	■	■		P	■	■		UPL	FACU	700,000	0.05	0.15										

TABLE 2.4: Selected List of Native Wildflowers and Legumes

Scientific Name	Common Name	Region [1]			Dur [2]	Moisture [3]			Wetland [4]		Est. Seeds/Lb	PLS Lbs/Ac [5]		Traits [6]	Flowering Period and Flower Color							
		M	P	CP		D	M	W	AGCP	EMP		Grass Mix	Forb Mix		M	A	M	J	J	A	S	O	N
Symphyotrichum laeve var. *laeve*	Smooth Blue Aster	■	■	■	P	■	■		UPL	FACU	1,014,000	0.03	0.1	D									
Symphyotrichum lateriflorum var. *lateriflorum*	Calico Aster	■	■	■	P		■	■	FAC	FACW	750,000	0.04	0.15	D									
Symphyotrichum novae-angliae	New England Aster	■	■	■	P		■	■	FACW	FACW	1,100,000	0.03	0.1										
Symphyotrichum novi-belgii	New York Aster		■	■	P			■	OBL	FACW	700,000	0.05	0.15										
Symphyotrichum oblongifolium	Aromatic Aster	■	■		P	■	■		NI	NI	700,000	0.05	0.15										
Symphyotrichum pilosum	White Oldfield Aster	■	■	■	P	■	■		FAC	FAC	700,000	0.05	0.15	D									
Symphyotrichum prenanthoides	Zigzag Aster	■	■		P		■		FAC	FAC	700,000	0.05	0.15	D									
Symphyotrichum puniceum	Purple-stemmed Aster	■	■	■	P			■	OBL	OBL	700,000	0.05	0.15										
Symphyotrichum urophyllum	White Arrowleaf Aster	■	■	■	P	■	■		NI	NI	700,000	0.05	0.15										
Thalictrum pubescens	Tall Meadow Rue	■	■	■	P		■	■	FACW	FACW	192,000	0.15	0.6	S									
Tradescantia ohiensis	Ohio Spiderwort	■	■	■	P		■		FAC	FAC	1,750,000	0.02	0.07	S									
Tradescantia virginiana	Virginia Spiderwort	■	■	■	P	■	■	■	FAC	FACU	1,750,000	0.02	0.07	D,S									
Verbena hastata	Blue (Swamp) Vervain	■	■	■	P			■	FAC	FACW	1,500,000	0.02	0.08										
Vernonia noveboracensis	New York Ironweed	■	■	■	P		■	■	FACW	FACW	300,000	0.1	0.4	S									
Veronicastrum virginicum	Culver's Root	■	■		P		■	■	FACW	FACU	7,800,000	0.004	0.02										
Zizia aurea	Golden Alexanders	■	■	■	P		■		FAC	FAC	168,400	0.2	0.7	S									

TABLE 2.4 NOTES:

1. **Region:** The physiographic region where the species usually occurs in Maryland, under natural conditions. M - Mountains, Ridge & Valley, Allegheny Plateau; P - Piedmont; CP - Coastal Plain.
2. **Dur (Duration):** A – Annual; B – Biennial; P – Perennial.
3. **Moisture:** The amount of moisture the species needs or tolerates. D - Dry (excessively drained to well-drained soil); M - Mesic (moderately well to somewhat poorly drained soil); W – Wet (poorly to very poorly drained soil).
4. **Wetland:** Wetland indicator status for the Atlantic and Gulf Coastal Plain (AGCP) and Eastern Mountains and Piedmont (EMP).
5. **PLS Lbs/Ac:** The value listed is the seeding rate in pure live seed (PLS) for the individual species within a Grasses with Wildflowers mix (a predominantly grass planting; column header “Grass Mix”) and a Wildflower Meadow mix (a predominantly wildflower planting; column header “Forb Mix”). Rates are based 30 PLS/SF with 3 spp grass and 5 spp forbs at a 75:25 ratio in the Grass Mix, and 30 PLS/SF with 3 spp grass and 10 spp forbs at 10:90 in the Forb Mix.
6. **Traits:** A - Can be aggressive; D - Drought tolerant; S - Shade tolerant; T - Potential toxicity to livestock.

SECTION 3 - UPLAND HERBACEOUS CONSERVATION PLANTINGS: HIGH DENSITY (CRITICAL AREA PLANTINGS)

This section contains recommended seed mixes for temporary and permanent herbaceous cover with high plant density. These critical area planting mixes are designed to provide cover that establishes relatively quickly and is very durable. These mixes are typically used on sites that have, or are expected to have, high erosion rates, and on sites with limiting factors that make plants especially difficult to establish (e.g., on construction sites) and/or maintain (e.g., on heavily used areas). Plantings are generally not harvested, hayed, or grazed for agricultural production.

The following specifications supplement the applicable conservation practice standards (see Section 1, Table 1.1), and contain additional criteria for species selection, planting rates, establishment methods, and care in handling and planting of the seed or planting stock.

Specifications for Selecting Mixes

Refer to Table 3.1 for recommended annual species, seeding rates, and planting dates for temporary cover.

Refer to Table 3.2 to select appropriate permanent herbaceous cover mixes for specific purposes.

Refer to Table 3.3 for recommended permanent herbaceous cover mixes and seeding rates. Other herbaceous species that are native to Maryland, or are introduced and are non-invasive, may also be suitable.

Specifications for Establishing Plantings

Grading Plan. Develop a grading plan for installation of the practice based upon adequate topographic surveys and investigations. The plan will show the location, slope, cut, fill, and finish elevation of the surfaces to be graded. The plan will also include auxiliary practices for safe disposal of runoff water, slope stabilization, erosion control, and drainage. Where necessary, include practices such as waterways, ditches, diversions, grade stabilization structures, retaining walls, and subsurface drains.

Site Preparation. Timber, logs, brush, rocks, stumps, and vegetative matter that will interfere with the grading operation or affect the planned stability of fill areas shall be removed and disposed of according to the plan.

Strip and stockpile topsoil in amounts necessary to complete finish grading of all exposed areas requiring topsoil. Use a minimum 4-inch stripping depth, depending on the particular soil.

Fill material shall be free of brush, rubbish, timber, logs, stumps, and other vegetative matter in amounts that is detrimental to constructing stable fills.

All disturbed areas shall be left with a generally smooth finish and shall be protected from erosion.

Include provisions to safely conduct surface water to storm drains or suitable watercourses and to prevent surface runoff from damaging cut faces and fill slopes. In areas having a high water table, provide subsurface drainage to intercept seepage that would adversely affect slope stability, building foundations, or create undesirable wetness.

Protect adjoining properties from sedimentation associated with excavation and filling operations.

Do not place fill material adjacent to the bank of a stream or channel, unless provisions are made to protect the hydraulic, biological, aesthetic, and other environmental functions of the stream.

Soil Amendments. Use soil tests to determine the optimum recommendations for both lime and fertilizer. Soil analysis shall be performed by a soil testing laboratory that has been accredited by the North American Proficiency Testing Program. At a minimum, soil samples taken for nutrient and pH analysis shall be from the soil layer that will be used as the surface layer (top 4 to 6 inches) for seeding. Follow sampling procedures recommended by the laboratory.

Lime - Apply lime to achieve a soil pH of 6.0 if legumes will be included in a planting, and 5.5 if only grasses or woody plants will be used. Lime materials shall be ground agricultural limestone that contains at least 50% total oxides (calcium plus magnesium oxide). Hydrated lime may be substituted for agricultural lime, except in hydroseeding applications. Do not use burnt lime as a soil amendment.

Pulverized limestone shall be ground to such fineness that at least 50% will pass through a 100-mesh sieve and at least 98% will pass through a 20-mesh sieve. Apply pulverized limestone with a drop spreader when high winds will not interfere with uniform distribution of the material or cause nuisance dust. Pulverized limestone may also be used in a hydroseeding slurry.

Granular limestone shall be of such fineness that at least 30% will pass through a 100-mesh sieve, at least 50% through a 60-mesh sieve, and at least 98% through a 20-mesh sieve. Apply granular limestone with a drop or rotary spreader, but do not use it in a hydroseeding slurry.

Pelletized limestone, a product composed of pellets of pulverized limestone, shall be of a pellet type and size that is recommended by the manufacturer for use with turfgrass. The limestone used in the manufacture of the pelletized limestone product shall meet the minimum fineness requirements for pulverized limestone. Apply pelletized limestone with a drop or rotary spreader, or it may be used in a hydroseeding slurry.

When a soil test is not feasible, apply lime according to the rates specified as follows:

Soil Texture	**Maximum Rates for Limestone Application**	
	Tons/Acre	Lbs/1,000 SF
Clay, clay loam, and highly organic soil	3	135
Sandy loam, loam, silt loam	2	90
Loamy sand, sand	1	45

Limestone applied at rates greater than 50 pounds per 1,000 square feet (or greater than 1 ton per acre) shall be incorporated into the upper 4 to 6 inches of the soil. Limestone applied at lower rates may be incorporated or left on the soil surface.

Fertilizer - The use of commercial fertilizer and other forms of plant nutrients must be in compliance with Maryland nutrient management regulations, as applicable. Apply fertilizer to prepared seedbeds, as needed based on soil test results. Fertilizer applied without a soil test may result in an inefficient quantity of nutrients for plant establishment, or could result in overapplication of nutrients leading to potential water quality problems and excessive weed growth.

In circumstances when a site is likely to have low nutrient levels (e.g., on a construction site) and obtaining a soil test is not feasible, use the following maximum rates for starter fertilizer applications for grass-based plantings:

Species	**Maximum Rates for Starter Fertilizer Application***		
	N	P_2O_5	K_2O
Cool-Season Grass (CSG)	40 Lbs/Ac (0.9 Lb/1,000 SF)	80 Lbs/Ac (1.8 Lbs/1,000 SF)	80 Lbs/Ac (1.8 Lbs/1,000 SF)
CSG + Legumes	20 Lbs /Ac (0.45 Lb/1,000 SF)	80 Lbs/Ac (1.8 Lbs/1,000 SF)	80 Lbs/Ac (1.8 Lbs/1,000 SF)
Warm-Season Grass (WSG) or WSG/CSG Mixes	N/A	60 Lbs/Ac (1.4 Lbs/1,000 SF)	60 Lbs/Ac (1.4 Lbs/1,000 SF)
WSG/CSG Mixes + Legumes	N/A	60 Lbs/Ac (1.4 Lbs/1,000 SF)	60 Lbs/Ac (1.4 Lbs/1,000 SF)

*Note: Formulations of commercial starter fertilizers vary significantly (e.g., 10-18-10, 12-18-8, 18-24-12, 24-25-4). Depending on the nutrient content of the product and the manufacturer's recommendations, actual application rates, especially for P and K, will often be less the maximums listed above.

Starter fertilizer shall be applied at the time of seeding or up to 5 days after seeding. Unless otherwise specified by NRCS, 20-50% of total nitrogen shall be slow-release to provide nitrogen over a longer period of time and to reduce nitrogen leaching and runoff. Nitrogen is generally not recommended for use during the establishment of warm-season grass because it encourages increased weed competition.

All fertilizer shall be uniform in composition, free-flowing, and suitable for application by approved equipment. Fertilizers shall be delivered to the site fully labelled according to applicable state fertilizer laws and shall bear the name, trade name, or trademark and warranty of the producer.

Organic Amendments - Apply manure and compost at a rate based on a nutrient analysis of that material. Organic amendments to sites shall be recommended only after an evaluation of any potential water quality hazards. To the extent practical, incorporate organic amendments into the upper 4 to 6 inches of the soil with a disk, springtooth harrow, or other suitable equipment.

Topsoil. Strip and stockpile topsoil in amounts necessary to complete finish grading of all exposed areas requiring topsoil. Use a minimum 4-inch stripping depth, depending on the soil and site conditions.

Topsoil shall be added to a site when needed to improve the soil medium for plant establishment and growth, or when a sufficient amount was not available to stockpile. The use of topsoil shall be limited to slopes that are 2:1 or flatter.

Exposed soils shall be topsoiled if they have one or more of the following limiting factors:

1. Very shallow to bedrock or other restrictive layer (e.g., the subsoil is less than 6 inches deep).
2. Extremely acidic (pH less than 5.0).
3. Extremely salty (conductivity greater than 500 parts per million, or 4.0 millisiemens per centimeter).

Topsoil shall also be used when assurance of improved vegetative growth is desired.

Topsoil Quality - Topsoil shall be friable and loamy, free of debris, stones, or other materials larger than 1.5 inches in diameter. It shall be free of any known viable seeds or plant parts of noxious weeds or invasive plants.

Topsoil shall contain no toxic substance that may be harmful to plant growth. Soluble salts shall not be excessive (concentration greater than 500 parts per million).

A pH range of 5.5 to 7.5 is required. If pH is less than 5.5, apply lime and incorporate with the topsoil to achieve a soil pH of 6.0 if legumes will be included in a planting, and 5.5 if only grasses or woody plants will be used.

Topsoil hauled in from off-site shall have a minimum organic matter content of 1% by weight, based on soil test results.

Topsoil Application - Before spreading topsoil for final grade, test the pH of the exposed subsoil. If the subsoil is highly acidic (pH 5.0 or less), add ground agricultural limestone at the rate of 4 to 8 tons per acre (200 to 400 pounds per 1,000 square feet). Distribute the lime uniformly and work it into the subsoil as previously described in the section concerning Soil Amendments.

Immediately before spreading topsoil, loosen the subsoil by disking or scarifying to provide a good bond for the topsoil. Where the slope of the site is flatter than 3:1, loosen the subsoil to a minimum average depth of 2 inches. On steeper slopes (up to 2:1), loosen the subsoil to a depth of 0.5 to 1 inch, or use a bulldozer to track up and down slope to create horizontal check slots that will prevent topsoil from sliding down the slope.

Topsoil shall only be handled when it is dry enough to work (less than field capacity) without damaging soil structure. Do not spread topsoil when it is partly frozen or muddy or on frozen slopes covered with ice or snow.

Topsoil shall be uniformly applied and lightly compacted to a minimum thickness of 4 inches. Subsoil with a pH of 4.0 or less, or containing sufides, shall be covered with a minimum depth of 12 inches of topsoil.

Topsoil placed on slopes greater than 5% shall be promptly limed and fertilized (if needed), seeded, mulched, and tracked with suitable equipment.

Seedbed Preparation. Seedbed preparation shall be done when the soil is moist, but not wet. Apply lime, fertilizer, and other soil amendments evenly where needed on the site, as described in previous sections of these specifications. Either dry or wet application methods may be suitable.

Slopes Flatter Than 3:1 - Work the soil to a depth of 3 to 5 inches with a disk or similar equipment. Continue tillage until a reasonably uniform seedbed is prepared.

Slopes 3:1 or Steeper - Scarify the soil surface with a bulldozer, heavy chain, hand tools, or other equipment that will loosen the soil 0.5 to 1 inch deep. After the soil is loosened, do not work it completely smooth, but leave it in a somewhat roughened condition. Follow the general contour when making the final surface preparation.

Seed Quality and Treatment. All seed shall be labeled and meet the requirements of the Maryland State Seed Law. Refer to Table 3.4 for minimum germination and purity requirements. Seed shall have had a germination test within 12 months prior to the date of sowing. Use of certified seed is preferred. Keep seed cool and dry until planting.

Species with seed lots greater than 50% hard seed shall be dehulled and/or scarified and planted no later than 60 days after scarification.

Grasses that have fluffy seeds shall be planted using specially designed native seed drills. Alternatively, mechanically remove beards or awns from such seeds to facilitate movement through conventional seeding equipment.

Legume seeds shall be inoculated with the proper, viable *Rhizobium* bacteria before planting. Keep inoculant as cool as possible until use and do not use it later than the date indicated on the package. When hydroseeding, use four times the recommended inoculant rate.

Seeding Methods. Seed shall be applied uniformly by hand, cyclone seeder, drill, cultipacker-seeder, or hydroseeder. The preferred method of seeding is by drilling or cultipacker-seeder method because these methods optimize seed to soil contact.

Seeding operations shall be done on the contour to the extent feasible. When a uniform distribution of seed is especially important (e.g., on lawns and athletic fields) and slopes are not extremely steep, apply seed in two directions, each perpendicular to the other. Apply one-half the seeding rate in each direction.

Drill - Seed shall be planted by using a grass drill or cultipacker-type seeder. A grain drill may also be used if it can be calibrated to plant small seeds at the recommended planting rates. As previously noted, plant grasses with fluffy seeds by using a specially designed native seed drill. All drills shall have packer wheels, chains, or similar devices to close the seed slot and provide good seed to soil contact. Do not plant small-seeded grasses more than 1/4 to 1/2-inch deep.

Broadcast - Seed may be broadcast by using a cyclone or whirlwind seeder or by hand. If spread by hand, small or light-seeded species such as redtop or bluestem may be mixed with filler (e.g., sawdust, finely ground corn, or slightly moistened peat moss) to achieve an even distribution. Incorporate seed into the soil 1/8 to 1/4-inch deep by raking or dragging, cultipacking, or tracking with heavy machinery. Raked areas shall be rolled with a weighted roller to provide good seed to soil contact. Do not use broadcast seeding methods during windy conditions.

Hydroseeding - This method is best suited for steep, inaccessible areas where use of a drill or other mechanized equipment is not feasible. Hydroseeding may be performed in two separate operations, with a slurry of seed and fertilizer applied in the first pass and mulch applied in the second pass, or in one operation (sometimes referred to as “hydromulching”) to apply a slurry of fertilizer, seed, mulch, and tackifying agents. Do not use burnt or hydrated lime when hydroseeding. If legume inoculant is used, complete the seeding within 3 to 4 hours after slurry is mixed or add a fresh supply of inoculant to the mix. If feasible after seeding, track the area up and down slope with heavy machinery such as a bulldozer to improve seed to soil contact.

Temporary Seeding and Nurse Crops. When the period of soil exposure is more than two months but less than twelve months, use a temporary seeding (usually an annual grass) to provide short-term cover on disturbed areas. See Table 3.1 for recommended plant species and planting rates.

Temporary seedings shall be planted as a nurse crop with a permanent seeding mixture when rapidly growing cover is needed. When seeding toward the end of the listed planting dates for permanent seedings, or when conditions are expected to be less than optimal, select an appropriate nurse crop from Table 3.1 and plant with the permanent seeding mix. Companion seedings of small-seeded grasses shall not exceed 5% (by weight) of the overall permanent seeding mixture. Companion seedings of small grains such as barley, wheat, or oats shall be sown at one-third the rates listed in Table 3.1. Cereal rye generally should not be used as a nurse crop unless planting will occur in very late fall beyond the seeding dates for other temporary seedings. Cereal rye has allelopathic properties that inhibit the germination and growth of other plants.

Oats are the recommended nurse crop for warm-season grasses.

When a temporary or permanent seeding cannot be completed because of weather conditions or time of year, apply mulch only (no seeding) as a temporary cover when soil stabilization is needed. Refer to the conservation practice standard Mulching (484) for materials, application rates, and methods.

Permanent Seeding. Permanent herbaceous vegetation shall be designed to achieve a minimum stand density of 85 percent ground cover within one year. To establish permanent cover, select grass and legume mixes according to Tables 3.2 and 3.3.

When needed and feasible, supply new seedings with adequate water (a minimum of 1/4-inch twice a day) until vegetation is well established. This is especially necessary when seeding is performed in abnormally dry or hot weather or on droughty soils.

Mulching. Mulch shall consist of natural and/or artificial non-toxic materials of sufficient thickness and durability to achieve the intended effect for the required time period. Methods of anchoring mulch shall be sufficiently durable to maintain mulch in place until it is no longer needed.

Mulching is required for critical area plantings on structural measures (e.g., grassed waterways, diversions, embankments, etc.), and shall be applied elsewhere as needed. Refer to the conservation practice standard Mulching (484) for materials, application rates, and methods.

Sod. Commonly available sod types include Kentucky Bluegrass blends and Tall Fescue/Kentucky Bluegrass mixes.

Sod Quality and Treatment - Sod shall be state-certified sod that is at least one year old but not older than 3 years. Sod shall be machine cut to uniform thickness of 3/4-inch, plus or minus 1/4-inch, at the time of cutting. Measurement of thickness shall exclude top growth or thatch.

Standard size sections of sod shall be strong enough to support their own weight and retain their shape when suspended vertically with a firm grasp of the upper 10% of the section.

Individual pieces of sod shall be cut to the supplier's width and length. Maximum allowable deviation from standard widths and lengths shall be no more than 5%.

Sod shall be harvested, delivered, and installed within a period of 36 hours. Sod not transplanted within this period shall be inspected and approved prior to its installation.

Do not harvest or transplant sod when the moisture content (excessively wet or dry) may adversely affect its survival.

The optimum planting period is in early fall, followed by the spring planting period. Sod may be planted during the summer if supplemental watering will be provided until the sod is well established. The fall planting season is limited by the amount of time the sod has to develop roots before the ground freezes. Newly sodded areas usually need 4 to 6 weeks before the sod is sufficiently rooted. Similarly, the spring planting season is limited by the high temperatures and drought of summer, unless supplemental water will be provided.

Installation - Prior to sodding, the soil surface shall be cleared of roots, brush, trash, debris, and other objects that would interfere with planting. Based on a soil test, apply lime and fertilizer as needed, and mix into the top 3 inches of soil. Rake the site smooth in preparation for laying the sod.

During periods of high temperature, lightly water the soil surface immediately before laying the sod. Lay sod strips lengthwise on the contour, never up and down the slope, starting at the bottom of the slope and working up. On steep slopes, use ladders to facilitate the work and prevent damage to the sod.

Lay sod strips in staggered rows, with joints butted tightly together to prevent voids. Roll or tamp the sod immediately following placement to insure solid contact of root mat and soil surface. Do not overlap the sod strips.

On slopes greater than 3:1, secure sod to the soil surface with wooden pegs or wire staples.

Where surface water cannot be diverted from flowing over the face of a sodded slope, install a capping strip of heavy jute or plastic netting, properly secured, along the crown of the slope and edges to provide extra protection against lifting and undercutting of sod. Use the same technique to anchor sod in water-carrying channels and other critical areas. Use wire staples to anchor netting in channel work.

Supplemental Watering - Immediately following installation, water the sod until moisture penetrates the soil layer beneath the sod to a depth of 4 inches. Maintain optimum moisture for at least 2 weeks by lightly watering the sod on a regular (usually daily) basis, unless sufficient rainfall has occurred. Do not allow the sod to dry out completely. After the sod begins to take root, reduce the frequency of watering and increase the amount of water applied per watering. This encourages the development of a deep root system and ultimately reduces the amount of water needed.

Groundcovers. On sites where grass is difficult to grow or maintain, other perennial groundcovers may be used to control erosion. Groundcovers are low-growing herbaceous plants, vines, and creeping shrubs that spread quickly to form a dense cover. These plants should not be expected to provide erosion control or prevent soil slippage on sites that are inherently unstable due to soil texture, structure, water movement, or excessive slope.

Selection of Plant Species - Low-maintenance groundcovers are available to suit a variety of conditions, especially for small areas around homes and commercial buildings. These plants generally require more care than turf during the initial establishment period but may require less care after establishment.

Species recommendations may be found by consulting publications in the References section of the Critical Area Planting (342) standard. Be cautious of using species that have aggressive growth habits and may spread beyond the planted area, especially if the planting is near a neighboring property or a natural area such as a shoreline or woodland. Species such as English Ivy (*Hedera helix*) and Periwinkle (*Vinca minor*) tend to grow rapidly once established, and should not be used except under well-contained conditions.

Installation – Prepare the soil by incorporating 2 inches of compost into the upper 8 inches of soil. If needed based on a soil test, incorporate lime and fertilizer into the soil.

Install the plants at a spacing that is based on their present size, expected rate of growth and size at maturity, and how quickly complete coverage is desired. In general, use a spacing of one plant for every 1 to 4 square feet and stagger the spacing of plants between rows.

Cover the entire planted slope with mulch that will provide sufficient erosion control during the establishment period. Refer to the conservation practice standard Mulching (484) for materials, application rates, and methods.

TABLE 3.1: Temporary Seeding for Site Stabilization

Plant Species	Seeding Rate [1]		Seeding Depth (inches) [2]	Recommended Seeding Dates by Plant Hardiness Zone [3]		
	lbs./ac.	lbs./ 1,000 sq.ft.		5b and 6a	6b	7a, 7b, and 8a
Cool-Season Grasses						
Barley *Hordeum vulgare*	96	2.2	0.5 - 1.0	Mar 15 to May 31 Aug 1 to Sep 30	Mar 1 to May 15 Aug 1 to Oct 15	Feb 15 to Apr 30 Aug 15 to Nov 30
Oats *Avena sativa*	96	2.2	0.5 - 1.0	Mar 15 to May 31 Aug 1 to Sep 30	Mar 1 to May 15 Aug 1 to Oct 15	Feb 15 to Apr 30 Aug 15 to Nov 30
Wheat *Triticum aestivum*	120	2.8	0.5 - 1.0	Mar 15 to May 31 Aug 1 to Sep 30	Mar 1 to May 15 Aug 1 to Oct 15	Feb 15 to Apr 30 Aug 15 to Nov 30
Cereal Rye *Secale cereale*	112	2.8	0.5 - 1.0	Mar 15 to May 31 Aug 1 to Oct 31	Mar 1 to May 15 Aug 1 to Nov 15	Feb 15 to Apr 30 Aug 15 to Dec 15
Warm-Season Grasses						
Foxtail Millet *Setaria italica*	30	0.7	0.25 - 0.5	Jun 1 to Jul 31	May 16 to Jul 31	May 1 to Aug 14
Pearl Millet *Pennisetum glaucum*	20	0.5	0.25 - 0.5	Jun 1 to Jul 31	May 16 to Jul 31	May 1 to Aug 14
Teff [4] *Eragrostis tef*	7 (or 10, for coated seed) [5]	0.16 (or 0.23)	0.13 – 0.25	Jun 1 to Jul 31	May 16 to Jul 31	May 1 to Aug 14

TABLE 3.1 NOTES:

1. Seeding rates for the warm-season grasses are in pounds of Pure Live Seed (PLS). Actual planting rates need to be adjusted to reflect percent seed germination and purity, as tested. Adjustments are usually not needed for the cool-season grasses.

   Seeding rates listed above are for temporary seedings, when planted alone. When planted as a nurse crop with permanent seed mixes, use 1/3 of the seeding rate listed above for barley, oats, and wheat. For smaller-seeded grasses (pearl millet, foxtail millet, teff), do not exceed more than 5% (by weight) of the overall permanent seeding mix.

   Cereal rye generally should not be used as a nurse crop, unless planting will occur in very late fall beyond the seeding dates for other temporary seedings. Cereal rye has allelopathic properties that inhibit the germination and growth of other plants. If it must be used as a nurse crop, seed at 1/3 of the rate listed above.

   Oats are the recommended nurse crop for warm-season grasses.

2. For sandy soils, plant seeds at twice the depth listed above (except for teff -- see Note 5, below).

3. The seeding dates are averages for each zone, and may require adjustment to reflect local conditions, especially near the boundaries of the zone.

4. Teff is shorter-statured, finer-stemmed, and matures earlier than other warm-season grass covers. These traits make fall seeding of permanent cover following teff potentially much easier than with other warm-season covers because terminating the teff by spraying or mowing may be unnecessary in most cases.

5. Teff seeds are very small and should be broadcast or shallowly planted no deeper than 0.25 inch into a firm, prepared seedbed. Coated seed is larger and heavier than uncoated seed, and therefore has a higher seeding rate based on weight. Coated seed is recommended, especially when rotary-spinning teff, because the seed is more visible on the ground. This facilitates a more even distribution of seed.

TABLE 3.2: Recommended Permanent Upland Herbaceous Seeding Mixes (High Density) by Site Condition or Purpose															
Site Condition or Purpose of the Planting	**Recommended Mix (see Table 3.3)**														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Steep Slopes, Roadsides	✓	✓	✓	◆	✓	◆					◆	✓	✓		
Sand and Gravel Pits, Sanitary Landfills	✓	✓	✓	◆	✓	◆					◆	✓			
Salt-Damaged Areas	◆												✓		
Mine Spoil, Dredged Material, and Spoil Banks	◆		✓	◆	◆										
Utility Rights-of-Way	✓	✓	✓	✓	✓	✓	◆			✓	✓	✓			
Dikes and Dams	◆	◆	✓	◆		✓	✓	◆	✓		✓	✓			
Berms, Low Embankments (not on Ponds)	✓	✓	✓	✓	✓	✓	◆		◆	✓	✓	✓	◆		◆
Pond and Channel Banks, Streambanks, Ditch Plugs	✓	✓	✓	✓	◆	◆	◆		◆	✓	◆		◆		✓
Grassed Waterways, Diversions, Terraces, Spillways	◆				◆	✓	◆	◆	✓		◆				
Bottom of Dry Detention Basins and Swales				◆		◆	◆			◆	✓		✓		✓
Field Borders, Filter Strips, Contour Buffer Strips	✓	✓	✓	◆	◆	✓	◆	✓	✓	✓	✓	✓	◆		
Vegetated Treatment Areas (for Wastewater Treatment)								✓	◆	◆					
Heavy Use Areas (Grass Loafing Paddocks for Livestock)								✓						✓	
Athletic Fields, Residential and Commercial Lawns							◆	✓	✓		✓				
Recreation Areas (Low to Moderate Maintenance)							✓	✓	✓		✓				

TABLE 3.2 NOTES:

✓ Recommended mix for this site condition or purpose.

◆ Alternative mix, depending on site conditions.

TABLE 3.3: Permanent Upland Herbaceous Cover Mixes: High Density (Critical Area Plantings)

Mix	Recommended Cultivar	Seeding Rate [1] lbs./ac.	Seeding Rate [1] lbs./ 1,000 SF	Soil Drainage Class [2]	Max. Height (feet)	Maint. Level [3]	Remarks
WARM-SEASON/COOL-SEASON GRASS MIXES							
1. SELECT ONE WARM-SEASON GRASS:							
Switchgrass *Panicum virgatum* **OR**	Blackwell, Carthage, Cave-in-Rock, or Shelter	10	0.23				All species are native to Maryland. Plant this mix with a regular grass drill.
Coastal Panicgrass *Panicum amarum*	Atlantic	10	0.23				
AND ADD:							
Creeping Red Fescue *Festuca rubra*	Dawson, Jasper, Navigator II	15	0.34	E – P	4 - 7	C - D	Creeping Red Fescue is a cool-season grass that will provide erosion protection while the warm-season grass is becoming established.
PLUS ONE OF THE FOLLOWING LEGUMES:							
Partridge Pea *Chamaecrista fasciculata*	Common	1	0.02				Switchgrass, Coastal Panicgrass, the 'Dawson' variety of Creeping Red Fescue, and Partridge Pea are moderately salt-tolerant. Bush Clover and Wild Indigo do not tolerate wet sites.
Round Bush Clover *Lespedeza capitata*	Common	2	0.05				
Wild Indigo *Baptisia tinctoria*	Common	2	0.05				
2. Big Bluestem *Andropogon gerardii*	Niagara or Rountree	6	0.14				All species are native to Maryland.
Indiangrass *Sorghastrum nutans*	Rumsey	6	0.14				The Indiangrass and Bluestems have fluffy seeds. Plant with a specialized native seed drill.
Little Bluestem *Andropogon gerardii*	Aldous or Blaze	4	0.09				
Creeping Red Fescue *Festuca rubra*	Dawson, Jasper, Navigator II	15	0.34				Creeping Red Fescue is a cool-season grass that will provide erosion protection while the warm-season grasses are becoming established.
PLUS ONE OF THE FOLLOWING LEGUMES:				E – MW	6 - 8	C - D	
Partridge Pea *Chamaecrista fasciculata*	Common	1	0.02				
Round Bush Clover *Lespedeza capitata*	Common	2	0.05				
Wild Indigo *Baptisia tinctoria*	Common	2	0.05				
Showy Tick-Trefoil *Desmodium canadense*	Common	1	0.02				

TABLE 3.3: Permanent Upland Herbaceous Cover Mixes: High Density (Critical Area Plantings)							
Mix	**Recommended Cultivar**	**Seeding Rate [1]**		**Soil Drainage Class [2]**	**Max. Height (feet)**	**Maint. Level [3]**	**Remarks**
		lbs./ac.	**lbs./ 1,000 SF**				
WARM-SEASON/COOL-SEASON GRASS MIXES							
3. SELECT THREE GRASSES:							
Deertongue *Dichanthelium clandestinum*	Tioga	20	0.46				Excellent for excessively droughty, low pH (acidic) soils.
Sheep Fescue *Festuca ovina* **OR**	Bighorn	20	0.46				Sheep Fescue, Canada Wildrye, and Redtop are cool-season grasses that will provide erosion protection while the warm-season grass (Deertongue) is becoming established.
Canada Wildrye *Elymus canadensis*	Common	5	0.11				
Rough Bentrgrass *Agrostis scabra* **OR**	Common	1	0.02				
Redtop *Agrostis gigantea*	Streaker	1	0.02	E - MW	4 - 6	C - D	Rough Bentrgrass and Redtop are quick to establish. Rough Bentgrass is native; Redtop is introduced.
PLUS ONE OF THE FOLLOWING LEGUMES:							
Maryland Senna *Senna marilandica*	Common	0.25	0.006				
Round Bush Clover *Lespedeza capitata*	Common	2	0.05				
Wild Indigo *Baptisia tinctoria*	Common	2	0.05				
4. Deertongue *Dichanthelium clandestinum*	Tioga	15	0.34				
Creeping Red Fescue *Festuca rubra*	Dawson, Jasper, Navigator II	20	0.46				Use Virginia Wildrye on moist, shady sites.
Virginia Wildrye *Elymus virginicus* **OR**	Common	5	0.11				
Canada Wildrye *Elymus canadensis*	Common	5	0.11	W - P	2 - 3	C - D	Use Canada Wildrye on droughty sites.
PLUS ONE OF THE FOLLOWING LEGUMES:							
American Senna *Senna hebecarpa*	Common	0.25	0.006				
Panicled Tick-trefoil *Desmodium paniculatum*	Common	2	0.05				
Round Bush Clover *Lespedeza capitata*	Common	2	0.05				

TABLE 3.3: Permanent Upland Herbaceous Cover Mixes: High Density (Critical Area Plantings)

Mix	Recommended Cultivar	Seeding Rate [1] lbs./ac.	Seeding Rate [1] lbs./ 1,000 SF	Soil Drainage Class [2]	Max. Height (feet)	Maint. Level [3]	Remarks
COOL-SEASON GRASS MIXES							
5. SELECT ONE GRASS:							Either Creeping Red Fescue or Hard Fescue can be used in heavy shade. Use Hard Fescue for sites in full sun and/or with droughty soils.
Creeping Red Fescue *Festuca rubra* **OR**	Dawson, Jasper, Navigator II	20	0.46				
Hard Fescue *Festuca brevipila* (formerly *Festuca trachyphylla)*	Beacon, Gotham Spartan II, Sword	20	0.46				Perennial Ryegrass, Rough Bentgrass, and Redtop will establish more rapidly than either fescue. Rough Bentgrass and Redtop tolerate wet sites better than Ryegrass.
PLUS ONE OTHER GRASS:							
Perennial Ryegrass *Lolium perenne*	Recommended MD turf-types [4]	10	0.23	E - SP	2 - 3	C - D	Rough Bentgrass is native; Redtop is introduced.
Rough Bentgrass *Agrostis scabra*	Common	2	0.05				Flatpea will suppress woody vegetation. It should be planted in the spring or as a dormant seeding in late fall or winter. It may not be winter-hardy if planted late summer - fall. Caution: Flatpea can spread aggressively, and can be toxic to livestock.
Redtop *Agrostis gigantea*	Streaker	2	0.05				
OPTIONAL ADDITION:							
Flatpea *Lathyrus sylvestris*	Lathco	15	0.34				
6. Tall Fescue *Schedonorus arundinaceus* (formerly *Festuca arundinacea)*	Refer to Note 4 at the end of this table.	65	1.49				Tall Fescue produces a dense turf if frequently mowed, but tends to be clumpy if mowed only occasionally.
PLUS ONE OTHER GRASS:							
Perennial Ryegrass *Lolium perenne* **OR**	Recommended MD turf-types [4]	5	0.11	W - SP	2 - 3	C - D	Redtop tolerates moist sites better than Perennial Ryegrass. Either one will grow rapidly and provide erosion control while Tall Fescue becomes established.
Redtop *Agrostis gigantea*	Streaker	2	0.05				
PLUS ONE OF THE FOLLOWING LEGUMES:							
Showy Tick Trefoil *Desmodium canadense*	Common	1	0.02				Showy Tick-Trefoil is a native legume; White Clover is introduced.
White Clover *Trifolium repens*	Common	5	0.11				
7. Creeping Red Fescue *Festuca rubra*	Dawson, Jasper, Navigator II	30	0.69				Good mix for cool, shady sites. Can be frequently mowed.
Kentucky Bluegrass *Poa pratensis*	Recommended MD turf-types [4]	15	0.34	W - MW	1 - 2	A - D	Where erosion is a concern during stand establishment, add Perennial Ryegrass or Redtop at the rate shown for Mix 6. If desired, a legume may also be added as per Mix 6.

TABLE 3.3: Permanent Upland Herbaceous Cover Mixes: High Density (Critical Area Plantings)

Mix	Recommended Cultivar	Seeding Rate [1] lbs./ac.	Seeding Rate [1] lbs./ 1,000 SF	Soil Drainage Class [2]	Max. Height (feet)	Maint. Level [3]	Remarks
COOL-SEASON GRASS MIXES							
8. Tall Fescue *Schedonorus arundinaceus* (formerly *Festuca arundinacea)*	Refer to Note 4 at the end of this table.	100	2.29	E - SP	2 - 3	A - C	Suitable for highly managed turf areas when planted as a single species at this seeding rate. Higher rates may be specified for athletic fields and lawns. For best results, recommend using a blend of 3 turf-type cultivars. Use endophyte-friendly cultivars in areas where livestock may graze. When selected as an "Alternative Mix," include a nurse crop with the planting.
9. Tall Fescue *Schedonorus arundinaceus*	Refer to Note 4 at the end of this table.	60	1.38	W - SP	2 - 3	A - D	Suitable for highly managed turf areas and for low maintenance sites. Higher seeding rates may be specified for athletic fields and lawns. Tall Fescue produces a dense turf if frequently mowed, but tends to be clumpy if mowed only occasionally. Kentucky Bluegrass does not perform well on hot, dry sites without frequent watering. For best results, use a blend of 3 cultivars each for Tall Fescue and Kentucky Bluegrass. Perennial Ryegrass is generally not recommended for inclusion in highly managed turf where it is more susceptible to fungal diseases. However, its use may be justified for erosion control during stand establishment.
AND ADD ONE OF THE FOLLOWING:							
Creeping Red Fescue *Festuca rubra* **OR**	Dawson, Jasper, Navigator II	20	0.46				
Kentucky Bluegrass *Poa pratensis*	Recommended MD turf-types [4]	5	0.11				
PLUS ONE OTHER GRASS:							
Perennial Ryegrass *Lolium perenne* **OR**	Recommended MD turf-types [4]	5	0.11				
Redtop *Agrostis gigantea*	Streaker	2	0.05				
10. Orchardgrass *Dactylis glomerata*	Any	25	0.57	W - SP	2 - 3	C - D	Orchardgrass may not persist on sites that lack sufficient soil moisture and/or nutrients. Omit the clovers if using this mix for vegetated treatment areas.
Creeping Red Fescue *Festuca rubra*	Dawson, Jasper, Navigator II	10	0.23				
Redtop *Agrostis gigantea*	Streaker	2	0.05				
Alsike Clover *Trifolium hybridum*	Common	3	0.07				
White Clover *Trifolium repens*	Common	3	0.07				

TABLE 3.3: Permanent Upland Herbaceous Cover Mixes: High Density (Critical Area Plantings)

Mix	Recommended Cultivar	Seeding Rate [1] lbs./ac.	Seeding Rate [1] lbs./ 1,000 SF	Soil Drainage Class [2]	Max. Height (feet)	Maint. Level [3]	Remarks
COOL-SEASON GRASS MIXES							
11. Creeping Red Fescue *Festuca rubra*	Dawson, Jasper, Navigator II	15	0.34	E - MW	2 - 3	B - D	Suitable mix for shady turf area. Higher seeding rates may be specified for athletic fields and lawns.
Chewings Fescue *Festuca rubra* ssp.*fallax*	Fairmont, Intrigue 2, Longfellow 3, Radar, Treazure II, Wrigley 2, Zodiac	15	0.34				Add Rough Bluegrass in moist, shady conditions only.
Kentucky Bluegrass *Poa pratensis*	Recommended MD turf-types [4]	10	0.23				Where erosion is a concern during stand establishment, add Perennial Ryegrass or Redtop at the rate shown for Mix 9. Perennial Ryegrass is generally not recommended for inclusion in highly managed turf where it is more susceptible to fungal diseases. However, its use may be justified when needed for erosion control.
OPTIONAL ADDITION:							
Rough Bluegrass *Poa trivialis*	Laser, Saber	15	0.34				
12. Creeping Red Fescue *Festuca rubra*	Dawson, Jasper, Navigator II	15	0.34	E - MW	2 - 3	C - D	Attractive mix of fine fescues and wildflowers for low maintenance conditions. Once well established, the grasses may tend to outcompete the wildflowers. On sites where erosion is not a concern and wildlfowers will be planted, grasses may be seeded at 1/3 of the listed rate.
Hard Fescue *Festuca brevipila* (formerly *Festuca trachyphylla)*	Beacon, Gotham Spartan II, Sword	15	0.34				
Sheep Fescue *Festuca ovina*	Bighorn	15	0.34				
Perennial Ryegrass *Lolium perenne*	Recommended MD turf-types [4]	5	0.11				
AND ADD WILDFLOWER MIX:							Wildflowers are best established by broadcasting and cultipacking on a prepared seedbed. Drilling can be also used, but care must be taken so that seeds are not drilled too deep.
Black-eyed Susan *Rudbeckia hirta*	Common	2	0.05				
Golden Tickseed *Coreopsis tinctoria*	Common	2	0.05				
Wild Bergamot *Monarda fistulosa*	Common	2	0.05				Hydroseeding is not recommended for this mix if wildflowers are used because their seeds are very small.
Partridge Pea *Chamaecrista fasciculata*	Common	1	0.02				
OR ADD CLOVER MIX:							
White Clover *Trifolium repens*	Common	3	0.07				
Red Clover *Trifolium pratense*	Any	3	0.07				

TABLE 3.3: Permanent Upland Herbaceous Cover Mixes: High Density (Critical Area Plantings)							
Mix	**Recommended Cultivar**	**Seeding Rate [1/]**		**Soil Drainage Class [2/]**	**Max. Height (feet)**	**Maint. Level [3/]**	**Remarks**
		lbs./ac.	**lbs./ 1,000 SF**				
COOL-SEASON GRASS MIXES							
13. Alkali Saltgrass *Puccinellia distans*	Fults or Salty	20	0.46	W - P	2 - 3	B - D	This is the recommended mix for saline sites. Saltgrass will persist only under saline conditions.
Creeping Red Fescue *Festuca rubra*	Dawson	15	0.34				
Fowl Meadowgrass *Poa palustris*	Common	2	0.05				For best results, use only the 'Dawson' variety of Creeping Red Fescue. It is a salt-tolerant variety.
OPTIONAL ADDITION:							
Creeping Bentgrass *Agrostis stolonifera*	Seaside	2	0.05				Add Bentgrass for wetter conditions.
WARM-SEASON GRASS							
14. Bermudagrass *Cynodon dactylon*	Quickstand, Patriot, Tufcote	Plant sprigs at 25 - 40 bu./ac.	Plant sprigs at 0.57 – 0.92 bu./1000 SF	W - SP	1 - 2	B - D	Suitable for summer heavy use areas for livestock. Caution: Can spread rapidly into adjacent cool-season plantings. Broadcast sprigs on a prepared seedbed. Lightly disk (1-2 inches) to incorporate, and follow with a field roller or cultipacker to firm the soil. One bushel (1.25 cu. ft.) contains approx. 1,000 plants.

TABLE 3.3: Permanent Upland Herbaceous Cover Mixes: High Density (Critical Area Plantings)							
Mix	**Recommended Cultivar**	**Seeding Rate [1]**		**Soil Drainage Class [2]**	**Max. Height (feet)**	**Maint. Level [3]**	**Remarks**
		lbs./ac.	**lbs./ 1,000 SF**				
NATIVE GRASS-SEDGE-FORB MIX							
15. Riverbank Wildrye *Elymus riparius*	Common	10	0.23	MW - P	4 - 5	D	This mix is recommended for soil stabilization of earthen structures, such as ditch plugs, and disturbed areas within and adjacent to floodplains and wetlands. Primarily a native cool-season grass mix with wildflowers and legumes. Redtop Panicgrass is a native warm-season grass. Most species in this mix are tolerant of partial shade, but are also suitable for full sun. On the Coastal Plain, substitute Slender Woodoats for River Oats. Beaked Panicgrass can be substituted for Redtop Panicgrass on the Coastal Plain. If a wildflower is not available, double the rate of one of the other wildflowers in the mix (not Partridge Pea). For example, if Joe-Pye Weed is not available, Boneset could be substituted at a rate of 0.2 lb/ac.
Virginia Wildrye *Elymus virginicus*	Common	10	0.23				
Redtop Panicgrass *Panicum rigidulum*	Common	2	0.05				
River Oats *Chasmanthium latifolium*	Common	2	0.05				
Rough Bentgrass *Agrostis scabra*	Common	1	0.02				
Fox Sedge *Carex vulpinoidea*	Common	2	0.05				
Blue (Swamp) Vervain *Verbena hastata*	Common	0.2	0.005				
Boneset *Eupatorium perfoliatum*	Common	0.1	0.002				
Bur Marigold *Bidens aristosa*	Common	1.4	0.03				
Joe-Pye Weed *Eutrochium fistulosum*	Common	0.1	0.002				
Narrow-leaf Mountain Mint *Pycnanthemum tenuifolium*	Common	0.1	0.002				
Partridge Pea *Chamaecrista fasciculata*	Common	1	0.02				
Wild Bergamot *Monarda fistulosa*	Common	0.1	0.002				

TABLE 3.3 NOTES:

1. Seeding rates for native grasses, sedges, legumes, and other wildflowers are in pounds of Pure Live Seed (PLS). Order seed from the supplier based on the PLS rate; the seed supplier will adjust the bulk amount to be planted based on percent seed germination and purity, as tested.

Adjustments are not usually needed for the introduced grasses and legumes. However, be aware that some seed may be polymer-coated. This coating can double the weight of the seed, so that a bag of seed may contain only 50% seed by weight (e.g., a 10-pound bag of grass seed may contain only 5 pounds of seed, with the other 5 pounds consisting of the polymer coating). Be sure to read the seed analysis label when purchasing seed, and adjust the per acre weight to be planted accordingly.

Legume seeds shall be inoculated before planting with the appropriate *Rhizobium* bacteria. When feasible, hard-seeded legumes should be scarified to improve germination.

2. 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.

3. Maintenance Level:

A - Intensive mowing (every 2 - 4 days), fertilization, lime, insect and weed control, and watering (examples: high maintenance lawns and athletic fields).
B - Frequent mowing (every 4 - 7 days), occasional fertilization, lime, pest control, and watering (examples: residential, school, and commercial lawns).
C - Periodic mowing (every 7 - 14 days), occasional fertilization and lime (examples: residential lawns, parks).
D - Infrequent or no mowing, fertilization, or lime after the first year of establishment (examples: wildlife areas, roadsides, steep banks).

4. Select turf-type cultivars of Tall Fescue, Kentucky Bluegrass, and Perennial Ryegrass based on recommendations from the University of Maryland Extension, Turfgrass Technical Update TT-77, and the Virginia and Maryland National Turfgrass Evaluation Program (NTEP). The use of recommended cultivars usually results in a grass stand of higher quality and density, greater drought tolerance, lower nutrient requirements, and fewer pest problems. Cultivars developed for other regions of the country or for forage may be also used, but they may not perform as well as the recommended turf-types in a critical area planting.

Tall Fescue: Where livestock may be allowed to graze (e.g., heavy use grass loafing paddocks), use tall fescue varieties that are endophyte-free or are novel endophyte-infected to avoid livestock health problems due to endophyte toxicity. Tall fescue with the novel endophyte is not toxic to livestock, and has the adaptive advantages of being more resistant to drought, disease, and insects than endophyte-free varieties. Please note that endophyte levels in plantings can vary between varieties, between fields of the same variety, and with the time of year.

For areas where livestock will not have access, tall fescue varieties with higher endophyte levels are preferable because they tend to be more drought tolerant and more resistant to disease and insect damage. Most turf-type tall fescue varieties have high endophyte levels, as does ‘Kentucky 31’ tall fescue (originally selected as a forage variety).

Certified varieties of endophyte-infected tall fescue may be used for stockpile grazing (i.e., winter grazing) when the risk of endophyte toxicity is much reduced.

TABLE 3.4: Quality of Seed					
Species	**Minimum Seed Purity (%)**	**Minimum Seed Germination (%)**	**Species**	**Minimum Seed Purity (%)**	**Minimum Seed Germination (%)**
COOL-SEASON GRASSES			***WARM-SEASON GRASSES***		
Barley	98	85	Bluestem, Big	60	60
Bentgrass, Creeping	95	85	Bluestem, Little	55	60
Bluegrass, Canada	90	80	Deertongue	95	75
Bluegrass, Kentucky	90	80	Indiangrass	60	60
Bluegrass, Rough	90	80	Millet, Foxtail or Pearl	98	80
Fescue, Chewings	95	85	Panicgrass, Coastal	95	70
Fescue, Creeping Red	95	85	Switchgrass	95	75
Fescue, Hard	95	85	Other native WSGs	--	--
Fescue, Sheep	95	85	***LEGUMES/FORBS***		
Fescue, Tall	95	85	Clover, Alsike	99	85
Oats	98	85	Clover, Red	99	85
Orchardgrass	90	80	Clover, White	98	90
Redtop	92	80	Flatpea	98	75
Rye, Cereal	98	85	Lespedeza, Common	98	80
Ryegrass, Annual or Perennial	95	85	Lespedeza, Korean	98	80
Saltgrass, Alkali	85	80	Pea, Partridge	98	70
Wheat	98	85	Other native legumes	--	--
Wild Rye, Canada	85	70	Trefoil, Birdsfoot	98	85
Other native CSGs	--	--	Wildflowers	--	--

TABLE 3.4 NOTE:

1. All seed shall comply with the Maryland State Seed Law. Seed shall be free of prohibited or restricted noxious weeds, as currently listed by the Maryland Department of Agriculture, Turf and Seed Section.

SECTION 4 - TREE AND SHRUB PLANTINGS

This section contains recommended trees and shrubs (and several woody vines) that can be planted for native cover, hedgerows, windbreaks/shelterbelts, forest production, wetland restoration, and other purposes.

Specifications for Selecting Species and Establishing Plantings

These specifications supplement the applicable conservation practice standards (see Section 1, Table 1.1), and contain additional criteria for species selection, planting rates, and establishment methods.

Plant materials shall comply with minimum standards, such as those as established by the American Nursery and Landscape Association or U.S. Forest Service.

For wildlife habitat plantings, select two or more species to provide greater vegetative diversity.

Refer to the following tables to select appropriate woody species for specific purposes:

- Tables 4.1 and 4.2 - Deciduous trees.
- Tables 4.3 and 4.4 - Evergreen trees.
- Tables 4.5 and 4.6 - Shrubs (mostly multi-stemmed plants, ≤15 feet tall at 20 years of age), and woody vines.

Other woody species that are native to Maryland, or are introduced and are non-invasive, may also be suitable.

Refer to the Maryland NRCS Fact Sheets *Trees and Shrubs: Establishing and Maintaining Bare-root Seedlings* and *Trees and Shrubs: Establishing and Maintaining Containerized and Balled and Burlapped Plants* for planting, establishment, and maintenance recommendations.

For hedgerows around poultry houses, refer to the appropriate Maryland NRCS 422 Hedgerow Planting Fact Sheets (*Warm-Season Grasses for Poultry Houses* and *Trees and Shrubs for Poultry Houses*) for recommended species, planting, establishment, and maintenance recommendations.

Specifications for 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. Tree arrangement and spacing shall allow for access lanes if needed for future stand management, harvesting, or other purposes.

Calculate the number of trees needed per acre by multiplying row width by spacing in the row (all measurements in feet), and then dividing the result into 43,560. A standard tree spacing/planting rate table may also be used.

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, cut-over areas, and other non-wooded land. Spacing shall be as follows, or as specified by a licensed forester, licensed landscape architect, or other qualified resource management professional:

1. Native cover plantings (wildlife habitat and water quality) - Refer to Table 4.7 for recommended planting rates for trees, shrubs, and tree/shrub mixes.

2. Hedgerows - For all purposes except around poultry houses, refer to Table 4.8 for recommended spacing within and between rows.

   For hedgerows around poultry houses, especially in fan impact areas, refer to the appropriate Maryland NRCS 422 Hedgerow Planting Fact Sheets (*Warm-Season Grasses for Poultry Houses* and *Trees and Shrubs for Poultry Houses)* for spacing requirements.

3. Windbreaks/shelterbelts - Refer to Table 4.9 for recommended spacing within and between rows. Refer to Table 4.10 for the number of rows and type of plants needed to meet windbreak/shelterbelt density requirements.

4. Wood crops -

   a. Conifers - 8' x 8' to 10' x 10'.

   b. Hardwoods - 6' x 7' to 10' x 10'.

5. Christmas trees - 5' x 5' to 6' x 6'. Spacing may be as close as 4' x 4' for small trees.

6. Landscaping, site beautification, shade, and other environmental purposes - Varied spacing, according to a planting plan.

Specifications for Protecting Plantings

Protect the planting from unacceptable impacts from pests, wildlife, livestock or fire. Exclude livestock as needed to establish the planting. Fencing, if used, shall be in accordance with the Maryland conservation practice standard for Fence (382).

Vegetation surrounding the tree or shrub planting shall be sprayed with herbicide or mowed in the fall as needed to reduce rodent damage. Follow recommendations from University of Maryland Extension when using repellents or poisons to protect the planting from mice and voles.

Tree Shelters. Tree shelters may be used to protect seedlings from competition from weeds, damage by deer and small mammals, and damage by people while mowing, trimming, or spraying around plants. Four-foot tubes are the most common height to provide adequate protection. Five-foot shelters may result in weakened stems, but offer a better chance for tree seedlings to get above the browse line when deer pressure is very high.

Shorter tubes of 2 to 3 feet are preferable for shrub plantings, because shrubs tend to grow out rather than up. In areas where flooding is common, the use of shorter tubes or open weave shelters can prevent damage to the shelter and tree seedlings.

More recently designed tubes are ventilated to allow seedlings to harden off and prevent dieback after the tubes are removed. Tubes are typically translucent to allow sunlight to reach the plant. Although most tree tubes have a perforation that is supposed to split the shelter when the trunk becomes too large, shelters often need to be manually cut and removed.

Installation. Push each shelter into the soil to a depth of at least 1 inch to exclude rodents. Stake each shelter 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. Do not use metal or bamboo stakes. Bluebirds and some other birds are attracted to tree tubes and may get trapped inside the tube. Protect birds by installing bird exclusion netting on the tops of tree shelters, and maintain the netting until the plantings extend out of the tubes.

TABLE 4.1: Recommended Deciduous Trees for Selected Uses (see Table 4.2 for detailed species information)

Plant Names	Region [1/]			Moisture [2/]			Native to MD	Habitat Use Characteristics [3/]								Hedgerows and Windbreaks [4/]		Wetlands (surface saturation/ infrequent inundation)	Wetlands (surface saturation/ frequent or prolonged inundation)
								Cover		Fruit/Seed Consumption			Pollinator Food						
	Mountains	Piedmont	Coastal Plain	Dry Sites	Mesic Sites	Wet Sites		Nesting/ Resting	Protection	Wildlife (H)	Wildlife (M)	Humans	Nectar/ Pollen	Foliage	Toxic to Livestock	Wildlife Habitat	Barriers/ Screens		
ASPEN, LARGE-TOOTHED *Populus grandidentata*	■	■	■	■	■		■	■						■					
ASPEN, QUAKING *Populus tremuloides*	■			■	■		■	■						■					
BASSWOOD, AMERICAN *Tilia americana*	■			■	■		■	■					■				■		
BEECH *Fagus grandifolia*	■	■	■	■	■		■	■		■		■		■			■		
BIRCH, RIVER *Betula nigra*	■	■	■	■	■	■	■	■			■			■				■	
BLACKGUM *Nyssa sylvatica*	■	■	■	■	■	■	■	■			■		■				■	■	
BOX-ELDER *Acer negundo*	■	■	■		■	■	■	■			■						■	■	
BUTTERNUT *Juglans cinerea*	■	■			■		■	■			■	■		■	■		■		
CHERRY, BLACK *Prunus serotina*	■	■	■	■	■		■	■		■		■	■	■	■		■		
CHERRY, PIN *Prunus pensylvanica*	■			■	■		■	■		■		■	■	■	■		■		
CHESTNUT, AMERICAN *Castanea dentata*	■	■	■	■	■		■	■		■		■		■					
CHINQUAPIN *Castanea pumila*	■	■	■	■	■		■	■			■	■		■		■	■		
CHOKECHERRY *Prunus virginiana*	■	■		■	■		■	■		■		■	■	■	■	■	■		
COTTONWOOD, EASTERN *Populus deltoides*	■	■	■	■	■	■	■	■									■	■	
CRABAPPLE, SOUTHERN *Malus coronaria*	■	■	■	■	■		■	■		■		■	■	■		■	■		
CRABAPPLE, SWEET *Malus coronaria*	■	■	■	■	■		■	■		■		■	■	■		■	■		

TABLE 4.1: Recommended Deciduous Trees for Selected Uses (see Table 4.2 for detailed species information)

Plant Names	Region [1/]			Moisture [2/]			Native to MD	Habitat Use Characteristics [3/]								Hedgerows and Windbreaks [4/]		Wetlands (surface saturation/ infrequent inundation)	Wetlands (surface saturation/ frequent or prolonged inundation)
								Cover		Fruit/Seed Consumption			Pollinator Food						
	Mountains	Piedmont	Coastal Plain	Dry Sites	Mesic Sites	Wet Sites		Nesting/ Resting	Protection	Wildlife (H)	Wildlife (M)	Humans	Nectar/ Pollen	Foliage	Toxic to Livestock	Wildlife Habitat	Barriers/ Screens		
CYPRESS, BALD *Taxodium distichum*			■		■	■	■	■									■		■
DOGWOOD, FLOWERING *Cornus florida*	■	■	■	■	■		■	■		■			■			■			
DOGWOOD, PAGODA (ALTERNATE-LEAF DOGWOOD) *Cornus alternifolia*	■	■		■	■		■	■		■			■			■			
ELM, AMERICAN *Ulmus americana*	■	■	■	■	■	■	■	■						■			■	■	
ELM, SLIPPERY *Ulmus rubra*		■		■	■	■	■	■						■			■	■	
HACKBERRY *Celtis occidentalis*	■	■	■	■	■		■	■		■		■	■	■		■	■		
HACKBERRY, DWARF *Celtis pumila*	■	■		■	■		■	■		■		■	■	■		■	■		
HACKBERRY, SMALL'S *Celtis laevigata* var. *smallii*			■	■	■	■		■		■		■	■	■		■	■		
HAWTHORN, COCKSPUR *Crataegus crus-galli*	■	■	■	■	■		■	■			■	■	■			■	■		
HAWTHORN, GREEN *Crataegus viridis*			■		■	■	■	■			■	■	■			■	■	■	
HAWTHORN, WASHINGTON *Crataegus phaenopyrum*	■	■	■	■	■		■	■			■	■	■			■	■		
HICKORY, BITTERNUT *Carya cordiformis*	■	■	■		■	■	■	■						■			■	■	
HICKORY, MOCKERNUT *Carya tomentosa*	■	■	■	■	■		■	■		■		■		■			■		
HICKORY, PIGNUT *Carya glabra*	■	■	■	■	■		■	■			■			■			■		
HICKORY, SHAGBARK *Carya ovata*	■	■		■	■		■	■		■		■		■			■		

TABLE 4.1: Recommended Deciduous Trees for Selected Uses (see Table 4.2 for detailed species information)

Plant Names	Region [1/]			Moisture [2/]			Native to MD	Habitat Use Characteristics [3/]								Hedgerows and Windbreaks [4/]		Wetlands (surface saturation/ infrequent inundation)	Wetlands (surface saturation/ frequent or prolonged inundation)
								Cover		Fruit/Seed Consumption			Pollinator Food						
	Mountains	Piedmont	Coastal Plain	Dry Sites	Mesic Sites	Wet Sites		Nesting/ Resting	Protection	Wildlife (H)	Wildlife (M)	Humans	Nectar/ Pollen	Foliage	Toxic to Livestock	Wildlife Habitat	Barriers/ Screens		
HONEYLOCUST *Gleditsia triacanthos*	■	■	■	■	■		■	■					■	■			■		
HOP-HORNBEAM *Ostrya virginiana*	■	■		■	■		■	■			■						■		
HORNBEAM, AMERICAN *Carpinus caroliniana*	■	■	■		■	■	■	■			■						■	■	
LOCUST, BLACK *Robinia pseudoacacia*	■	■	■	■			■	■					■		■		■		
MAGNOLIA, SWEETBAY *Magnolia virginiana*			■		■	■	■	■			■		■			■	■	■	
MAPLE, RED *Acer rubrum*	■	■	■	■	■	■	■	■			■		■	■	■		■		■
MAPLE, SILVER *Acer saccharinum*	■	■	■		■	■	■	■			■		■	■			■		■
MOUNTAIN-ASH, AMERICAN *Sorbus americana*	■			■	■		■	■		■		■	■			■	■		
MULBERRY, RED *Morus rubra*	■	■	■	■	■		■	■		■		■					■		
NANNYBERRY *Viburnum lentago*	■	■			■	■	■	■			■	■	■			■	■	■	
OAK, BLACK *Quercus velutina*	■	■	■	■	■		■	■		■				■	■		■		
OAK, BLACKJACK *Quercus marilandica*		■	■	■			■	■		■				■	■		■		
OAK, CHERRYBARK *Quercus pagoda*			■			■	■	■		■				■	■		■	■	
OAK, CHESTNUT *Quercus montana* (*Q. prinus)*	■	■	■	■			■	■		■		■		■	■		■		
OAK, CHINQUAPIN *Quercus muehlenbergii*	■			■			■	■		■		■		■	■		■		
OAK, NORTHERN RED *Quercus rubra*	■	■		■	■		■	■		■				■	■		■		

TABLE 4.1: Recommended Deciduous Trees for Selected Uses (see Table 4.2 for detailed species information)

Plant Names	Region [1/]			Moisture [2/]			Native to MD	Habitat Use Characteristics [3/]								Hedgerows and Windbreaks [4/]		Wetlands (surface saturation/ infrequent inundation)	Wetlands (surface saturation/ frequent or prolonged inundation)
								Cover		Fruit/Seed Consumption			Pollinator Food						
	Mountains	Piedmont	Coastal Plain	Dry Sites	Mesic Sites	Wet Sites		Nesting/ Resting	Protection	Wildlife (H)	Wildlife (M)	Humans	Nectar/ Pollen	Foliage	Toxic to Livestock	Wildlife Habitat	Barriers/ Screens		
OAK, OVERCUP *Quercus lyrata*		■	■		■	■	■	■		■		■		■	■		■		■
OAK, PIN *Quercus palustris*	■	■	■		■	■	■	■		■				■	■		■	■	
OAK, POST *Quercus stellata*	■	■	■	■	■		■	■		■		■		■	■		■		
OAK, SOUTHERN RED *Quercus falcata*			■	■	■		■	■		■				■	■		■		
OAK, SWAMP CHESTNUT (BASKET OAK) *Quercus michauxii*			■		■	■	■	■		■		■		■	■		■	■	
OAK, SWAMP WHITE *Quercus bicolor*			■		■	■	■	■		■		■		■	■		■	■	
OAK, WATER *Quercus nigra*			■		■	■	■	■		■				■	■		■	■	
OAK, WHITE *Quercus alba*	■	■	■	■	■		■	■		■		■		■	■		■		
OAK, WILLOW *Quercus phellos*			■		■	■	■	■		■				■	■		■	■	
OSAGE-ORANGE *Maclura pomifera*	■	■	■	■	■			■									■		
PAWPAW *Asimina triloba*	■	■	■		■	■	■	■		■		■		■		■		■	
PECAN *Carya illinoinensis*	■	■	■	■	■			■		■		■					■		
PERSIMMON, COMMON *Diospyros virginiana*	■	■	■	■	■	■	■	■		■		■	■			■		■	
PLUM, AMERICAN *Prunus americana*	■	■	■	■	■		■	■		■		■	■		■	■	■		
POPLAR, HYBRID *Populus deltoides x nigra* 'Spike'	■	■	■		■			■								■	■		

TABLE 4.1: Recommended Deciduous Trees for Selected Uses (see Table 4.2 for detailed species information)

Plant Names	Region [1/]			Moisture [2/]			Native to MD	Habitat Use Characteristics [3/]								Hedgerows and Windbreaks [4/]		Wetlands (surface saturation/ infrequent inundation)	Wetlands (surface saturation/ frequent or prolonged inundation)
								Cover		Fruit/Seed Consumption			Pollinator Food						
	Mountains	Piedmont	Coastal Plain	Dry Sites	Mesic Sites	Wet Sites		Nesting/ Resting	Protection	Wildlife (H)	Wildlife (M)	Humans	Nectar/ Pollen	Foliage	Toxic to Livestock	Wildlife Habitat	Barriers/ Screens		
POPLAR, TULIP *Liriodendron tulipifera*	■	■	■	■	■		■	■					■	■		■	■		
REDBUD *Cercis canadensis*	■	■			■		■	■					■			■			
REDWOOD, DAWN *Metasequoia glyptostroboides*	■	■	■		■	■		■									■		
SASSAFRAS *Sassafras albidum*	■	■	■	■			■	■			■	■	■	■		■	■		
SERVICEBERRY, CANADIAN *Amelanchier canadensis*			■		■	■	■	■		■		■	■	■		■	■	■	
SERVICEBERRY, COMMON *Amelanchier arborea*	■	■	■	■	■	■	■	■		■		■	■	■		■	■	■	
SERVICEBERRY, SMOOTH *Amelanchier laevis*	■	■		■	■		■	■		■		■	■	■		■	■		
SWEETGUM *Liquidambar styraciflua*			■		■	■	■	■									■	■	
SYCAMORE *Platanus occidentalis*	■	■	■		■	■	■	■									■	■	
TUPELO, SWAMP (SWAMP BLACK GUM) *Nyssa biflora*			■		■	■	■	■			■		■				■		■
WALNUT, BLACK *Juglans nigra*	■	■	■		■		■	■			■	■		■	■				
WILLOW, BLACK *Salix nigra*	■	■	■		■	■	■	■					■	■			■		■
WILLOW, HYBRID *Salix matsudana x alba* 'Austree'	■	■	■	■	■	■		■	■								■		
WILLOW, PURPLEOSIER *Salix purpurea* 'Streamco'	■	■	■		■	■		■	■								■		

Notes for this table are on Page 80.

TABLE 4.2: Selected Characteristics of Deciduous Trees

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
ASPEN, LARGE-TOOTHED *Populus grandidentata*	All	Statewide	W - SP	40 ft.	Fast	Low	Very Low	Medium: browsed by deer and rabbits; buds and catkins eaten by grouse; bark and buds eaten by beaver.	Beneficial to cavity-nesting species when trees get older. Very fast-growing; relatively short-lived tree. In hedgrerows and windbreaks, can be planted in one row, and add one or more other rows of species with higher density foliage. Has aggressive roots—keep away from structures, sewers, and tile lines.
ASPEN, QUAKING *Populus tremuloides*	5b, 6a, 6b	Higher elevations of W. Md. (mostly Garrett Co.)	W - SP	40 ft.	Fast	Low	Very Low	Medium: browsed by deer and rabbits; buds and catkins eaten by grouse; bark and buds eaten by beaver.	Similar to Large-Toothed Aspen (see above).
BASSWOOD, AMERICAN *Tilia americana*	All	Mostly Western Maryland	W - SP	40 ft.	Fast	Medium to High	Low	Low: seeds eaten by quail and squirrels; browsed by deer and rabbits.	Prefers rich, moist, well-drained soils; tolerates some drought. Good den tree when mature. Fragrant white flowers attract bees and other pollinators.
BEECH, AMERICAN *Betula lenta*	All	Statewide	W - SP	20 ft.	Slow	Medium	Low	High: fruits eaten by squirrels, quail, turkey, songbirds, deer.	Prefers rich, moist, well-drained soils; can tolerate drier or wetter conditions. Suckers and forms colonies. Shade tolerant.
BIRCH, RIVER *Betula nigra*	All	Mostly Coastal Plain; lower elevations in W. Md.	W - P	30 ft.	Fast	Low	Very Low	Medium: seeds eaten by ducks and songbirds.	Naturally occurring on streambanks and floodplains. Unique peeling reddish bark. Attractive for landscaping.
BLACKGUM *Nyssa sylvatica*	All	Statewide	W - P	30 ft.	Mod.	Medium	Low	Medium: fruits eaten by squirrels, quail, turkey, and songbirds; browsed by deer.	Foliage turns bright red in early fall.
BOX-ELDER *Acer negundo*	All	Statewide; less common on Coastal Plain & at higher elevations of W. Md.	MW - P	40 ft.	Fast	Medium to High	Low	Medium: seeds eaten by gamebirds, songbirds, squirrels; browsed by deer.	Naturally occurring on streambanks and floodplains. Soft wood may split in ice storms. Abundant seed produced in late summer. Attracts box-elder bugs.

TABLE 4.2: Selected Characteristics of Deciduous Trees

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
BUTTERNUT *Juglans cinerea*	5b, 6a, 6b, 7a, 7b	Mostly Piedmont & W. Md.; uncommon	MW - SP	40 ft.	Fast	Medium	Low	Medium: nuts eaten by squirrels.	Fast-growing but relatively short-lived tree. Nuts are similar to black walnut, with thick, hard shells that are not easily accessible as food for most wildlife (except squirrels). Butternut can be allelopathic to other plants. Susceptible to butternut canker, an introduced fungal disease.
CHERRY, BLACK *Prunus serotina*	All	Statewide; less common on the Coastal Plain	W - SP	40 ft.	Fast	Medium	Low	High: fruits eaten by songbirds, grouse, turkey, quail; browsed by rabbits and deer.	Clusters of white flowers attract bees and other pollinators. Leaves and branches are poisonous if eaten by livestock.
CHERRY, PIN *Prunus pensylvanica*	5b, 6a, 6b, 7a, 7b	Mostly Western Md.	W - MW	40 ft.	Fast	Medium	Low	High: fruits eaten by songbirds, grouse, turkey, quail; browsed by rabbits.	Same as above. Often sprouts abundantly after a forest fire or clear-cut.
CHESTNUT, AMERICAN *Castanea dentata*	All	Statewide; less common on the Coastal Plain	W - MW	20 ft.	Slow	Medium	Low	High: nuts eaten by grouse, turkey, squirrels, and deer; browsed by deer.	Native trees are susceptible to the Asian chestnut blight fungus. Stump sprouts occur, but rarely grow mature enough to produce seeds. Choose a blight-resistant variety for planting. Host plant for butterfly larvae.
CHINQUAPIN *Castanea pumila*	6a, 6b, 7a, 7b, 8a	Statewide, except at higher elevations; uncommon	W - MW	15 ft.	Slow	Medium	Low	Medium: nuts eaten by turkey, squirrels, and deer; browsed by deer.	Small tree or shrub. Moderately resistant to the Asian chestnut blight fungus that kills the related American chestnut (*C. dentata*). Nuts preferred by wildlife, but amount produced is low. Host plant for butterfly larvae.
CHOKECHERRY *Prunus virginiana*	5b, 6a, 6b, 7a, 7b	Mostly Western Maryland	W - SP	15 ft.	Fast	High	Low	High: fruits eaten by songbirds, grouse, turkey, quail; browsed by rabbits and deer.	Small tree or shrub; tends to spread by root suckering. Clusters of white flowers attract bees and other pollinators. Leaves and branches are poisonous if eaten by livestock.

TABLE 4.2: Selected Characteristics of Deciduous Trees

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
COTTONWOOD, EASTERN *Populus deltoides*	All	Statewide; especially common in Potomac River watershed	W - P	80 ft.	Fast	Medium to High	Low	Medium: browsed by deer and rabbits; buds and catkins eaten by squirrels and quail.	Naturally occurring on streambanks and floodplains. Tolerates dry soils. Grows rapidly, can be used to quickly establish cover for wildlife. Is weak-wooded, tends to be messy. Has aggressive roots; keep away from structures, sewers, and tile lines.
CRABAPPLE, SOUTHERN *Malus angustifolia*	All	Statewide; more common in eastern Md.	W - SP	20 ft.	Slow	Medium to High	Medium	High: fruits eaten by songbirds, grouse, turkey, quail, and various mammals; browsed by rabbits and deer.	Small tree or shrub; can spread by root suckering. Pink-white flowers attract bees and other pollinators. Plant at least 500 ft. away from red cedar *(Juniperus virginiana)* to avoid spread of cedar-apple rust.
CRABAPPLE, SWEET *Malus coronaria*	All	Statewide; common	W - SP	20 ft.	Slow	Medium to High	Medium	High: same as above.	Same as above.
CYPRESS, BALD *Taxodium distichum*	All	Coastal Plain	MW - P	45 ft.	Fast	High	Medium	Low: seeds eaten by ducks and marsh birds.	Naturally occurring on streambanks and in swamps.
DOGWOOD, FLOWERING *Cornus florida*	All	Statewide	W - SP	20 ft.	Slow	Low	Low	High: berries eaten by songbirds, grouse, turkey, quail, squirrels; browsed by deer, rabbits.	White flowers and red fruit. Widely planted as an ornamental. Susceptible to dogwood anthracnose disease.
DOGWOOD, PAGODA (ALTERNATE-LEAF DOGWOOD) *Cornus alternifolia*	5b, 6a,6b, 7a, 7b	Piedmont & W. Md.	W - SP	25 ft.	Slow	Low	Low	High: berries eaten by songbirds, grouse, turkey, quail, squirrels; browsed by deer, rabbits.	Small tree or shrub; may be multi-stemmed. Usually found on dry, rocky sites, but will tolerate some moisture. White flowers and bluish-black fruit. Attracts pollinators.
ELM, AMERICAN *Ulmus americana* 'New Harmony' and 'Valley Forge'	All	Statewide	W - P	35 ft.	Mod.	Medium	Low	Low: seeds eaten by songbirds, grouse, turkey, quail; browsed by rabbits and deer.	Prefers moist soil but will tolerate drier sites. Species is susceptible to Dutch elm disease. The New Harmony and Valley Forge cultivars are disease-resistant.
ELM, SLIPPERY *Ulmus rubra*	All	Mostly Piedmont	W - P	45 ft.	Fast	Medium	Low	Low: seeds eaten by songbirds, grouse, turkey, quail; browsed by rabbits and deer.	Naturally occurring on streambanks, floodplains, and uplands. Shade tolerant.

TABLE 4.2: Selected Characteristics of Deciduous Trees

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
HACKBERRY *Celtis occidentalis*	All	Statewide	W - SP	25 ft.	Mod.	Medium to High	Low	High: fruits eaten by quail, turkey, and songbirds.	Small tree. Adaptable to a wide range of conditions. Flowers attractive to butterflies and other pollinators. Host plant for several species of butterfly larvae.
HACKBERRY, DWARF *Celtis pumila*	All	Mostly Piedmont & W. Md.	W - MW	15 ft.	Mod.	High	Low	High: fruits eaten by quail, turkey, and songbirds.	Small tree or shrub; single-stemmed. Flowers attractive to butterflies and other pollinators. Host plant for several species of butterfly larvae.
HACKBERRY, SMALL'S *Celtis laevigata* var. *smallii*	7a, 7b, 8a	Introduced; native to Southeastern U.S.	W - P	25 ft.	Mod.	High	Low	High: fruits eaten by quail, turkey, and songbirds.	Small tree. Very hardy; adapted to a wide range of soil and site conditions. Flowers attractive to butterflies and other pollinators. Host plant for several species of butterfly larvae.
HAWTHORN, COCKSPUR *Crataegus crus-galli*	All	Statewide; common, especially in W. Md.	W - SP	25 ft.	Slow	High	Medium	Medium: fruits eaten by songbirds, gamebirds, squirrels; browsed by deer.	Small tree or shrub. Attractive white flowers produce bright orange-red fruits that may persist into winter. Thorny stems. Flowers attract bees and other pollinators.
HAWTHORN, GREEN *Crataegus viridis*	All	Coastal Plain	MW - P	25 ft.	Slow	High	Medium	Medium: fruits eaten by songbirds, gamebirds, squirrels; browsed by deer.	Same as above.
HAWTHORN, WASHINGTON *Crataegus phaenopyrum*	All	Statewide; uncommon	W - SP	25 ft.	Slow	High	Medium	Medium: same as above.	Same as above. Often planted as an ornamental; multi-trunked or single-trunked forms are available.
HICKORY, BITTERNUT *Carya cordiformis*	All	Statewide	MW - P	25 ft.	Slow	Medium	Low	Low: nuts are very bitter and are not a preferred food; may be eaten by squirrels.	Naturally occurring on floodplains and in wetlands; occasionally on dry sites. Wood used for furniture, tool handles, charcoal, firewood.
HICKORY, MOCKERNUT *Carya tomentosa*	All	Statewide; mostly at lower elevations	W - SP	20 ft.	Slow	Medium	Low	High: nuts eaten by squirrels, turkey, quail, deer.	Usually found on well-drained sites; tolerates some moisture. Wood used for furniture, tool handles, charcoal, firewood.

TABLE 4.2: Selected Characteristics of Deciduous Trees

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
HICKORY, PIGNUT *Carya glabra*	All	Statewide	W - SP	20 ft.	Slow	Medium	Low	Medium: nuts are usually bitter and are not a preferred food; may be eaten by squirrels and other mammals.	Usually found on well-drained sites; tolerates some moisture. Wood used for furniture, tool handles, charcoal, firewood.
HICKORY, SHAGBARK *Carya ovata*	All	Mostly Piedmont & W. Md.	W - SP	20 ft.	Slow	Medium	Low	High: nuts eaten by squirrels, turkey, quail, deer.	Same as above.
HONEYLOCUST *Gleditsia triacanthos*	All	Statewide	W - SP	40 ft.	Fast	Low to Medium	Very Low	Low: seeds eaten by songbirds and squirrels.	Prefers well-drained sites, but will tolerate brief inundation. Drought-resistant and somewhat tolerant of salinity. Fragrant white flowers attract bees and other pollinators.
HOP-HORNBEAM *Ostrya virginiana*	All	Mostly Piedmont & W. Md.	W - SP	20 ft.	Slow	Medium	Low	Medium: seeds eaten by songbirds, turkey, grouse, squirrels; browsed by deer, rabbits.	Occurs as an understory tree in moist woods and on rocky slopes. Produces hop-like, papery seed clusters.
HORNBEAM, AMERICAN *Carpinus caroliniana*	All	Statewide; less common on the lower Coastal Plain	MW - P	20 ft.	Slow	Medium	Low	Medium: seeds eaten by songbirds, turkey, grouse, squirrels; browsed by deer, rabbits, beaver.	Understory tree in woodlands; may be multi-stemmed. Prefers moist soil and partial shade.
LOCUST, BLACK *Robinia pseudoacacia*	All	Statewide; esp. common in W. Md.	W - MW	40 ft.	Fast	Low to Medium	Very Low	Low: seeds eaten by songbirds and squirrels.	Spreads readily; seeds freely and suckers. Nitrogen fixing. Fragrant white flowers attract bees and other pollinators. Flowers are poisonous if eaten by livestock.
MAGNOLIA, SWEETBAY *Magnolia virginiana*	6b, 7a, 7b, 8a	Coastal Plain	SP - P	30 ft.	Mod.	Medium	Low to Medium	Medium: seeds eaten by songbirds and squirrels; browsed by deer.	Considered a small tree or shrub. May be evergreen in mild winters. Creamy white flowers up to 3" diameter. Host plant for three species of swallowtail butterfly larvae.
MAPLE, RED *Acer rubrum*	All	Statewide	W - P	40 ft.	Fast	Medium to High	Low	Medium: seeds eaten by ducks, gamebirds, songbirds, squirrels; browsed by deer.	Abundant seed produced in the spring. Red fall color and blooms. May provide an early source of pollen for bees.

TABLE 4.2: Selected Characteristics of Deciduous Trees

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
MAPLE, SILVER *Acer saccharinum*	All	Statewide; less common on Coastal Plain & at higher elevations of W. Md.	SP - P	45 ft.	Fast	Medium to High	Low	Medium: seeds eaten by ducks, gamebirds, songbirds, squirrels; browsed by deer.	Naturally occurring on streambanks and floodplains. Good source of woody debris for riparian systems. Roots can be aggressive. Abundant seed produced in the spring. May provide an early source of pollen for bees.
MOUNTAIN ASH, AMERICAN *Sorbus americana*	5b, 6a, 6b	Western Maryland	W - SP	20 ft.	Slow	Medium to High	Low	High: fruits eaten by turkey, grouse, songbirds, squirrels; browsed by deer.	Considered a small tree or shrub. Usually short-lived; prefers cool, moist sites. Creamy white flowers attract pollinators. Berries are blue-black.
MULBERRY, RED *Morus rubra*	All	Statewide	W - SP	35 ft.	Mod.	Medium	Low	High: fruits eaten by songbirds, squirrels, and other mammals.	Occurs in rich, moist woods and along field edges. Produces numerous, large, reddish-purple fruits that can be messy when fallen.
NANNYBERRY *Viburnum lentago*	5b, 6a, 6b	Mostly Western Maryland	MW - P	25 ft.	Slow	High	Low	Medium: fruits eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	Considered a small tree or shrub. Naturally occurring on streambanks, floodplains, and other wet areas. Often suckers. Creamy white flowers attract pollinators. Berries are blue-black.
OAK, BLACK *Quercus velutina*	All	Statewide; more common in Piedmont & W. Md	W - MW	35 ft.	Mod.	Medium to High	Low	High: acorns eaten by quail, turkey, grouse, squirrels, and deer.	Prefers moist, well-drained sites, but tolerates drier conditions.
OAK, BLACKJACK *Quercus marilandica*	6b, 7a, 7b, 8a	Mostly Coastal Plain & Piedmont	W - MW	30 ft.	Mod.	Medium to High	Low	High: same as above.	Occurs on dry, sandy or shaly soils, including serpentine barrens and back dunes.
OAK, CHERRYBARK *Quercus pagoda*	7a, 7b, 8a	Coastal Plain	SP - P	35 ft.	Mod.	Medium to High	Low	High: same as above.	Occurs in moist, wooded floodplains and wetlands.
OAK, CHESTNUT *Quercus montana (Quercus prinus)*	All	Mostly Piedmont & W. Md.; infrequent on Coastal Plain	W - MW	35 ft.	Mod.	Medium to High	Low	High: same as above.	Grows well on dry, rocky, or gravelly soils.

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Plant Names	Plant Hardiness Zones [1/]	Natural Distribution in Maryland [1/]	Soil Drainage Class [2/]	Height at 20 Years	Growth Rate [3/]	Density [4/] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
OAK, CHINQUAPIN *Quercus muehlenbergii*	6a, 6b, 7a, 7b, 8a	Mostly Allegany & Washington Cos.; uncommon	W - MW	35 ft.	Mod.	Medium to High	Low	High: acorns eaten by quail, turkey, grouse, squirrels, and deer.	Under-used, native tree. Usually found on dry, limestone outcrops.
OAK, NORTHERN RED *Quercus rubra*	All	Mostly Piedmont & W. Md.; uncommon on Coastal Plain	W - SP	35 ft.	Mod.	Medium to High	Low	High: same as above.	Excellent red fall color. Tolerates urban conditions.
OAK, OVERCUP *Quercus lyrata*	6a, 6b, 7a, 7b, 8a	Mostly Patuxent River valley & Charles Co.; uncommon	SP - P	30 ft.	Mod.	Medium to High	Low	High: same as above.	Important lumber tree. Withstands flooding and prolonged inundation.
OAK, PIN *Quercus palustris*	All	Statewide, except in Garrett Co.	MW - P	40 ft.	Fast	High	Medium	High: same as above.	Bronze or red fall foliage. Widely planted as an ornamental. Produces small acorns.
OAK, POST *Quercus stellata*	All	Statewide, except in Garrett Co.	W - SP	30 ft.	Mod.	Medium to High	Low	High: same as above.	Often occurs on dry ridges, including shale barrens and serpentine barrens. Also found on moist sites at lower elevations.
OAK, SOUTHERN RED *Quercus falcata*	7a, 7b, 8a	Mostly Coastal Plain	W - SP	35 ft.	Mod.	Medium to High	Low	High: same as above.	Excellent red fall color. Tolerates poor, dry soil.
OAK, SWAMP CHESTNUT (BASKET OAK) *Quercus michauxii*	6a, 6b, 7a, 7b, 8a	Mostly Coastal Plain; infrequent elsewhere	SP - P	35 ft.	Mod.	Medium to High	Low	High: same as above.	Naturally occurring on floodplains and other wet areas. Important lumber tree.
OAK, SWAMP WHITE *Quercus bicolor*	All	Mostly Coastal Plain	SP - P	30 ft.	Mod.	Medium to High	Low	High: same as above.	Good choice for wet sites. Important lumber tree. Requires acid soils.
OAK, WATER *Quercus nigra*	6b, 7a, 7b, 8a	Mostly Lower Eastern Shore	SP - P	30 ft.	Mod.	Medium to High	Low	High: same as above.	Naturally occurring on floodplains and other wet areas, but can tolerate a wide range of conditions, including well-drained uplands. Produces small acorns.
OAK, WHITE *Quercus alba*	All	Statewide	W - SP	25 ft.	Slow	Medium to High	Low	High: same as above.	Variable fall color, stately tree. Important lumber tree.

TABLE 4.2: Selected Characteristics of Deciduous Trees

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
OAK, WILLOW *Quercus phellos*	6b, 7a, 7b, 8a	Mostly Coastal Plain	MW - P	60 ft.	Fast	Medium to High	Low	High: acorns eaten by quail, turkey, grouse, squirrels, and deer.	Frequently used as an ornamental planting. Produces small acorns. Red fall color.
OSAGE-ORANGE *Maclura pomifera*	All	Introduced: native to Midwestern U.S.	W - SP	20 ft.	Slow	High	Low	Low: seeds eaten quail and squirrels.	Adapted to a wide range of soil and site conditions. Trunk is usually short and divides into several prominent limbs. Fruits are messy, so select male plants. 'White Shield' may be the most thorn-free cultivar.
PAWPAW *Asimina triloba*	6a, 6b, 7a, 7b, 8a	Statewide; infrequent	MW - P	25 ft.	Slow	Medium	Low	High: important food for fox, raccoon, opossum; also turkey, songbirds, deer, and other mammals.	Suckers and forms colonies. Purple flowers; large yellow fruits. Host plant for zebra swallowtail larvae.
PECAN *Carya illinoinensis*	All	Introduced; native to south-central U.S.	W - SP	35 ft.	Mod.	High	Low	High: nuts eaten by squirrels, turkey, quail, deer; browsed by deer.	Prefers moist, well-drained sites. Numerous cultivars are available for nut production.
PERSIMMON, COMMON *Diospyros virginiana*	All	Mostly Coastal Plain and Piedmont	E - P	25 ft.	Slow	Medium	Low	High: important food for fox, raccoon, opossum; also turkey, songbirds, deer, and other mammals.	Slow growing tree. Adaptable to a wide range of conditions. Attracts pollinators. Produces edible fruit.
PLUM, AMERICAN *Prunus americana*	All	Statewide	W - SP	20 ft.	Slow	High	Medium	High: fruits eaten by songbirds, grouse, turkey, quail; browsed by rabbits and deer.	Small tree or shrub, with thorny stems. Prefers full sun and mesic moisture conditions. Can sucker and form thickets. Provides cover for wildlife and attracts pollinators.
POPLAR, HYBRID *Populus deltoides x nigra* 'Spike'	All	Introduced; hybrid of U.S. and European species	MW -SP	40 ft.	Fast	Medium	Low	Unknown. Presumably similar to other species of *Populus*.	Sterile hybrid.
POPLAR, TULIP *Liriodendron tulipifera*	All	Statewide	W - SP	40 ft.	Fast	Medium	Low	Low: seeds eaten by squirrels and songbirds; seedlings browsed by deer.	Flowers produce abundant nectar, much used by bees. Dropped flowers and fruits can be messy. Tends to be weak-wooded; not recommended near buildings. Important lumber tree.

TABLE 4.2: Selected Characteristics of Deciduous Trees

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
REDBUD *Cercis canadensis*	All	Mostly Piedmont & W. Md.; infrequent elsewhere	MW -SP	20 ft.	Slow	Medium	Low	Low: seeds eaten by quail, pheasants, and deer.	Nitrogen-fixing. Bright pink flowers, appearing in early spring before the leaves, provide an early source of nectar/pollen for bees and other insects. Useful as an ornamental.
REDWOOD, DAWN *Metasequoia glyptostroboides*	All	Introduced; native to China	MW - P	35 ft.	Mod.	High	Medium	Low. Presumably similar to bald cypress.	Prefers moist soil but will tolerate drier sites. Needle-leaved deciduous tree; similar in appearance to bald cypress. Sometimes planted as an ornamental.
SASSAFRAS *Sassafras albidum*	All	Statewide; infrequent at higher elevations of Western Maryland	W - MW	20 ft.	Slow	Medium	Low	Medium: fruits eaten by songbirds, quail, turkey, and squirrels. Browsed by deer and rabbits.	Small tree; forms dense thickets by suckering. Greenish-yellow flowers are pollinated by small bees and other insects. Host plant for spicebush and tiger swallowtail larvae, as well as several species of moths.
SERVICEBERRY, CANADIAN *Amelanchier canadensis*	All	Mostly Coastal Plain	MW - P	20 ft.	Slow	High	Low	High: fruits eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	Small tree or shrub; usually multi-stemmed. Showy white flowers provide an early spring food source for bees, butterflies, and other pollinators. Also a food source for several species of butterfly and moth larvae. Produces purple-black fruits.
SERVICEBERRY, COMMON *Amelanchier arborea*	All	Statewide	W - P	20 ft.	Slow	High	Low	High: fruits eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	Small tree or shrub; single or multi-stemmed. Tolerates a wide range of moisture conditions. Other characteristics similar to Canadian serviceberry.
SERVICEBERRY, SMOOTH *Amelanchier laevis*	All	Mostly Piedmont and W. Md.	W - SP	20 ft.	Slow	Medium	Low	High: fruits eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	Small tree or shrub; usually multi-stemmed. Other characteristics similar to Canadian serviceberry.
SWEETGUM *Liquidambar styraciflua*	6b, 7a, 7b, 8a	Mostly Coastal Plain	MW - P	40 ft.	Fast	Medium	Low	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. Volunteers readily on wet Coastal Plain soils.

TABLE 4.2: Selected Characteristics of Deciduous Trees

Plant Names	Plant Hardiness Zones [1/]	Natural Distribution in Maryland [1/]	Soil Drainage Class [2/]	Height at 20 Years	Growth Rate [3/]	Density [4/] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
SYCAMORE *Platanus occidentalis*	All	Statewide; infrequent at higher elevations of Western Maryland	MW - P	65 ft.	Fast	Medium to High	Low	Low: seeds eaten by songbirds and squirrels.	Naturally occurring on streambanks and floodplains. Unique peeling bark, fast growth rate. Susceptible to anthracnose; mix with other species for disease control. Constantly drops leaves, twigs, and fruits. Good den tree.
TUPELO, SWAMP (SWAMP BLACK GUM) *Nyssa biflora*	6a, 6b, 7a, 7b, 8a	Eastern Shore	SP - P	35 ft.	Mod.	Medium to High	Low	Medium: fruits eaten by squirrels, quail, turkey, and songbirds. Browsed by deer.	Naturally occurring on streambanks, floodplains, and bottomland swamps. Foliage turns bright red in early fall.
WALNUT, BLACK *Juglans nigra*	All	Mostly Piedmont & W. Md.	MW -SP	40 ft.	Fast	Low	Low	Medium: nuts eaten by squirrels.	Very important lumber tree. Valuable for furniture and nut production. Nuts are large and sweet, with thick, hard shells; nuts are not easily accessible as food for most wildlife (except squirrels). Black walnut can be allelopathic to other plants.
WILLOW, BLACK *Salix nigra*	All	Statewide	SP -P	50 ft.	Fast	Medium	Low	Medium: browsed by grouse, beaver, and deer.	Naturally occurring on streambanks and floodplains. Can be aggressive and weedy. Flowers provide an early source of nectar/pollen in the spring for bees.
WILLOW, HYBRID *Salix matsudana x alba* 'Austree'	All	Introduced; hybrid of Chinese and European species	W - P	60 ft.	Very Fast	Medium to High	Medium	Unknown. Presumably similar to other willows.	Sterile hybrid. Due to its extremely fast growth (>3 ft/yr), can provide visual screen in 1 – 2 years. Dense branch structure.
WILLOW, PURPLEOSIER *Salix purpurea* 'Streamco'	All	Introduced from Europe	MW - P	20 ft.	Fast	Medium to High	Medium	Low: browsed by deer, beaver, and rabbits.	Non-invasive small tree or shrub; usually multi-stemmed. 'Streamco' is a male clone, does not root sucker, and does not spread readily beyond the planting site.

Notes for this table are on Page 81.

TABLE 4.3: Recommended Evergreen Trees for Selected Uses (see Table 4.4 for detailed species information)

Plant Names	Region [1/]			Moisture [2/]			Native to MD	Habitat Use Characteristics [3/]								Hedgerows and Windbreaks [4/]		Wetlands (surface saturation/ infrequent inundation)	Wetlands (surface saturation/ frequent or prolonged inundation)
								Cover		Fruit/Seed Consumption			Pollinator Food						
	Mountains	Piedmont	Coastal Plain	Dry Sites	Mesic Sites	Wet Sites		Nesting/ Resting	Protection	Wildlife (H)	Wildlife (M)	Humans	Nectar/ Pollen	Foliage	Toxic to Livestock	Wildlife Habitat	Barriers/ Screens		
ARBORVITAE *Thuja occidentalis*	■	■		■	■	■	■	■	■								■		
ARBORVITAE *Thuja plicata x standishii* 'Green Giant'	■	■	■	■	■			■	■								■		
CEDAR, ATLANTIC WHITE *Chamaecyparis thyoides*			■		■	■	■	■	■		■						■		■
CEDAR, EASTERN RED *Juniperus virginiana*	■	■		■	■		■	■	■							■	■		
CYPRESS, LEYLAND *x Cupressocyparis leylandii*	■	■	■	■	■			■	■								■		
FIR, DOUGLAS *Pseudotsuga menziesii*	■	■		■	■		■	■	■								■		
HEMLOCK, EASTERN *Tsuga canadensis*	■	■		■	■		■	■	■		■						■	■	
HOLLY, AMERICAN *Ilex opaca*			■	■	■	■	■	■	■		■					■	■	■	
PINE, AUSTRIAN *Pinus nigra*	■	■	■	■	■	■		■	■								■		
PINE, LOBLOLLY *Pinus taeda*			■		■	■	■	■	■		■			■			■	■	
PINE, PITCH *Pinus rigida*	■	■		■	■		■	■	■		■			■			■		
PINE, VIRGINIA *Pinus virginiana*	■	■	■	■	■		■	■	■		■			■			■		
PINE, WHITE *Pinus strobus*	■			■	■		■	■	■		■			■			■		
SPRUCE, NORWAY *Picea abies*	■	■	■	■	■			■	■								■		
SPRUCE, WHITE *Picea glauca*	■	■		■	■			■	■		■			■			■		

Notes for this table are on Page 80.

TABLE 4.4: Selected Characteristics of Evergreen Trees

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
ARBORVITAE *Thuja occidentalis*	All	Western Maryland, along the Potomac River	W - P	25 ft.	Slow	Very High	Very High	Low: browsed by deer.	Frequently planted statewide as an ornamental. Prefers moist, well-drained soil, but tolerates a wide range of conditions. Prone to bagworms.
ARBORVITAE *Thuja plicata x standishii* 'Green Giant'	All	Introduced; hybrid of Western U.S. and Japanese species	W - MW	40 ft.	Fast	Very High	Very High	Low: browsed by deer.	Prefers well-drained soil, but tolerates a wide range of conditions. Bagworms are potential pests.
CEDAR, ATLANTIC WHITE *Chamaecyparis thyoides*	All	Lower Eastern Shore; uncommon	SP - P	20 ft.	Slow	Very High	Very High	Low: seeds eaten by songbirds; browsed by deer.	Cannot compete with hardwoods; best planted in solid stands.
CEDAR, EASTERN RED *Juniperus virginiana*	All	Mostly Piedmont & Western Maryland	W - SP	20 ft.	Slow	Very High	Very High	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.
CYPRESS, LEYLAND *x Cupressocyparis leylandii*	6a, 6b, 7a, 7b, 8a	Introduced; not native to U.S.	W - SP	40 ft.	Very Fast	Very High	Very High	Low: browsed by deer.	This is a hybrid of Cupressus macrocarpa and Chamaecyparis nootkatensis. Adaptable to adverse sites; growth is best on good sites. Prone to bagworms, canker, and windthrow. Use in multiple-row plantings to minimize windthrow. Green Giant arborvitae is a preferred alternative to Leyland cypress.
FIR, DOUGLAS *Pseudotsuga menziesii*	5b, 6a, 6b	Introduced; native to Western U.S.	W - MW	40 ft.	Mod.	Medium	Medium	Low: browsed by deer.	Prefers deep, moist, well-drained soils. Often planted for Christmas trees.
HEMLOCK, EASTERN *Tsuga canadensis*	All	Mostly Piedmont & Western Maryland	W - SP	20 ft.	Slow	Very High	Very High	Medium: seeds eaten by songbirds and squirrels; browsed by deer.	Often planted as an ornamental. Can become infested with hemlock woolly adelgid, a serious insect pest.

TABLE 4.4: Selected Characteristics of Evergreen Trees

Plant Names	Plant Hardiness Zones [1/]	Natural Distribution in Maryland [1/]	Soil Drainage Class [2/]	Height at 20 Years	Growth Rate [3/]	Density [4/] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
HOLLY, AMERICAN *Ilex opaca*	6a, 6b, 7a, 7b, 8a	Mostly Coastal Plain	W - P	20 ft.	Slow	High	High	Medium: fruits eaten by songbirds, quail, and squirrels.	Need male and female plants for fruit production. Shade tolerant. In hedgerows and windbreaks, can be planted in one row, and add one or more other rows of faster-growing species.
PINE, AUSTRIAN *Pinus nigra*	All	Introduced; not native to U.S.	E - P	35 ft.	Mod.	Low to Medium	Low to Medium	Unknown. Presumably similar to other pines.	Frequently planted statewide as an ornamental. Prefers moist, well-drained soil, but tolerates a wide range of conditions. Withstands dryness better than other pines. Fairly salt tolerant.
PINE, LOBLOLLY *Pinus taeda*	6b, 7a, 7b, 8a	Mostly Coastal Plain	MW - P	45 ft.	Fast	Low to Medium	Low to Medium	Medium: seeds eaten by songbirds, quail, turkey; browsed by deer and rabbits.	Self-prunes lower limbs, so best suited in a multiple-row planting.
PINE, PITCH *Pinus rigida*	5b, 6a, 6b	Mostly Piedmont & W. Md.	W - SP	30 ft.	Mod.	Low to Medium	Low to Medium	Medium: seeds eaten by songbirds, quail, grouse, turkey; browsed by deer and rabbits.	Tolerant of dry, rocky, sandy soils. Mature trees are resistant to fire. Will reproduce from stump sprouts.
PINE, VIRGINIA *Pinus virginiana*	All	Statewide	W - MW	30 ft.	Mod.	Low to Medium	Low to Medium	Medium: same as above.	Can be used for pulpwood. Tolerant of adverse site conditions.
PINE, WHITE *Pinus strobus*	All	Mostly Western Maryland	W - MW	40 ft.	Fast	Low to Medium	Low to Medium	Medium: same as above.	Frequently planted statewide as an ornamental.
SPRUCE, NORWAY *Picea abies*	All	Introduced; not native to U.S.	W - MW	35 ft.	Mod.	High	High	Unknown. Presumably similar to white spruce.	Fast growth rate when young, slows down with age. Prefers moderately moist, well-drained soil. Often planted as an ornamental.
SPRUCE, WHITE *Picea glauca*	5b, 6a, 6b	Introduced; native to Northern U.S.	W - MW	30 ft.	Mod.	High	High	Medium: seeds eaten by songbirds, grouse; browsed by deer and rabbits.	Good ornamental and shade tree. Tolerates heat, drought, and wind better than most spruces.

Notes for this table are on Page 81.

TABLE 4.5: Recommended Shrubs and Woody Vines for Selected Uses (see Table 4.6 for detailed species information)

Plant Names	Region [1/]			Moisture [2/]			Native to MD	Habitat Use Characteristics [3/]								Hedgerows and Windbreaks [4/]		Wetlands (surface saturation/ infrequent inundation)	Wetlands (surface saturation/ frequent or prolonged inundation)
								Cover		Fruit/Seed Consumption			Pollinator Food						
	Mountains	Piedmont	Coastal Plain	Dry Sites	Mesic Sites	Wet Sites		Nesting/ Resting	Protection	Wildlife (H)	Wildlife (M)	Humans	Nectar/ Pollen	Foliage	Toxic to Livestock	Wildlife Habitat	Barriers/ Screens		
ABELIA, GLOSSY *Abelia x grandiflora*	■	■	■	■	■			■	■				■				■		
ALDER, SMOOTH *Alnus serrulata*	■	■	■		■	■	■	■	■	■						■	■		■
ALDER, SPECKLED *Alnus incana ssp. rugosa (Alnus rugosa)*	■				■	■	■	■	■	■						■	■		■
ARROWWOOD *Viburnum dentatum*	■	■	■	■	■	■	■	■	■	■						■	■	■	
AZALEA, SWAMP *Rhododendron viscosum*	■	■	■		■	■	■	■					■		■	■		■	
BARBERRY, AMERICAN *Berberis canadensis*	■			■	■		■	■	■			■	■			■	■		
BAYBERRY, NORTHERN *Morella pensylvanica (Myrica pensylvanica)*			■	■	■	■	■	■	■	■						■	■	■	
BEAUTYBERRY, AMERICAN *Callicarpa americana*			■	■	■		■	■	■	■			■			■	■		
BLACKBERRY, ALLEGHENY *Rubus allegheniensis*	■	■		■	■		■	■	■	■		■	■			■	■		
BLACKBERRY, SAND *Rubus cuneifolius*			■	■	■		■	■	■	■		■	■			■			
BLACK-HAW *Viburnum prunifolium*	■	■	■	■	■		■	■	■	■		■				■	■		
BLUEBERRY, HIGHBUSH *Vaccinium corymbosum*			■		■	■	■	■	■	■		■	■	■		■	■	■	
BLUEBERRY, LOWBUSH *Vaccinium angustifolium*	■	■		■	■		■	■	■	■		■	■	■		■			
BUSH, HIGH TIDE (GROUNDSEL) *Baccharis halimifolia*			■		■	■	■	■	■								■	■	
BUSH, HIGH TIDE (MARSH-ELDER) *Iva frutescens*			■		■	■	■	■	■								■	■	

TABLE 4.5: Recommended Shrubs and Woody Vines for Selected Uses (see Table 4.6 for detailed species information)

Plant Names	Region [1/]			Moisture [2/]			Native to MD	Habitat Use Characteristics [3/]								Hedgerows and Windbreaks [4/]		Wetlands (surface saturation/ infrequent inundation)	Wetlands (surface saturation/ frequent or prolonged inundation)
								Cover		Fruit/Seed Consumption			Pollinator Food						
	Mountains	Piedmont	Coastal Plain	Dry Sites	Mesic Sites	Wet Sites		Nesting/ Resting	Protection	Wildlife (H)	Wildlife (M)	Humans	Nectar/ Pollen	Foliage	Toxic to Livestock	Wildlife Habitat	Barriers/ Screens		
BUTTONBUSH *Cephalanthus occidentalis*	■	■	■		■	■	■	■	■				■			■	■		■
CHOKEBERRY, BLACK *Aronia melanocarpa*	■	■	■	■	■	■	■	■	■		■	■	■			■	■	■	
CHOKEBERRY, RED *Aronia arbutifolia*	■	■	■	■	■	■	■	■	■		■	■	■			■	■	■	
CRANBERRYBUSH, AMERICAN *Viburnum opulus* var.*americanum (Viburnum trilobum)*	■				■	■	■	■	■		■	■				■	■	■	
DEWBERRY, BRISTLY *Rubus hispidus*	■	■	■			■	■	■			■	■		■		■		■	
DEWBERRY, COMMON *Rubus flagellaris*	■	■	■	■	■		■	■			■	■	■						
DOGWOOD, GRAY *Cornus racemosa*	■	■		■	■		■	■	■	■			■			■	■		
DOGWOOD, REDOSIER *Cornus sericea*	■	■	■		■	■	■	■	■	■			■			■	■		■
DOGWOOD, SILKY *Cornus amomum*	■	■	■		■	■	■	■	■	■			■			■	■	■	
DOGWOOD, STIFF *Cornus foemina*			■		■	■	■	■	■	■			■			■	■	■	
ELDERBERRY *Sambucus nigra* ssp. *canadensis* (*Sambucus canadensis)*	■	■	■		■	■	■	■	■	■		■	■		■	■	■	■	
EUONYMUS, SPREADING *Euonymus kiautschovicus* 'Manhattan'	■	■	■	■	■			■	■				■				■		
FETTERBUSH *Eubotrys racemosa (Leucothoe racemosa)*			■		■	■	■	■	■						■		■	■	
GOOSEBERRY, APPALACHIAN *Ribes rotundifolium*	■	■		■	■		■	■	■		■	■	■	■		■	■		

TABLE 4.5: Recommended Shrubs and Woody Vines for Selected Uses (see Table 4.6 for detailed species information)

Plant Names	Region [1/]			Moisture [2/]			Native to MD	Habitat Use Characteristics [3/]								Hedgerows and Windbreaks [4/]		Wetlands (surface saturation/ infrequent inundation)	Wetlands (surface saturation/ frequent or prolonged inundation)
								Cover		Fruit/Seed Consumption			Pollinator Food						
	Mountains	Piedmont	Coastal Plain	Dry Sites	Mesic Sites	Wet Sites		Nesting/ Resting	Protection	Wildlife (H)	Wildlife (M)	Humans	Nectar/ Pollen	Foliage	Toxic to Livestock	Wildlife Habitat	Barriers/ Screens		
GOOSEBERRY, PRICKLY *Ribes cynosbati*	■	■		■	■		■	■	■		■	■	■	■		■			
GRAPE, FOX *Vitis labrusca*	■	■	■	■	■		■	■	■	■		■				■			
GRAPE, MUSCADINE *Vitis rotundifolia*			■		■	■	■	■	■	■		■				■		■	
GRAPE, RIVERBANK *Vitis riparia*	■	■	■			■	■	■	■	■		■				■		■	
HAZELNUT (AMERICAN FILBERT) *Corylus americana*	■	■	■	■	■		■	■	■	■		■				■	■		
HAZELNUT, BEAKED *Corylus cornuta*	■	■	■	■	■		■	■	■	■		■				■	■		
HOLLY, JAPANESE *Ilex crenata* 'Steeds'	■	■	■		■			■	■								■		
HOLLY, NELLIE STEVENS *Ilex cornuta x aquifolium* 'Nellie Stevens'	■	■	■		■			■	■								■		
HUCKLEBERRY, BLACK *Gaylussacia baccata*	■	■	■	■	■	■	■	■	■	■		■	■	■		■		■	
HUCKLEBERRY, BLUE (DANGLEBERRY) *Gaylussacia frondosa*	■	■	■	■	■	■	■	■	■	■		■	■	■		■		■	
INDIGO, FALSE (INDIGO BUSH) *Amorpha fruticosa*	■	■	■	■	■	■	■	■	■		■		■			■	■	■	
INKBERRY *Ilex glabra*			■		■	■	■	■	■	■						■	■		■
MEADOWSWEET, WHITE *Spiraea alba*	■	■	■		■	■	■	■	■		■		■	■		■	■	■	
NINEBARK, COMMON *Physocarpus opulifolius*	■	■	■	■	■	■	■	■	■		■		■			■	■	■	
PEPPERBUSH, SWEET *Clethra alnifolia*			■		■	■	■	■	■				■			■	■	■	

TABLE 4.5: Recommended Shrubs and Woody Vines for Selected Uses (see Table 4.6 for detailed species information)

Plant Names	Region [1/]			Moisture [2/]			Native to MD	Habitat Use Characteristics [3/]								Hedgerows and Windbreaks [4/]		Wetlands (surface saturation/ infrequent inundation)	Wetlands (surface saturation/ frequent or prolonged inundation)
								Cover		Fruit/Seed Consumption			Pollinator Food						
	Mountains	Piedmont	Coastal Plain	Dry Sites	Mesic Sites	Wet Sites		Nesting/ Resting	Protection	Wildlife (H)	Wildlife (M)	Humans	Nectar/ Pollen	Foliage	Toxic to Livestock	Wildlife Habitat	Barriers/ Screens		
POSSUM-HAW *Viburnum nudum*			■		■	■	■	■	■		■	■				■	■	■	
RAISIN, WILD *Viburnum nudum* var. *cassinoides*	■				■	■	■	■	■		■	■				■	■	■	
RASPBERRY, AMERICAN RED *Rubus idaeus*	■				■		■	■	■	■		■	■			■	■		
RASPBERRY, BLACK *Rubus occidentalis*	■	■	■	■	■		■	■	■	■		■	■			■	■		
ROSE, CAROLINA *Rosa carolina*	■	■	■	■	■		■	■	■	■		■	■			■			
ROSE, SWAMP *Rosa palustris*	■	■	■		■	■	■	■	■	■		■	■			■	■		■
ROSE, VIRGINIA *Rosa virginiana*	■	■	■	■	■		■	■	■	■		■	■			■	■		
SPICEBUSH *Lindera benzoin*	■	■	■		■	■	■	■	■	■		■		■		■	■	■	
STEEPLEBUSH *Spiraea tomentosa*	■	■	■		■	■	■	■	■				■	■		■	■	■	
SWEETSPIRE, VIRGINIA *Itea virginica*			■		■	■	■	■	■				■			■	■	■	
VIBURNUM, MAPLE-LEAF *Viburnum acerifolium*	■			■	■		■	■	■		■	■				■	■		
WAXMYRTLE, SOUTHERN *Morella cerifera (Myrica cerifera)*			■	■	■	■	■	■	■	■						■	■	■	
WINTERBERRY *Ilex verticillata*	■	■	■		■	■	■	■	■	■						■	■	■	
WITCH-HAZEL *Hamamelis virginiana*	■	■	■	■	■		■	■	■				■			■	■		

Notes for this table are on Page 80.

TABLE 4.6: Selected Characteristics of Shrubs and Woody Vines

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
ABELIA, GLOSSY *Abelia x grandiflora*	All	Introduced; not native to U.S.	W - SP	6 ft.	Fast	High	Medium	Low: generally not browsed by wildlife.	Semi-evergreen foliage. Stems may be killed to the ground in cold winters. No serious pests or diseases. Many cultivars are available with different height and width characteristics. Rosy-white flowers attract pollinators.
ALDER, SMOOTH *Alnus serrulata*	All	Statewide; less common on Coastal Plain	SP - P	10 ft.	Fast	Medium	Low	High: seeds eaten by ducks, quail, doves; browsed by deer, beaver.	Nitrogen-fixing. Attractive catkins. Provides good cover for woodcock.
ALDER, SPECKLED *Alnus incana* ssp. *rugosa (Alnus rugosa)*	5b, 6a, 6b	Only in Western Maryland; uncommon	SP - P	15 ft.	Fast	Medium to High	Low to Medium	High: seeds eaten by ducks, quail, doves; browsed by deer, beaver.	Nitrogen-fixing. Attractive catkins. Provides good cover for woodcock.
ARROWWOOD *Viburnum dentatum*	All	Statewide	W - P	10 ft.	Fast	Medium	Low	High: fruits eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	Suckers freely; wood used to make arrows. White flowers, bluish-black berries. Attracts pollinators.
AZALEA, SWAMP *Rhododendron viscosum*	All	Statewide	SP - P	8 ft.	Slow	Low	Low	Low: nectar attractive to hummingbirds; plants browsed by deer.	Naturally occurring in shrub swamps, forested wetlands, and on streambanks. Showy pink-white tubular flowers attract pollinators.
BARBERRY, AMERICAN *Berberis canadensis*	5b, 6a, 6b	Western Maryland; uncommon	W - MW	6 ft.	Mod.	High	Medium	Low: fruits eaten by pheasant and songbirds.	Occurs in dry forests and open fields. Spiny stems and branches. Similar in appearance to the frequently planted Japanese barberry *(B. thunbergii)*, which is listed as an invasive species. Small yellow flowers attract bees and other pollinators. Red berries often persist until spring.
BAYBERRY, NORTHERN *Morella pensylvanica (Myrica pensylvanica)*	6b, 7a, 7b, 8a	Coastal Plain	W - P	10 ft.	Mod.	Medium	Low	High: fruits eaten by quail, songbirds. Browsed by deer.	Need male and female plants for fruit production. Waxy berries may persist through winter. Salt tolerant (0-20 ppt.) Suckers to form colonies.

TABLE 4.6: Selected Characteristics of Shrubs and Woody Vines

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
BEAUTYBERRY, AMERICAN *Callicarpa americana*	7a, 7b, 8a	Coastal Plain; uncommon	W - SP	6 ft.	Mod.	High	Medium	High: fruits eaten by quail, songbirds, squirrels. Browsed by deer.	Occurs on woodland edges and in openings, thickets, and fence rows; intolerant of deep shade. Adapted to a wide range of upland sites. Attracts pollinators. Produces clusters of attractive, pink-purple berries along the stems.
BLACKBERRY, ALLEGHENY *Rubus allegheniensis*	All	Mostly Piedmont and W. Md.	W - SP	6 ft.	Fast	High	Medium	High: fruits eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	Arching stems (canes) can develop into dense, thorny thickets. White flowers attract pollinators, and produce purplish black berries.
BLACKBERRY, SAND *Rubus cuneifolius*	7a, 7b, 8a	Mostly Coastal Plain	W - SP	3 ft.	Fast	High	Medium	High: fruits eaten by turkey, songbirds, squirrels; browsed by rabbits, deer.	Same as above.
BLACK-HAW *Viburnum prunifolium*	All	Statewide	W - SP	12 ft.	Fast	Medium	Low	High: fruits 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 *Vaccinium corymbosum*	All	Coastal Plain	MW - P	12 ft.	Mod.	Medium to High	Low to Medium	High: fruits eaten by songbirds, turkey, squirrel; browsed by deer, rabbits.	Prefers acid soils. Small white flowers attract bees.
BLUEBERRY, LOWBUSH *Vaccinium angustifolium*	All	Mostly Piedmont and W. Md.	W - SP	2 ft.	Mod.	Medium to High	Low to Medium	High: fruits eaten by songbirds, turkey, squirrel; browsed by deer, rabbits.	Same as above.
BUSH, HIGH TIDE (GROUNDSEL) *Baccharis halimifolia*	7a, 7b, 8a	Coastal Plain	MW - P	10 ft.	Mod.	Medium	Low	Low: minimal value for food; occasionally browsed by deer.	Usually in brackish and coastal marshes, above MHW. Salinity 0-15 ppt. Has fluffy white seeds. Male flowers & female flowers on separate plants. Prefers full sun.
BUSH, HIGH TIDE (MARSH-ELDER) *Iva frutescens*	7a, 7b, 8a	Coastal Plain	MW - P	10 ft.	Mod.	Medium	Low	Low: minimal value for food; occasionally browsed by deer.	Usually in brackish and coastal marshes, above MHW. Salinity 0-15 ppt. Prefers full sun.
BUTTONBUSH *Cephalanthus occidentalis*	6a, 6b, 7a, 7b, 8a	Statewide	SP - P	10 ft.	Mod.	Medium	Low	Low: seeds eaten by ducks and rails; browsed by deer.	Unusual, round white flowers. Tolerates extended periods of flooding and ponding. Prefers permanent saturation. Attracts butterflies and other insects.

TABLE 4.6: Selected Characteristics of Shrubs and Woody Vines

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
CHOKEBERRY, BLACK *Aronia melanocarpa*	All	Statewide; more common in Western Maryland	W – P	6 ft.	Mod.	Medium	Low	Medium: fruits eaten by songbirds, grouse, bear, squirrel; browsed by deer, rabbits.	White flowers in spring. Lush summer foliage. Black berries in late summer persist into winter. Colorful red foliage in fall. Suckers and forms thickets. Tolerant of a wide range of soil and moisture conditions. Attracts small bees.
CHOKEBERRY, RED *Aronia arbutifolia*	All	Statewide	W – P	10 ft.	Mod.	Medium	Low	Medium: fruits eaten by songbirds, grouse, bear, squirrel; browsed by deer, rabbits.	Similar to black chokeberry, but with red berries, and slightly taller and more upright growth habit. Attracts small bees.
CRANBERRYBUSH, AMERICAN *Viburnum opulus* var.*americanum* (*Viburnum trilobum*)	5b, 6a, 6b, 7a	Native to No. U.S.; probably occurs in W. Md.	MW -P	6 ft.	Slow	Medium	Low	Medium: fruits eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	Multi-stemmed shrub that does not form thickets by suckering. Bright red berries often persist throughout the winter. Sometimes planted as an ornamental.
DEWBERRY, BRISTLY *Rubus hispidus*	All	Statewide	SP – P	1 ft.	Fast	Medium	Low	High: berries eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	More like a vine than a shrub. Very low-growing, with long, trailing stems; in moist woods and wetlands. White flowers attract pollinators, and produce small, reddish-purple berries.
DEWBERRY, COMMON *Rubus flagellaris*	All	Statewide	W – MW	2 ft.	Fast	Medium	Low	High: fruits eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	More like a vine than a shrub. Mostly low, trailing stems (less than 1 foot tall), but flowering stems can be taller. White flowers attract pollinators, and produce small, reddish-purple berries.
DOGWOOD, GRAY *Cornus racemosa*	5b, 6a, 6b, 7a	Mostly Piedmont and Western Maryland	W – SP	6 ft.	Mod.	High	Medium	High: fruits eaten by songbirds, grouse, turkey, quail, squirrels; browsed by deer, rabbits.	Low growing, thickly branched shrub. Suckers and forms thickets. Not well adapted to the Coastal Plain. Beneficial for wildlife and pollinators.
DOGWOOD, REDOSIER *Cornus sericea*	All	Statewide; uncommon	MW - P	12 ft.	Mod.	Medium	Low	High: fruits eaten by songbirds, grouse, turkey, quail, squirrels; browsed by deer, rabbits.	Attractive red stem color. White flowers and fruit. Attracts pollinators.
DOGWOOD, SILKY *Cornus amomum*	All	Statewide; common on Coastal Plain & Piedmont	MW - P	10 ft.	Mod.	Medium to High	Low to Medium	High: fruits 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. Attracts pollinators.

TABLE 4.6: Selected Characteristics of Shrubs and Woody Vines

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
DOGWOOD, STIFF *Cornus foemina*	7a, 7b, 8a	Mostly Coastal Plain	MW - P	15 ft.	Mod.	Medium	Low	High: fruits eaten by songbirds, turkey, quail, squirrels; browsed by deer, rabbits.	Usually occurs in wetlands and on streambanks. Suckers and forms thickets. Moderately salt-tolerant. White flowers produce blue berries. Attracts pollinators.
ELDERBERRY *Sambucus nigra* ssp. *canadensis* (*Sambucus canadensis)*	All	Statewide	MW - P	8 ft.	Fast	Medium	Low	High: fruits eaten by songbirds, turkey, squirrels; browsed by deer, rabbits.	Large clusters of white flowers followed by purple berries; fast growth rate. Suckers freely. Attracts bees.
EUONYMUS, SPREADING *Euonymus kiautschovicus* 'Manhattan'	All	Introduced; not native to U.S.	W - SP	10 ft.	Mod.	High	High	Low: fruits eaten by songbirds; browsed by deer.	Semi-evergreen foliage that may be damaged in cold winters. Not as susceptible to scale as other euonymus. Attracts pollinators.
FETTERBUSH *Eubotrys racemosa* *(Leucothoe racemosa)*	6a, 6b, 7a, 7b, 8a	Mostly Coastal Plain; common	SP - P	12 ft.	Mod.	Medium to High	Low to Medium	Low: seeds eaten by songbirds; browsed by deer.	Small white flowers in drooping racemes. Tends to sucker and form thickets. Prefers permanent saturation.
GOOSEBERRY, APPALACHIAN *Ribes rotundifolium*	5b, 6a, 6b, 7a	Mostly Piedmont & W. Md.	W – MW	6 ft.	Mod.	High	Medium	Medium: fruits eaten by songbirds, grouse, turkey, squirrels; browsed by deer.	Stems may or may not have prickles. Gooseberries are alternate hosts of white pine blister rust; do not plant near white pines. Clusters of white, tubular flowers produce purple berries. Attracts bees and other pollinators.
GOOSEBERRY, PRICKLY *Ribes cynosbati*	5b, 6a, 6b, 7a	Mostly Piedmont & W. Md.	W – SP	4 ft.	Mod.	High	Medium	Medium: fruits eaten by songbirds, grouse, turkey, squirrels; browsed by deer.	Same as above, but with prickly stems.
GRAPE, FOX *Vitis labrusca*	All	Statewide	W – SP	20 ft. (in trees)	Fast	Medium	Low	High: fruits eaten by songbirds, grouse, turkey, squirrels; browsed by deer, rabbits.	Vine that climbs up tree trunks and sprawls over shrubs. Commonly found in thickets and fence rows, and along woodland edges.
GRAPE, MUSCADINE *Vitis rotundifolia*	7a. 7b, 8a	Mostly Coastal Plain	MW – P	20 ft. (in trees)	Fast	Medium	Low	High: fruits eaten by songbirds, turkey, squirrels; browsed by deer, rabbits.	Similar to above, but prefers moist to wet sites.

TABLE 4.6: Selected Characteristics of Shrubs and Woody Vines

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
GRAPE, RIVERBANK *Vitis riparia*	All	Statewide	SP – P	20 ft. (in trees)	Fast	Medium	Low	High: fruits eaten by songbirds, grouse, turkey, squirrels; browsed by deer, rabbits.	Vine that climbs up tree trunks and sprawls over shrubs. Commonly found in thickets and fence rows, and along woodland edges.
HAZELNUT (AMERICAN FILBERT) *Corylus americana*	All	Statewide	W - SP	10 ft.	Mod.	Medium	Low	Medium: seeds eaten by grouse, turkey, squirrels; browsed by deer, rabbits.	Thicket-forming. Good ornamental; not many diseases/pests. Monecious flowers (needs both male and female plants to produce nuts).
HAZELNUT, BEAKED *Corylus cornuta*	5a, 6a, 6b	Western Maryland	W - SP	15 ft.	Mod.	High	Medium	Medium: seeds eaten by grouse, turkey, squirrels; browsed by deer, rabbits.	Same as above.
HOLLY, JAPANESE *Ilex crenata* 'Steeds'	6a, 6b, 7a, 7b, 8a	Introduced; not native to U.S.	MW -SP	8 ft.	Fast	High	High	Low: fruits eaten by songbirds.	Evergreen. Need male and female plants for fruit production.
HOLLY, NELLIE STEVENS *Ilex cornuta x aquifolium* 'Nellie Stevens'	6a, 6b, 7a, 7b, 8a	Introduced; not native to U.S.	MW -SP	15 ft.	Fast	High	High	Low: fruits eaten by songbirds.	Evergreen. Need male and female plants for fruit production.
HUCKLEBERRY, BLACK *Gaylussacia baccata*	All	Statewide	W - P	3 ft.	Mod.	High	Medium	High: fruits eaten by songbirds, grouse, quail, turkey, squirrels; browsed by deer.	Overall appearance is very similar to highbush blueberry. Forms thickets. Berries are edible but seedier than blueberries. Small flowers attract bees and other pollinators.
HUCKLEBERRY, BLUE (DANGLEBERRY) *Gaylussacia frondosa*	All	Statewide; mostly on Coastal Plain	W - P	4 ft.	Mod.	High	Medium	High: fruits eaten by songbirds, grouse, quail, turkey, squirrels; browsed by deer.	Same as above.
INDIGO, FALSE (INDIGO BUSH) *Amorpha fruticosa*	All	Statewide; uncommon	W - P	6 ft.	Slow	Medium to High	Low	Medium: seeds eaten by quail, turkey, and doves; browsed by deer.	Nitrogen-fixing multi-stemmed shrub. Flowers in purple spikes during late spring; attracts pollinators. Tolerates a wide range of moisture conditions, from seasonal saturation to drought. Individual plants may have a limited life span (5-10 years), but naturally regenerate from seed.

TABLE 4.6: Selected Characteristics of Shrubs and Woody Vines

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
INKBERRY *Ilex glabra*	6a, 6b, 7a, 7b, 8a	Coastal Plain	SP - P	6 ft.	Slow	Medium	Low	High: fruits eaten by songbirds, quail, and squirrels.	Black fruits persist during the winter. Extensive rhizomes, often forms colonies. Prefers permanent saturation.
MEADOWSWEET, WHITE *Spiraea alba*	All	Statewide	SP - P	6 ft.	Mod.	High	Medium	Low: seeds eaten by songbirds; browsed by deer and rabbits.	Deciduous upright shrub. Prefers moist to wet sites. Clusters of white flowers in summer attract pollinators. Host plant for butterfly and moth larvae.
NINEBARK, COMMON *Physocarpus opulifolius*	All	Statewide	W - P	10 ft.	Slow	High	Medium	Medium: fruits eaten by songbirds.	Deciduous upright, spreading shrub. Adaptable to a wide range of soil and moisture conditions. Cultivars commonly used in landscape plantings. White flowers in spring attract pollinators.
PEPPERBUSH, SWEET *Clethra alnifolia*	All	Coastal Plain	MW - P	10 ft.	Mod.	Medium	Low	Low: seeds eaten by songbirds; browsed by deer.	Showy, fragrant white flower spikes in mid-summer, often when other flowers and nectar are less abundant. Many cultivars available. Attracts pollinators.
POSSUM-HAW *Viburnum nudum*	All	Mostly Coastal Plain	SP - P	12 ft.	Mod.	Medium	Low	Medium: fruits 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 *Viburnum nudum* var. *cassinoides*	All	Mostly Western Maryland	SP - P	8 ft.	Mod.	Medium	Low	Medium: fruits 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.
RASPBERRY, AMERICAN RED *Rubus idaeus*	All	Mostly Western Maryland	MW - SP	6 ft.	Fast	High	Medium	High: fruits eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	Arching stems (canes) can develop into dense, thorny thickets. White flowers attract pollinators, and produce red berries.
RASPBERRY, BLACK *Rubus occidentalis*	All	Statewide	W - SP	6 ft.	Fast	High	Medium	High: fruits eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	Arching stems (canes) can develop into dense, thorny thickets. White flowers attract pollinators, and produce black berries.

TABLE 4.6: Selected Characteristics of Shrubs and Woody Vines

Plant Names	Plant Hardiness Zones [1]	Natural Distribution in Maryland [1]	Soil Drainage Class [2]	Height at 20 Years	Growth Rate [3]	Density [4] -Summer	Density - Winter	Wildlife Food Value for Birds and Mammals	Remarks
ROSE, CAROLINA *Rosa carolina*	All	Statewide	W - MW	3 ft.	Mod.	High	Medium	High: fruits eaten by songbirds; browsed by deer.	Occurs on field edges and in pastures; forms thorny thickets. Pink flowers attract bees and other pollinators. Red fruits may remain for much of the winter.
ROSE, SWAMP *Rosa palustris*	All	Statewide; more common on Coastal Plain	SP - P	6 ft.	Mod.	Medium	Low	High: fruits eaten by songbirds; browsed by deer.	Prefers wetlands with permanent saturation and full sun; forms thorny thickets. Pink flowers attract bees and other pollinators. Red fruits may remain for much of the winter.
ROSE, VIRGINIA *Rosa virginiana*	All	Statewide	W - SP	6 ft.	Mod.	High	Medium	High: fruits eaten by songbirds; browsed by deer.	Occurs on field edges and in pastures; forms thorny thickets. Pink flowers attract bees and other pollinators. Red fruits may remain for much of the winter.
SPICEBUSH *Lindera benzoin*	All	Statewide	MW - P	12 ft.	Slow	Medium	Low	High: fruits eaten by songbirds (especially thrushes) and small mammals; browsed by rabbits, deer.	Fragrant leaves and twigs; yellow fall color. Bright red berries. Leaves are a main food source for larvae of spicebush and eastern tiger swallowtail butterflies, and prometheus moths.
STEEPLEBUSH *Spiraea tomentosa*	All	Statewide; more common on Coastal Plain	SP -P	6 ft.	Mod.	High	Medium	Low: seeds eaten by songbirds; browsed by deer and rabbits.	Deciduous upright shrub. Spreads by root suckering. Prefers moist to wet sites; acidic soils. Terminal clusters of pink flowers in summer attract pollinators. Host plant for butterfly and moth larvae.
SWEETSPIRE, VIRGINIA *Itea virginica*	6a, 6b, 7a, 7b, 8a	Coastal Plain	SP - P	8 ft.	Mod.	Medium	Low	Low: seeds eaten by songbirds; foliage and twigs not generally browsed by wildlife.	Small white flowers in elongated clusters up to 6 inches long. Prefers permanent saturation. Attracts pollinators.
VIBURNUM, MAPLE-LEAF *Viburnum acerifolium*	All	Mostly Western Maryland	W -SP	6 ft.	Slow	Medium	Low	High: fruits eaten by turkey, grouse, songbirds, squirrels; browsed by rabbits, deer.	Suckers freely. Yellow to red fall color; white flower clusters. Bright red berries.
WAXMYRTLE, SOUTHERN *Morella cerifera (Myrica cerifera)*	7a, 7b, 8a	Coastal Plain	W - P	10 ft.	Mod.	Medium	Medium	Medium: fruits eaten by quail, songbirds; browsed by deer.	Evergreen. Need male and female plants for fruit production. Salt tolerant (0-10 ppt).

TABLE 4.6: Selected Characteristics of Shrubs and Woody Vines									
Plant Names	**Plant Hardiness Zones [1]**	**Natural Distribution in Maryland [1]**	**Soil Drainage Class [2]**	**Height at 20 Years**	**Growth Rate [3]**	**Density [4] -Summer**	**Density - Winter**	**Wildlife Food Value for Birds and Mammals**	**Remarks**
WINTERBERRY *Ilex verticillata*	All	Statewide; less common on Coastal Plain	SP - P	10 ft.	Mod.	Medium to High	Low to Medium	Medium: fruits eaten by songbirds, quail, and squirrels.	Need male and female plants for fruit production. Bright red berries persist after leaves drop.
WITCH-HAZEL *Hamamelis virginiana*	All	Statewide; less common on Coastal Plain	W - SP	15 ft.	Slow	Medium	Low	Low: seeds eaten by grouse and squirrels; browsed by deer.	Bark is used for making witch-hazel lotion. Blooms in the fall; fragrant yellow flowers attract bees and other pollinators. .

Notes for this table are on Page 81.

TABLES 4.1, 4.3, 4.5 NOTES:

1. **Region:** The physiographic region where the species usually occurs in Maryland, under natural conditions. For introduced species, this is the region where the species can be planted. Native species may also be planted in other locations, based on Plant Hardiness Zones (PHZ). Refer to Tables 4.2, 4.4, and 4.6 for PHZ and other information for each species.

2. **Moisture:** The amount of moisture the species needs or tolerates. Dry - excessively drained to well-drained soil; Mesic - moderately well to somewhat poorly drained soil; Wet - poorly to very poorly drained soil.

3. **Habitat Use Characteristics:**

   Cover - All plants provide some type of cover for wildlife, depending on the time of year and the wildlife species of interest. These columns describe the cover use primarily for birds and small mammals, as follows:

   - Nesting/Resting - Provides nesting and/or resting cover.
   - Protection - Provides protective habitat, typically characterized by high stem density near ground level and/or dense, persistent foliage (usually evergreens, but also some deciduous species that retain leaves well into the winter).

   Fruit/Seed Consumption - These columns note whether a fruit or seed is a good food source for wildlife, or may be eaten by humans:

   - Wildlife - (H) Highly preferred food for many birds and mammals, or (M) Medium value, and is utilized by fewer species or is produced in smaller quantities than similar foods. Plant species not noted as having High or Medium value have Low or unknown value. Refer to Tables 4.2, 4.4, and 4.6 for detailed wildlife food value information.
   - Humans - May be consumed by people. Caution: This list should not solely be relied upon for knowledge of human edibility. Many plants with palatable parts also contain parts that are to a certain degree toxic to humans. Toxicity effects can vary with people and environment, and not all human toxicity effects are known for wild plants. People who intend to consume parts of wild plants should ensure their own safety and health by consulting experts and/or trusted plant references.

   Pollinator Food - These columns note whether a species provides a food source for adult and larval-stage pollinators:

   - Nectar/Pollen - Species produces nectar and/or pollen that are consumed by adults or larvae of various pollinator species.
   - Foliage - Species has vegetative plant parts (foliage, stems, etc.) that are consumed by various insect pollinators, especially while in the larval stage.

   Toxic to Livestock - Reported to be slightly to highly toxic if consumed by livestock. Toxicity may include flowers, fruits/nuts, foliage, and other plant parts, and can vary with species of livestock, age of the animal, and growth stage of the plant.

4. **Hedgerows and Windbreaks:**

   Wildlife Habitat - Species is a recommended planting for wildlife habitat. Recommended species are native to Maryland, and are shrubs and small trees that have moderate to high value as food for birds, mammals, and/or pollinators.

   Barriers/Screens - Species is a recommended planting for barriers to wind and airborne snow, particulates, chemicals, and odors, and may also serve as visual and noise screens. Recommended species are expected to grow to at least 6 feet in height at 20 years, and have a medium or high foliar density for at least part of the year. For year-round protection, most barriers will need one or more rows of evergreens. Shorter or less dense species may be selected for planting in additional rows, provided there are sufficient rows of recommended species to meet the objectives of the planting.

   Note: For hedgerows around poultry houses, especially in fan impact areas, refer to the Maryland NRCS 422 Hedgerow Planting Fact Sheet *Trees and Shrubs for Poultry Houses* for recommended woody species that are tolerant of harsh conditions.

TABLES 4.2, 4.4, and 4.6 NOTES:

1. The Plant Hardiness Zones designate where a species can be successfully planted in Maryland, while the Geographic Distribution describes where the species usually occurs under natural conditions.

2. 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.

3. Growth Rate: Slow = usually 1 ft/year or less; Moderate = 1–2 ft/year; Fast = 2-3 ft/year; Very Fast = more than 3 ft/year.

4. Density: For an individual plant species, defined as the amount of space that is occupied by foliage, twigs, and branches, and can be estimated by the amount of light that can be seen through the plant. Low density – 25-35% of space occupied by plant material (with 65-75% open space through which air can travel); Medium density – 40-60% of space occupied by plant material; High density - 60-80% of space occupied by plant material; Very High – more than 80% of space occupied by plant material. The overall density of a windbreak is affected by the species selected, number of rows, and spacing between plants.

TABLE 4.7: Planting Rates for Trees, Shrubs, and Tree & Shrub Mixes for Native Cover Plantings (Wildlife Habitat and Water Quality)

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.

Primary Purpose	Establishment Goal (number of trees and/or shrubs per acre after two years)	Type of Planting Stock	Planting Rate [1/] (per acre)	Number of Plants Needed (per acre) for Standard Spacing (in feet)	Remarks
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 Mix 12 from Table 2.2 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 4.7 NOTE:

1. 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.

After a planting is established, the long-term density goal for trees is often determined by basal area (i.e., the cross-sectional area of trees measured at 4.5 feet above the ground). Consult with a licensed professional forester to determine the appropriate basal area (typically, in square feet per acre) or stand density (trees per acre) for a specific site.

TABLE 4.8: Hedgerows - Recommended Spacing Within and Between Rows [1/]		
Plant Type	**Spacing (in feet) for:**	
	Physical Barriers and Visual/Noise Screens	**Wildlife Habitat, Landscaping, and Other Uses**
Perennial Bunch Grasses	1 - 2	2 - 4
Shrubs [2/]	2 - 4	4 - 8
Deciduous Trees	6 - 12	8 - 14
Evergreen Trees	6 - 10	8 - 14

TABLE 4.8 NOTES:

1. Within a row, use only one species, or select a mix of species that have similar growth forms and growth rates. Use staggered spacing in multiple row plantings. Plant taller-growing trees or shrubs in center rows, and medium or lower growing species in outer rows. Or, for a more "natural appearing" effect, intersperse trees, shrubs, and grasses in the hedgerow. For hedgerows around poultry houses, especially in fan impact areas, refer to the Maryland NRCS 422 Hedgerow Planting Fact Sheets *Warm-Season Grasses for Poultry Houses* and *Trees and Shrubs for Poultry Houses* for spacing requirements.

2. Use a spacing of 2 feet between rows if drilling seeds of leguminous shrubs.

TABLE 4.9: Windbreaks/Shelterbelts - Recommended Spacing Within and Between Rows [1/]			
Plant Type	**Spacing (feet) Within Rows**		**Spacing (feet) Between Rows**
	Single Row	*Multiple Rows*	
Small Shrubs (4 – 12 feet tall)	3 - 5	4 - 6	10 - 15
Large Shrubs and Small Deciduous Trees (12 – 30 feet tall)	6 - 8	8 - 10	10 - 20
Large Deciduous Trees (more than 30 feet tall)	10 - 12	12 - 14	15 - 20
Evergreen Trees (columnar form)	6 - 8	8 - 10	10 - 20
Evergreen Trees (conical and broad forms)	8 - 10	10 - 14	15 - 20

TABLE 4.9 NOTE:

1. Use spacings at or near the lower end of the range to create a dense barrier in a shorter period of time. Spacing between rows shall be at least four feet wider than the mechanized maintenance equipment used, and may be increased beyond what is shown in this table to accommodate the equipment. Where space (width) is limited and a two-row planting is needed to meet density requirements, the same spacing within and between rows may be used with staggered plantings.

TABLE 4.10: Windbreaks/Shelterbelts - Number of Rows and Type of Plants Needed to Meet Density Requirements		
Purpose	**Required Density and Location of Planting [1/]**	**Minimum Number of Rows and Type of Plants [2/]**
Provide shelter for structures, animals, and people	Livestock (wind and cold): At least 65% density; windward (upwind) within 10H (preferably within 2-5H) of the area to be protected.	Plant two rows of medium and/or high density species. If year-round protection is needed, use at least one row of evergreens.
	Livestock (shade): Low density; adjacent to the area to be shaded.	Plant one row of low density species that allow air movement and have a mature height sufficient to shade the site. Deciduous trees that will develop wide crowns (e.g., maples, oaks) are preferred, but other species may also be suitable.
Enhance plant health and productivity (protect plants from wind-related damage)	At least 50% density; windward (upwind) within 10H and leeward (downwind) within 2H of the crops to be protected.	Plant one row of medium and/or high density species, or two rows of low density species with a mature height that will be taller than the crops to be protected.
Reduce energy use in structures	Winter heat loss: At least 50% density; windward (upwind) within 5H from the structure.	Plant one row of medium and/or high density species, or two rows of low density species. At least one row should be evergreens.
	Summer cooling: Low density; adjacent to the structure to be shaded.	Plant one row of low density species that allow air movement but have a mature height sufficient to shade the site. Deciduous trees that will develop wide crowns (e.g., maples, oaks) are preferred, but other species may also be suitable.
Improve air quality (airborne particulates, chemicals, odors)	At least 50% density windward (upwind) within 10H, and 50 - 65% density leeward (downwind) within 10H of the source area.	Plant one row of medium and/or high density species, or two rows of low density species. If year-round protection is needed, use at least one row of evergreens.
Manage snow distribution and deposition	Snow distribution: 25 to 50% density; windward (upwind) within 20H of an area to be protected.	Plant one row of low, medium, or high density species to distribute snow across a field or other area. To achieve the overall specified density, use a closer spacing for low density species, and wider spacing for high density species.
	Snow deposition: At least 50%; windward (upwind) within 20H of an area to be protected.	Plant one row of medium and/or high density species, or two rows of low density species to reduce wind velocities sufficiently for snow to accumulate within 100-200 feet on the downwind side of the windbreak.
Improve moisture use and irrigation efficiency; increase carbon storage	Density and location as appropriate for the purpose.	Minimum one row. For carbon sequestration, design the windbreak to maximize above and below ground biomass production. Refer to Additional Criteria in the Windbreak Shelterbelt Establishment (380) standard for specific requirements.

TABLE 4.10 NOTES:

1. The maximum design height (H) for the windbreak is the expected height of the tallest row of trees or shrubs in 20 years. Select species with an appropriate mature height to provide protection.

2. For higher levels of protection (at a density $\geq$50%), use at least three rows of trees and shrubs, with at least one row being evergreen trees. Refer to Tables 4.2, 4.4, and 4.6 for the summer and winter densities of each species.

SECTION 5 - STREAMBANK AND SHORELINE PLANTINGS

This section contains recommended woody and herbaceous plantings for streambank and shoreline stabilization and protection.

Specifications for Selecting Species and Establishing Plantings

Select bioengineering plant materials and tidal marsh plantings from Tables 5.1 to 5.3. For additional lists of suitable bioengineering plants, and details concerning site preparation and use of these plants, refer to the NRCS Engineering Field Handbook, Chapter 16, *Streambank and Shoreline Protection* and East Region Supplement No. 1. (See the References section of the 580 standard.)

When using unrooted woody plant materials (e.g., whips, fascines, and live stakes), select species that have a rooting ability of "Good" or better. (See Table 5.1) Species rated as "Fair" can be mixed with better rooting species. For species rated "Poor," use only bare-root or containerized materials.

Select and establish dune plantings based on recommendations in the publication *The Utility and Beauty of Coastal Dunes*. (See the References section of the 580 standard.)

TABLE 5.1: Selected List of Woody Plants for Streambank and Shoreline Stabilization									
Plant Names	**Plant Hardiness Zones [1]**	**Geographic Distribution in Maryland [1]**	**Planting Zone [2]**	**Sun/ Shade [3]**	**Growth Rate**	**Height at 20 years**	**Rooting Ability from Cuttings [4]**	**Type of Plant Material Available**	**Natural Habitat and Other Characteristics**
ARROWWOOD *Viburnum dentatum*	All	Statewide	Mid to Upper Bank	○ - ◗	Fast	10 ft.	Fair	Bare-root, Containerized	Shrub swamps and forested wetlands. Suckers freely. White flowers, bluish-black berries.
BLACK-HAW *Viburnum prunifolium*	All	Statewide	Upper Bank	○ - ◗	Fast	12 ft.	Poor	Bare-root, Containerized	Upland forests and hedgerows. White flower clusters, blue berries, red fall color. Fruits may remain on shrubs for much of the winter.
BUSH, HIGH-TIDE (GROUNDSEL) *Baccharis halimifolia*	All	Coastal Plain	Mid to Upper Bank	○	Moderate	10 ft.	Fair	Whips, Fascines, Bare-root, Containerized	Brackish and coastal marshes, usually above MHW. Salinity 0-15 ppt. Has fluffy white seeds. Male flowers & female flowers on separate plants.
BUSH, HIGH-TIDE (MARSH-ELDER) *Iva frutescens*	All	Coastal Plain	Lower to Mid Bank	○	Moderate	10 ft.	Fair	Whips, Fascines, Bare-root, Containerized	Brackish and coastal marshes, usually above MHW. Salinity 0-15 ppt.
BUTTONBUSH *Cephalanthus occidentalis*	All	Statewide	Toe	○ - ◗	Moderate	10 ft.	Fair - Good	Bare-root, Containerized	Shrub swamps and streambanks. Unusual, round white flowers. Tolerates long periods of inundation.
DOGWOOD, GRAY *Cornus racemosa*	All	Mostly Piedmont and Western Maryland	Mid to Upper Bank	○ - ◗	Moderate	6 ft.	Poor	Bare-root, Containerized	Forested wetlands and streambanks. Produces fruit at 3-5 years of age. White flowers with white berries on reddish stalks. Prefers some shade.
DOGWOOD, REDOSIER *Cornus sericea* 'Ruby'	All	Statewide; uncommon	Toe to Mid Bank	○ - ◗	Fast	12 ft.	Good	Whips, Fascines, Live Stakes, Bare-root, Containerized	Forested wetlands and streambanks. Attractive red stem color. White flowers and fruit.

TABLE 5.1: Selected List of Woody Plants for Streambank and Shoreline Stabilization

Plant Names	Plant Hardiness Zones [1/]	Geographic Distribution in Maryland [1/]	Planting Zone [2/]	Sun/ Shade [3/]	Growth Rate	Height at 20 years	Rooting Ability from Cuttings [4/]	Type of Plant Material Available	Natural Habitat and Other Characteristics
DOGWOOD, SILKY *Cornus amomum*	All	Common on Coastal Plain & Piedmont	Lower to Mid Bank	○ - ◗	Moderate	10 ft.	Fair	Whips, Fascines, Live Stakes, Bare-root, Containerized	Forested wetlands and streambanks. Produces fruit at 3-5 years of age. White flowers with blue berries. Prefers some shade.
ELDERBERRY *Sambucus nigra ssp. canadensis* (formerly *S. canadensis)*	All	Statewide	Toe to Upper Bank	○ - ◗	Fast	8 ft.	Fair	Whips, Fascines, Live Stakes, Bare-root, Containerized	Open, forested wetlands and streambanks. Suitable for use as a secondary component of plantings with willows and dogwoods. Suckers freely.
NANNYBERRY *Viburnum lentago*	5b, 6a, 6b	Mostly Western Maryland	Mid to Upper Bank	○ - ◗	Slow	25 ft.	Fair - Good	Whips, Fascines, Live Stakes, Bare-root, Containerized	Forested wetlands and streambanks. Often suckers. Creamy white flowers. Berries are blue-black.
VIBURNUM, MAPLE-LEAF *Viburnum acerifolium*	All	Mostly Western Maryland	Lower to Mid Bank	○	Slow	6 ft.	Poor	Bare-root, Containerized	Forested wetlands and streambanks. Yellow to red fall color; white flower clusters. Bright red berries.
WILLOW, DWARF *Salix X cottetii* 'Bankers'	All	Introduced; not native to U.S.	Toe to Mid Bank	○ - ◗	Fast	5 ft.	Good	Whips, Fascines, Live Stakes, Bare-root, Containerized	Male hybrid (sterile), non-invasive. Semi-prostrate shrub, sends up many branches from the roots to form dense surface cover in 2-3 years.
WILLOW, PURPLEOSIER *Salix purpurea* 'Streamco'	All	Introduced; not native to U.S.	Toe to Upper Bank	○ - ◗	Fast	20 ft.	Excellent	Whips, Fascines, Live Stakes, Poles, Bare-root, Containerized	Non-invasive small tree or shrub. 'Streamco' is a male clone, does not root sucker, and does not spread readily beyond the planting site.
WILLOW, PUSSY *Salix discolor*	All	Statewide	Toe to Mid Bank	○ - ◗	Fast	20 ft.	Very Good	Whips, Fascines, Live Stakes, Poles, Bare-root, Containerized	Forested wetlands and streambanks. Fuzzy flower catkins appear in early spring. Grows rapidly, but does not spread readily beyond the planting site.

TABLE 5.1: Selected List of Woody Plants for Streambank and Shoreline Stabilization									
Plant Names	**Plant Hardiness Zones [1]**	**Geographic Distribution in Maryland [1]**	**Planting Zone [2]**	**Sun/ Shade [3]**	**Growth Rate**	**Height at 20 years**	**Rooting Ability from Cuttings [4]**	**Type of Plant Material Available**	**Natural Habitat and Other Characteristics**
WILLOW, SANDBAR *Salix exigua* 'Greenbank'	All	Statewide	Toe	○	Fast	15 ft.	Good	Whips, Fascines, Live Stakes, Poles, Bare-root, Containerized	Streambanks and sandbars. **Caution:** This is a native species that may aggressively spread by root suckering into adjacent areas.
WILLOW, SILKY *Salix sericea*	All	Statewide	Toe to Mid Bank	○ - ◗	Fast	20 ft.	Good	Whips, Fascines, Live Stakes, Poles, Bare-root, Containerized	Forested wetlands and streambanks. Fuzzy flower catkins appear in early spring. Grows rapidly, but does not spread readily beyond the planting site.

TABLE 5.1 NOTES:

1. The **Plant Hardiness Zones** designate where a species can be successfully planted in Maryland, while the **Geographic Distribution** describes where the species usually occurs under natural conditions.

2. **Planting Zone:** Recommended area for planting each species, based on tolerance of flooding, long periods of saturation, and drought.
   Toe - at base flow elevation.
   Lower to Mid Bank - just above the baseflow elevation to the two-year flood elevation.
   Upper Bank - above the two-year flood elevation and onto the floodplain.

3. **Sun - Shade:** Sunlight and shade tolerance for each species.
   ○ Full Sun - 6 or more hours of direct sunlight per day or 4 hours of midday sun.
   ◗ Part Shade - 3 to 6 hours of direct sunlight per day.
   ● Shade - less than 3 hours of direct sunlight per day.

4. **Rooting Ability from Cuttings:** Subjective rating of the ability of cut stems of woody plants to root in soil without any special measures (e.g., without the use of a rooting hormone or greenhouse conditions). When using unrooted woody plant materials such as whips, fascines, live stakes, or poles, select species that have a rooting ability of "Good" or better. Species rated as "Fair" can be mixed with better rooting species. For species rated "Poor," use only bare-root or containerized materials.

   Generally, no special site preparation or soil amendments are required at the time of planting. Sites with low fertility, based on results from a soil test, may benefit from top-dressing with fertilizer after leaf-out.

TABLE 5.2: Selected List of Companion Grasses for Woody Bioengineering Plantings

Plant Names	Recommended Cultivar	Plant Hardiness Zones [1/]	Planting Zone [2/]	Sun/ Shade [3/]	Growth Rate	Max. Height	Planting Rate [4/]	Natural Habitat and Other Characteristics
BLUEGRASS, ROUGH *Poa trivialis*	Colt, Cypress, Sabre	All	Lower to Mid Bank	○ - ●	Moderate	2 ft.	Plant seed at the rate of 10 lbs./acre (0.23 lbs./1,000 SF).	Introduced, cool-season, sod-forming grass. Medium textured, non-competitive. Prefers moist, shady sites; moderately well drained to somewhat poorly drained soils. More shade tolerant than *Poa palustris*. May be short-lived on the Coastal Plain, especially on drier sites in full sun.
FESCUE, CREEPING RED *Festuca rubra*	Dawson, Jasper, Navigator II	All	Mid to Upper Bank	○ - ●	Moderate	2 ft.	Plant seed at the rate of 20 lbs./acre (0.45 lbs./1,000 SF).	Found in shady, upland areas. Native, cool-season, sod-forming grass. Fine textured, non-competitive. Use on upland sites, especially in shady conditions. Prefers well drained to somewhat poorly drained soils. The 'Dawson' variety is salt-tolerant.
MEADOWGRASS, FOWL *Poa palustris*	Common	All	Lower to Mid Bank	○ - ◗	Moderate	3 ft.	Plant seed at the rate of 10 lbs./acre (0.23 lbs./1,000 SF).	Found in moist, shady sites. Native, cool-season, sod-forming grass. Fine textured, non-competitive. Prefers moderately well drained to somewhat poorly drained soils. May be short-lived on the Coastal Plain, especially on drier sites in full sun.
RYEGRASS, PERENNIAL *Lolium perenne*	Recommended MD turf-types	All	Mid to Upper Bank	○ - ◗	Fast	2 ft.	Plant seed at the rate of 10 lbs./acre (0.23 lbs./1,000 SF).	Introduced, cool-season grass. Bunch grass with medium longevity. Seedlings establish quickly. Prefers moist sites; moderately well drained to somewhat poorly drained soils.
WILDRYE, RIVERBANK *Elymus riparius*	Common	All	Lower to Mid Bank	○ - ●	Moderate	5 ft.	Plant seed at the rate of 10 lbs/ac (0.23 lbs/1,000 SF) This seeding rate is for Pure Live Seed. (Seed is usually sold with awns still attached.)	Found along rivers and streams on moist, shady sites. Native, cool-season grass. Short-lived, coarse textured bunch grass. Seedlings establish quickly, but are not highly competitive with other plantings.

TABLE 5.2: Selected List of Companion Grasses for Woody Bioengineering Plantings								
Plant Names	**Recommended Cultivar**	**Plant Hardiness Zones [1]**	**Planting Zone [2]**	**Sun/ Shade [3]**	**Growth Rate**	**Max. Height**	**Planting Rate [4]**	**Natural Habitat and Other Characteristics**
WILDRYE, VIRGINIA *Elymus virginicus*	Common	All	Lower to Mid Bank	○ - ●	Moderate	3 ft.	Plant seed at the rate of 10 lbs./acre (0.23 lbs./1,000 SF). This seeding rate is for Pure Live Seed. (Seed is usually sold with awns still attached.)	Found along rivers and streams on moist, shady sites. Native, cool-season grass. Short-lived, coarse textured bunch grass. Seedlings establish quickly, but are not highly competitive with other plantings. Prefers moderately well drained to poorly drained soils.

TABLE 5.2 NOTES:

1. The **Plant Hardiness Zones** designate where a species can be successfully planted in Maryland.

2. Planting Zone: Recommended area for planting each species, based on tolerance of flooding, long periods of saturation, and drought.
Toe - at base flow elevation.
Lower to Mid Bank - just above the baseflow elevation to the two-year flood elevation.
Upper Bank - above the two-year flood elevation and onto the floodplain.

3. Sun - Shade: Sunlight and shade tolerance for each species.
○ Full Sun - 6 or more hours of direct sunlight per day or 4 hours of midday sun.
◗ Part Shade - 3 to 6 hours of direct sunlight per day.
● Shade - less than 3 hours of direct sunlight per day.

4. Generally, no special site preparation or soil amendments are required at the time of planting. Sites with very low fertility, based on results of a soil test, may benefit from top-dressing when plants are actively growing.

TABLE 5.3: Selected List of Native Grasses and Grass-like Plants for Tidal Shoreline Stabilization [1]								
Plant Names	**Plant Hardiness Zones [2]**	**Geographic Distribution in Maryland [2]**	**Planting Zone [3]**	**Sun/ Shade [4]**	**Growth Rate**	**Max. Height**	**Planting Rate [3]**	**Natural Habitat and Other Characteristics**
BEACHGRASS, AMERICAN *Ammophila breviligulata* 'Cape'	All	Coastal Plain	Above MHT	○	Fast	3 ft.	Plant containerized plants and bare-root plants 18 to 24 inches apart, in staggered rows. If the site is exposed to severe wind erosion, spacing needs to be reduced to 12 inches.	Upland sites with sandy or other coarse textured soils. Cool-season grass. Strongly rhizomatous. Highly salt tolerant and drought tolerant. Does not tolerate much soil moisture. Use on coastlines for initial stabilization of frontal sand dunes.
BULRUSH, THREE-SQUARE *Schoenoplectus pungens (*formerly *Scirpus pungens)*	All	Statewide	Mid-tide to MHT	○	Fast	3 ft.	Plant containerized plants and bare-root plants 12 to 24 inches apart, in staggered rows.	Shallow fresh to brackish marshes and open water fringes. Salinity 0–15 ppt.
CORDGRASS, GIANT *Spartina cynosuroides*	6b, 7a, 7b, 8a	Coastal Plain	Near MHT to above MHT	○	Moderate	10 ft.	Plant containerized plants and bare-root plants 18 to 36 inches apart, in staggered rows.	Upper intertidal zone of tidal marshes, and saturated soils above MHT. Warm-season grass. Up to 0.5 feet of lateral spread can be expected annually. Salinity 0 – 10 ppt.
CORDGRASS, PRAIRIE *Spartina pectinata*	All	Mostly Coastal Plain and Piedmont	Mid-tide to above MHT	○	Fast	6 ft.	Plant containerized plants and bare-root plants in staggered rows 24 to 36 inches apart, with plants 24 inches apart in each row.	Occurs in wet ditches and on upper margins of tidal fresh areas, and in saturated nontidal wetlands. Warm-season grass. Strongly rhizomatous; 5 – 10 feet of lateral spread can be expected annually. Tolerates seasonal dryness once established. Low tolerance to prolonged flooding or ponding. Salinity 0-3 ppt.

TABLE 5.3: Selected List of Native Grasses and Grass-like Plants for Tidal Shoreline Stabilization [1/]								
Plant Names	**Plant Hardiness Zones [2/]**	**Geographic Distribution in Maryland [2/]**	**Planting Zone [3/]**	**Sun/ Shade [4/]**	**Growth Rate**	**Max. Height**	**Planting Rate [3/]**	**Natural Habitat and Other Characteristics**
CORDGRASS, SALTMEADOW *Spartina patens* 'Avalon'	All	Coastal Plain	Above MHT	○	Fast	3 ft.	Plant containerized plants and bare-root plants 18 to 36 inches apart, in staggered rows.	Tidal marshes between MHT and the 15-foot elevation above MHT. Warm-season grass. Strongly rhizomatous; up to 2 feet of lateral spread can be expected annually. Salinity 0 – 35 ppt.
CORDGRASS, SMOOTH *Spartina alterniflora* 'Bayshore'	All	Coastal Plain	Mid-tide to MHT	○	Fast	6 ft.	Plant containerized plants and bare-root plants 18 to 36 inches apart, in staggered rows.	Intertidal zone of tidal marshes. Warm-season grass. Up to 2 feet of lateral spread can be expected annually. Salinity 0 – 35 ppt.
PANICGRASS, COASTAL *Panicum amarum* var. *amarulum* 'Atlantic'	All	Coastal Plain	Above MHT	○	Moderate	6 ft.	Plant containerized plants and bare-root plants in staggered rows 2 to 3 feet apart, with plants 2 feet apart in each row. Plant seed at the rate of 20 lbs./acre (0.45 lbs./1,000 SF).	Naturally found on dry upland sites. Warm-season grass. Drought tolerant. Moderately salt tolerant. Used extensively for secondary dune stabilization. May be interseeded between rows of American Beachgrass.
RUSH, SOFT *Juncus effusus*	All	Statewide	Near MHT to above MHT	○	Moderate	3 ft.	Plant containerized plants and bare-root plants 6 to 12 inches apart, in staggered rows.	Upper intertidal zone of tidal fresh marshes, saturated soils above MHT, and in saturated nontidal wetlands. Moderately drought tolerant once established. Salinity to 0.5 ppt (fresh water).

TABLE 5.3: Selected List of Native Grasses and Grass-like Plants for Tidal Shoreline Stabilization [1]								
Plant Names	**Plant Hardiness Zones [2]**	**Geographic Distribution in Maryland [2]**	**Planting Zone [3]**	**Sun/ Shade [4]**	**Growth Rate**	**Max. Height**	**Planting Rate [3]**	**Natural Habitat and Other Characteristics**
SWITCHGRASS *Panicum virgatum* 'Blackwell' 'Carthage' 'Cave-in-Rock' 'High Tide' 'Shelter'	All	Statewide	Above MHT	○	Moderate	6 ft.	Plant containerized plants and bare-root plants in staggered rows 2 to 3 feet apart, with plants 2 feet apart in each row. Plant seed at the rate of 20 lbs./acre (0.45 lbs./1,000 SF).	Occurs on upper margins of fresh and brackish tidal marshes. Native, warm-season bunchgrass. Wide range of adaptation from dry uplands to poorly drained sites. Moderately salt tolerant. Salinity 0 – 10 ppt. 'Blackwell,' 'Carthage,' and 'Shelter' varieties are better suited for well-drained to somewhat poorly drained sites. 'Cave-in-Rock' is a lowland type that tolerates droughty soils, but is better suited to wet sites and frequent flooding. 'High Tide' is a Mid-Atlantic ecotype specifically selected for tidal shorelines and streambank stabilization.

TABLE 5.3 NOTES:

1. **Selected List of Native Grasses and Grass-like Plants:** The term "native" refers to species that occur naturally in one or more geographic regions of Maryland. Due to page limitations, this list is not all-inclusive. There are many other species that may be suitable, depending on site conditions.
2. The **Plant Hardiness Zones** designate where a species can be successfully planted in Maryland, while the **Geographic Distribution** describes where the species usually occurs under natural conditions.
3. **Planting Zone:** Recommended area for planting each species, based on tolerance of flooding, long periods of saturation, and drought. Mid-tide – elevation midway between mean low tide (MLT) and mean high tide (MHT); MHT – elevation at mean high tide; Above MHT - above the mean high tide elevation.
4. **Sun - Shade:** Sunlight and shade tolerance for each species. ○ Full Sun - 6 or more hours of direct sunlight per day or 4 hours of midday sun; ◗ Part Shade - 3 to 6 hours of direct sunlight per day; ● Shade - less than 3 hours of direct sunlight per day.
5. Generally, no special site preparation or soil amendments are required at the time of planting. Sites with low fertility, based on results of a soil test, may benefit from top-dressing with fertilizer when plants are actively growing.

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SECTION 6 - WETLAND HERBACEOUS PLANTINGS

This section contains recommended herbaceous plantings for wetlands and shallow water areas. (See Section 4 to select trees and shrubs for wetlands.) Other wetland plantings that are native to Maryland may also be suitable.

Specifications for Selecting Species and Establishing Plantings

Planting can be used as appropriate to hasten establishment of desired species or to supplement the natural regeneration process. The use of species native to Maryland is required for all permanent plantings (not including temporary seedings or nurse crops) in a wetland or shallow water area.

Where needed, use an appropriate seed mix for wetlands to provide short-term herbaceous cover to control erosion and to help build the organic components of the soil. Temporary or non-competitive permanent mixes may be needed in areas where natural regeneration is planned, woody species will be planted, or other permanent plantings will be delayed. Plantings for short-term cover shall be non-competitive to the introduction and establishment of the desired species.

Refer to Tables 6.1 and 6.2 for recommended herbaceous wetland plantings.

Refer to the Maryland NRCS *Wetland Design Guide* and the *Shallow Water Area Design Guide* for additional vegetative and structural requirements, as applicable.

TABLE 6.1: Selected List of Herbaceous Mixes for Wetlands [1/]

Mix	Recommended Cultivar	Seeding Rate (lbs/ac) [2/]	Plant Hardiness Zones [3/]	Max. Height (feet)	Type of Grass in Mix	Remarks
1. Rough Barnyard Grass *Echinochloa muricata*	Common	5 - 10	All	3 - 4	Warm & cool season grasses	Mix for temporary site stabilization. Native, short-lived grasses. Can be used when permanent plantings will be delayed. (For example, use this mix to stabilize the site in late fall, then plant permanent vegetation the following spring.) Suitable for seasonally saturated wetlands and adjacent somewhat poorly drained areas. Tolerates dry conditions and brief periods of inundation after establishment.
Riverbank Wildrye *Elymus riparius*	Common	4 - 6				
Virginia Wildrye *Elymus virginicus*	Common	4 - 6				
2. Rough Bentgrass *Agrostis scabra*	Common	4 - 6	All	1 - 2	Cool season grasses	Companion planting for trees and shrubs. Low-growing, native perennial grasses. Mix provides semi-permanent grass cover that helps to suppress weeds and control erosion. May be planted at the same time as woody plantings. Suitable for seasonally saturated wetlands and adjacent somewhat poorly drained areas. Tolerates dry conditions and brief periods of inundation after establishment.
Fowl Meadowgrass *Poa palustris*	Common	4 - 8				
3. Virginia Wildrye *Elymus virginicus*	Common	2 - 3	All	2 - 3	Warm & cool season grasses	Early successional mix. Low-growing all-native species. Use this as a basic "starter mix" to provide cover in areas where natural regeneration is planned. Suitable for seasonally saturated wetlands and adjacent somewhat poorly drained areas. Tolerates dry conditions and brief periods of inundation after establishment. Fowl Meadowgrass may be short-lived on the Coastal Plain, especially on drier sites in full sun.
Red Fescue *Festuca rubra*	Common	3 - 4				
Fowl Meadowgrass *Poa palustris* **OR**	Common	2 - 4				
Deertongue *Dichanthelium clandestinum*	Tioga	2 - 4				
AND ADD:						
Partridge Pea *Chamaecrista fasciculata*	Common	1				
4. Rough Barnyard Grass *Echinochloa muricata*	Common	2 - 4	All	3 - 4	Warm & cool season grasses	Early successional mix. All native species. The Barnyard Grass is an annual warm-season grass that provides temporary cover and wildlife food. Use this mix as a basic "starter mix" to provide cover in areas where natural regeneration is planned. Diverse mix that is suitable for seasonally saturated wetlands and adjacent somewhat poorly drained areas. Tolerates dry conditions and brief periods of inundation after establishment. Fowl Meadowgrass may be short-lived on the Coastal Plain, especially on drier sites in full sun.
Fowl Meadowgrass *Poa palustris*	Common	2 - 4				
Virginia Wildrye *Elymus virginicus*	Common	2 - 4				
AND ADD THE FOLLOWING WILDFLOWERS:						
Partridge Pea *Chamaecrista fasciculata*	Common	1				
Beggar Ticks *Bidens frondosa*	Common	1				
Smartweed *Polygonum pensylvanicum*	Common	0.5 - 1				
Swamp Milkweed *Asclepias incarnata*	Common	2				

TABLE 6.1: Selected List of Herbaceous Mixes for Wetlands [1/]

Mix	Recommended Cultivar	Seeding Rate (lbs/ac) [2/]	Plant Hardiness Zones [3/]	Max. Height (feet)	Type of Grass in Mix	Remarks
5. Eastern Bur Reed *Sparganium americanum*	Common	0.5				This is a diverse, all-native species for emergent wetlands and shallow water areas that will provide food and cover for waterfowl and other wetland wildlife.
Fox Sedge *Carex vulpinoidea*	Common	0.2				
Lurid Sedge *Carex lurida*	Common	0.5				Substitutions:
Redtop Panicgrass *Panicum rigidulum*	Common	0.3				Can substitute Hop Sedge (*Carex lupulina*) for Fox Sedge or Lurid Sedge at a rate of 1.5 lb/ac.
Riverbank Wildrye *Elymus riparius*	Common	2				
Rough Barnyard Grass *Echinochloa muricata*	Common	1				Can substitute Fowl Mannagrass (*Glyceria striata*) for Redtop Panicgrass at a rate of 0.1 lb/ac, or can substitute Woolgrass (*Scirpus cyperinus*) for Redtop Panicgrass at a rate of 0.01 lb/ac.
Softstem Bulrush *Schoenoplectus tabernaemontani*	Common	0.1				
AND ADD THE FOLLOWING WILDFLOWERS:			All	5 - 8	Warm & cool season grasses	If a wildflower in the mix is not available, double the rate of one of the other wildflower species. For example, if Swamp Milkweed is not available, Joe-Pye Weed can be increased to 0.2 lb/ac.
Beggar Ticks *Bidens frondosa*	Common	1				
Blue (Swamp) Vervain *Verbena hastata*	Common	0.1				
Joe-Pye Weed *Eutrochium fistulosum*	Common	0.1				
Nodding Bur Marigold *Bidens cernua*	Common	0.5				
Pennsylvania Smartweed *Polygonum pensylvanicum*	Common	1				
Swamp Milkweed *Asclepias incarnata*	Common	1				
Yellow Sneezeweed *Helenium autumnale*	Common	0.1				

TABLE 6.1 NOTES:

1. **Selected List of Herbaceous Mixes for Wetlands:** This is a list of mixes that can be used for temporary site stabilization, companion plantings for trees and shrubs, and as basic "starter mixes" to provide initial cover and food for wildlife. See the "Remarks" column of this table for recommended uses. Due to page limitations, this list is not all-inclusive. There are many other mixes that may be suitable, depending on site conditions and the purpose of the planting.

2. **Seeding Rate:** Seeding rates for native grasses, sedges, legumes, and other wildflowers are in pounds of Pure Live Seed (PLS). Order seed from the supplier based on the PLS rate; the seed supplier will adjust the bulk amount to be planted based on percent seed germination and purity, as tested. Legume seeds shall be inoculated before planting with the appropriate *Rhizobium* bacteria. When feasible, hard-seeded legumes should be scarified to improve germination.

   When a seeding rate is expressed as a range (i.e., 4 - 6), the lower rate should be used if site conditions are generally good and erosion is not a concern.

3. The **Plant Hardiness Zones** designate where a species can be successfully planted in Maryland.

TABLE 6.2: Selected List of Native Herbaceous Wetland Plants [1]							
Plant Names	**Plant Hardiness Zones [2]**	**Geographic Distribution in Maryland [2]**	**Sun/ Shade [3]**	**Height at Maturity**	**Rate of Spread [4]**	**Wildlife Value for Food**	**Natural Habitat and Other Characteristics**
Water Regime: Surface Saturation to Infrequent Inundation							
ASTER, NEW ENGLAND *Aster novae-angliae*	All	Statewide; common	❍ - ◗	3-6 ft.	Slow	Flowers attractive to butterflies. Seeds eaten by songbirds.	Wet meadows. Prefers full sun. Attractive clusters of purple flowers.
ASTER, NEW YORK *Aster novi-belgii*	All	Mostly Coastal Plain; common	❍ - ◗	3-6 ft.	Slow	Flowers attractive to butterflies. Seeds eaten by songbirds.	Wet meadows. Prefers full sun. Attractive clusters of violet flowers.
ASTER, PURPLE-STEMMED *Aster puniceus*	All	Statewide; common	❍ - ◗	3-6 ft.	Slow	Flowers attractive to butterflies. Seeds eaten by songbirds.	Wet meadows. Prefers full sun. Attractive clusters of violet flowers.
BENTGRASS, CREEPING *Agrostis stolonifera*	All	Statewide	❍	<3 ft.	Slow	Seeds eaten by songbirds.	Wet meadows. Cool-season grass with creeping habit.
BLUESTEM, BUSHY *Andropogon glomeratus*	6a, 6b, 7a, 7b, 8a	Coastal Plain	❍	<3 ft.	Fast	Seeds eaten by songbirds.	Wet meadows. Warm-season grass with stiff stems.
BONESET *Eupatorium perfoliatum*	All	Statewide; common	❍ - ◗	3-6 ft.	Slow	Flowers attractive to butterflies.	Wet meadows. Small white flower clusters.
CARDINAL FLOWER *Lobelia cardinalis*	All	Statewide; common	◗	<3 ft.	Slow	Flowers attractive to hummingbirds & butterflies.	Wet meadows and open forested wetlands. Spike of attractive bright red flowers.
CORDGRASS, SALTMEADOW *Spartina patens*	All	Coastal Plain; common	❍	<3 ft.	Fast	Seeds eaten by waterfowl & songbirds. Roots eaten by waterfowl and muskrats.	Tidal marshes above MHT. Warm-season grass. Salinity 0 – 35 ppt.
DEERTONGUE *Dichanthelium clandestinum*	All	Statewide; common	❍ - ◗	<3 ft.	Slow	Seeds eaten by songbirds.	Wet meadows. Warm-season grass. Tolerates seasonal wetness and drought.
FESCUE, RED *Festuca rubra*	All	Statewide; common	❍ - ●	<3 ft.	Slow	Seeds eaten by songbirds.	Shady uplands and moist sites. Cool-season, sod-forming grass. Very fine leaves. Tolerates drought once established.

TABLE 6.2: Selected List of Native Herbaceous Wetland Plants [1/]							
Plant Names	**Plant Hardiness Zones [2/]**	**Geographic Distribution in Maryland [2/]**	**Sun/ Shade [3/]**	**Height at Maturity**	**Rate of Spread [4/]**	**Wildlife Value for Food**	**Natural Habitat and Other Characteristics**
Water Regime: Surface Saturation to Infrequent Inundation (continued)							
FERN, MARSH *Thelypteris palustris*	All	Statewide; common	❍ - ◗	<3 ft.	Fast	Minimal value for food. Occasionally browsed by deer.	Open forested wetlands and wet meadows.
IRONWEED *Vernonia noveboracensis*	All	Statewide; common	❍	3-6 ft.	Slow	Flowers attractive to butterflies.	Wet meadows. Deep purple flower clusters.
JOE-PYE WEED *Eutrochium fistulosum*	All	Statewide; common in W. Md.	❍ - ◗	3-6 ft.	Slow	Flowers attractive to butterflies.	Wet meadows. Pink-purple flower clusters.
JOE-PYE WEED, SPOTTED *Eutrochium maculatum*	5b, 6a, 6b	Piedmont & W. Md.; common	❍ - ◗	3-6 ft.	Slow	Flowers attractive to butterflies.	Wet meadows. Pink-purple flower clusters.
LOBELIA, BLUE *Lobelia siphilitica*	All	Statewide; common in Piedmont & W. Md.	◗	<3 ft.	Slow	Flowers attractive to butterflies. Leaves and stems eaten by deer.	Wet meadows (often in shade) and saturated forested wetlands. Attractive blue flower spike.
MEADOWGRASS, FOWL *Poa palustris*	All	Piedmont & W. Md.	❍ - ◗	<3 ft.	Slow	Seeds eaten by songbirds.	Wet meadows. Cool-season grass. May be short-lived on the Coastal Plain, especially on drier sites in full sun.
MILKWEED, SWAMP *Asclepias incarnata*	All	Statewide; common	❍	3-6 ft.	Slow	Flowers attractive to butterflies. Important plant for Monarchs.	Wet meadows. Small pink flowers in clusters.
MONKEY FLOWER, WINGED *Mimulus alatus*	All	Statewide; less common on Coastal Plain	❍	<3 ft.	Slow	Flowers attractive to butterflies.	Wet meadows. Pink-purple flowers similar to snapdragons.
MONKEY FLOWER, ALLEGHANY *Mimulus ringens*	All	Statewide; common	❍ - ◗	<3 ft.	Slow	Flowers attractive to butterflies.	Openings in saturated forested wetlands. Pink-purple flowers similar to snapdragons.
PASPALUM, FLORIDA *Paspalum floridanum*	7a, 7b, 8a	Coastal Plain	❍	3-5 ft.	Moderate	Wildlife browse the foliage. Large seeds eaten by quail, dove, turkeys, and other birds.	Native warm-season bunch grass. Readily grows on moist, disturbed areas and roadside ditches. Foliage deteriorates rapidly after maturity.

TABLE 6.2: Selected List of Native Herbaceous Wetland Plants [1]							
Plant Names	**Plant Hardiness Zones [2]**	**Geographic Distribution in Maryland [2]**	**Sun/ Shade [3]**	**Height at Maturity**	**Rate of Spread [4]**	**Wildlife Value for Food**	**Natural Habitat and Other Characteristics**
Water Regime: Surface Saturation to Infrequent Inundation (continued)							
PEA, PARTRIDGE *Chamaecrista fasciculata*	All	Statewide	❍ - ◗	<3 ft.	Fast	Seeds eaten by quail, turkeys, songbirds.	Mostly in upland fields. Tolerates moist sites. Reseeding annual legume. Feathery foliage; yellow flowers.
REEDGRASS, WOOD *Cinna arundinacea*	All	Statewide; common	❍ - ◗	3-6 ft.	Slow	Seeds eaten by songbirds. Foliage eaten by deer.	Saturated forested wetlands. Cool-season grass.
TICKSEED *Coreopsis tinctoria*	All	Statewide	❍ - ◗	<3 ft.	Fast	Seeds eaten by songbirds.	River banks and floodplains. Prefers moist soils; tolerates dry sites. Re-seeding annual with yellow flowers.
VERVAIN, BLUE *Verbena hastata*	All	Statewide; common	❍	3-6 ft.	Slow	Seeds eaten by songbirds.	Wet meadows. Small blue flowers in spikes.
WILDRYE, RIVERBANK *Elymus riparius*	All	Statewide	❍ - ◗	3-5 ft.	Fast	Foliage eaten by wildlife in early spring.	Wet meadows and river banks. Cool-season grass.
WILDRYE, VIRGINIA *Elymus virginicus*	All	Statewide	❍ - ◗	<3 ft.	Fast	Foliage eaten by wildlife in early spring.	Wet meadows and river banks. Cool-season grass.
WOODOATS, SLENDER *Chasmanthium laxum*	6b, 7a, 7b, 8a	Coastal Plain	❍ - ◗	2-3 ft.	Moderate	Occasionally browsed by wildlife. Seeds eaten by birds.	Stream banks, floodplains, moist meadows.
Water Regime: Surface Saturation to +3 inches of Surface Water							
CUTGRASS, RICE *Leersia oryzoides*	All	Statewide; common	❍	<3 ft.	Fast	Seeds eaten by waterfowl, songbirds. Roots eaten by waterfowl.	Shallow fresh marshes & wet meadows. Cool-season grass. Leaves have sawtoothed edges.
FERN, SENSITIVE *Onoclea sensibilis*	All	Statewide; common	❍ - ●	<3 ft.	Fast	Minimal value for food. Occasionally browsed by deer.	Wet meadows and saturated forested wetlands.
FERN, CINNAMON *Osmunda cinnamomea*	All	Statewide; common	●	3-6 ft.	Slow	Minimal value for food. Occasionally browsed by deer.	Saturated forested wetlands.
FERN, ROYAL *Osmunda regalis*	All	Statewide; common	◗ - ●	3-6 ft.	Slow	Minimal value for food. Occasionally browsed by deer.	Wooded swamps and saturated forested wetlands.
IRIS, BLUE *Iris versicolor*	All	Statewide; common	❍	<3 ft.	Slow	Plants eaten by muskrats.	Shallow fresh marshes. Attractive blue flower.
IRIS, VIRGINIA *Iris virginica*	All	Mostly Coastal Plain; uncommon	❍	<3 ft.	Slow	Plants eaten by muskrats.	Shallow fresh marshes. Attractive blue flower.

TABLE 6.2: Selected List of Native Herbaceous Wetland Plants [1]							
Plant Names	**Plant Hardiness Zones [2]**	**Geographic Distribution in Maryland [2]**	**Sun/ Shade [3]**	**Height at Maturity**	**Rate of Spread [4]**	**Wildlife Value for Food**	**Natural Habitat and Other Characteristics**
Water Regime: Surface Saturation to +3 inches of Surface Water (continued)							
MALLOW, MARSH *Kosteletzkya virginica*	7a, 7b, 8a	Coastal Plain	❍	3-6 ft.	Slow	Flowers attractive to hummingbirds.	Brackish & fresh tidal marshes; saturated soils above MHT. Salinity 0 - 10 ppt. Large, showy pink flowers.
MALLOW, ROSE *Hibiscus moscheutos*	All	Coastal Plain	❍	3-6 ft.	Slow	Flowers attractive to hummingbirds.	Brackish & fresh tidal marshes; saturated soils above MHT. Salinity 0 - 15 ppt. Large, showy white flowers.
MANNA GRASS *Glyceria canadensis*	All	Mostly Piedmont & W. Md.	❍ - ◗	3-6 ft.	Fast	Seeds eaten by songbirds, waterfowl. Plants eaten by deer, muskrats.	Shallow fresh marshes, wet meadows, open forested wetlands. Cool-season grass.
MANNA GRASS, EASTERN *Glyceria septentrionalis*	All	Mostly Coastal Plain; common	❍	3-6 ft.	Fast	Seeds eaten by songbirds, waterfowl. Plants eaten by deer, muskrats.	Shallow fresh marshes and wet meadows. Cool-season grass.
MANNA GRASS, FOWL *Glyceria striata*	All	Statewide; common	❍ - ◗	<3 ft.	Slow	Seeds eaten by songbirds, waterfowl. Plants eaten by deer, muskrats.	Wet meadows. Cool-season grass. Contains prussic acid; can be poisonous to livestock.
MILLET, WALTER'S *Echinochloa walteri*	All	Mostly Coastal Plain; common	❍	<3 ft.	Slow	Seeds eaten by songbirds, waterfowl.	Shallow fresh marshes and wet meadows. Annual, warm-season grass.
REEDGRASS, BLUE-JOINT *Calamagrostis canadensis*	5b, 6a, 6b	Mostly Piedmont & W. Md.	❍ - ◗	3-6 ft.	Slow	Stems, leaves, & rootstocks eaten by muskrats, deer.	Shallow fresh marshes, wet meadows, open forested wetlands. Cool-season grass.
RUSH, SOFT *Juncus effusus*	All	Statewide; common	❍	<3 ft.	Slow	Seeds eaten by songbirds, waterfowl.	Shallow fresh marshes and wet meadows.
SMARTWEED, PENNSYLVANIA *Polygonum pensylvanicum*	All	Statewide; common	❍	3-6 ft.	Fast	Seeds eaten by waterfowl, songbirds.	Shallow marshes and wet meadows. Small pink flowers.
SMARTWEED, SWAMP *Polygonum hydropiperoides*	All	Statewide; common	❍	<3 ft.	Fast	Seeds eaten by waterfowl, songbirds.	Shallow fresh marshes and wet meadows. Small white flowers.
SWITCHGRASS *Panicum virgatum*	All	Mostly Coastal Plain; common	❍	3-6 ft.	Slow	Seeds eaten by songbirds. Foliage eaten by rabbits, deer.	Wet meadows; shallow edges of fresh & brackish marshes. Warm-season grass. Salinity 0 - 10 ppt.

TABLE 6.2: Selected List of Native Herbaceous Wetland Plants [1]							
Plant Names	**Plant Hardiness Zones [2]**	**Geographic Distribution in Maryland [2]**	**Sun/ Shade [3]**	**Height at Maturity**	**Rate of Spread [4]**	**Wildlife Value for Food**	**Natural Habitat and Other Characteristics**
Water Regime: Surface Saturation to +3 inches of Surface Water (continued)							
TEARTHUMB *Polygonum arifolium* *Polygonum sagittatum*	All	Statewide; common	❍	Vine	Fast	Seeds eaten by waterfowl, songbirds.	Shallow fresh marshes and wet meadows. Small white-pink flowers. Many small prickles on stems.
WOOL-GRASS *Scirpus cyperinus*	All	Statewide; common	❍	3-6 ft.	Fast	Seeds eaten by songbirds, waterfowl. Rootstocks & foliage eaten by muskrats.	Shallow fresh marshes and wet meadows. A bulrush, not a grass.
WILD RICE *Zizania aquatica*	All	Mostly Coastal Plain	❍	6-9 ft.	Slow	Seeds eaten by songbirds, waterfowl.	Mostly in tidal fresh marshes. Annual, cool-season grass.
Water Regime: Surface Saturation to +6 inches of Surface Water							
ARROW-ARUM *Peltandra virginica*	All	Mostly Coastal Plain; common	❍ - ◗	<3 ft.	Slow	Seeds eaten by waterfowl, rails, muskrats.	Shallow marshes and stream edges. Salinity 0 - 2 ppt. Plant also known as “Duck Corn.” Inconspicuous green flowers.
BURREED, AMERICAN *Sparganium americanum*	All	Mostly Coastal Plain & Piedmont	❍ - ◗	<3 ft.	Fast	Seeds eaten by waterfowl and rails. Stems and leaves eaten by muskrats.	Shallow fresh marshes, especially along rivers & streams. White flowers.
BURREED, GIANT *Sparganium eurycarpum*	All	Statewide; common	❍	3-6 ft.	Fast	Seeds eaten by waterfowl and rails. Stems and leaves eaten by muskrats.	Shallow fresh marshes. White flowers.
BULRUSH, GREEN *Scirpus atrovirens*	All	Statewide; common	❍	3-6 ft.	Fast	Seeds eaten by waterfowl, songbirds. Rootstocks & stems eaten by muskrats.	Shallow fresh marshes and wet meadows.
BULRUSH, RIVER *Schoenoplectus fluviatilis* *(*formerly *Scirpus fluviatilis)*	All	Coastal Plain; common	❍ - ◗	3-6 ft.	Fast	Seeds eaten by waterfowl, songbirds. Rootstocks & stems eaten by muskrats.	Shallow fresh marshes.
BULRUSH, SOFT-STEM *Schoenoplectus tabernaemontani* *(*formerly *Scirpus validus)*	All	Statewide; common	❍	6-9 ft.	Fast	Seeds eaten by waterfowl, songbirds. Rootstocks & stems eaten by muskrats.	Shallow fresh to slightly brackish marshes. Salinity 0 - 5 ppt.
BULRUSH, THREE-SQUARE *Schoenoplectus pungens* *(*formerly *Scirpus pungens)*	All	Statewide; common	❍	<3 ft.	Fast	Seeds eaten by waterfowl, songbirds. Rootstocks & stems eaten by muskrats.	Shallow fresh to brackish marshes and open water fringes. Salinity 0 - 15 ppt.

TABLE 6.2: Selected List of Native Herbaceous Wetland Plants [1/]							
Plant Names	**Plant Hardiness Zones [2/]**	**Geographic Distribution in Maryland [2/]**	**Sun/ Shade [3/]**	**Height at Maturity**	**Rate of Spread [4/]**	**Wildlife Value for Food**	**Natural Habitat and Other Characteristics**
Water Regime: Surface Saturation to +6 inches of Surface Water (continued)							
CORDGRASS, SALTMARSH *Spartina alterniflora*	All	Coastal Plain	❍	3-6 ft.	Fast	Seeds eaten by waterfowl & songbirds. Roots eaten by waterfowl and muskrats.	Tidal marshes between mid tide and MHT. Warm-season grass. Salinity 0 - 35 ppt.
SEDGE, FOX *Carex vulpinoidea*	All	Statewide; common	❍	<3 ft.	Slow	Seeds eaten by waterfowl, songbirds, rails. Foliage eaten by deer.	Shallow fresh marshes.
SEDGE, FRINGED *Carex crinita*	All	Statewide; common	❍ - ◗	<3 ft.	Slow	Seeds eaten by waterfowl, songbirds, rails. Foliage eaten by deer.	Forested wetlands and thickets.
SEDGE, SHALLOW CAREX LURIDA	All	Statewide; common	❍ - ◗	<3 ft.	Slow	Seeds eaten by waterfowl, songbirds, rails. Foliage eaten by deer.	Forested wetlands with shallow water and/or saturated soil.
SEDGE, THREE-WAY *Dulichium arundinaceum*	All	Statewide; common	❍	<3 ft.	Slow	Foliage eaten by deer.	Shallow fresh marshes and openings in forested wetlands.
SEDGE, TUSSOCK *Carex stricta*	All	Statewide; common	❍	<3 ft.	Slow	Seeds eaten by waterfowl, songbirds, rails. Foliage eaten by deer.	Shallow fresh marshes and wet meadows.
SPIKERUSH, BLUNT *Eleocharis obtusa*	All	Statewide; common	❍ - ◗	<3 ft.	Slow	Seeds and plants eaten by waterfowl, muskrats.	Shallow fresh marshes and open water fringes.
SWEETFLAG *Acorus americanus* (formerly *Acorus calamus)*	All	Statewide; more common on Coastal Plain	❍ - ◗	<3 ft.	Fast	Roots eaten by waterfowl, muskrats.	Shallow fresh to brackish marshes, stream edges, and wet meadows on floodplains. Salinity 0 - 10 ppt. Inconspicuous green flowers.

TABLE 6.2: Selected List of Native Herbaceous Wetland Plants [1]							
Plant Names	**Plant Hardiness Zones [2]**	**Geographic Distribution in Maryland [2]**	**Sun/ Shade [3]**	**Height at Maturity**	**Rate of Spread [4]**	**Wildlife Value for Food**	**Natural Habitat and Other Characteristics**
Water Regime: Surface Saturation to +12 inches of Surface Water							
ARROWHEAD, BROADLEAF *Sagittaria latifolia*	All	Statewide; common	❍ - ◗	<3 ft.	Fast	Seeds and tubers eaten by waterfowl, wading birds, muskrats.	Shallow fresh marshes. White flowers.
ARROWHEAD, RIGID *Sagittaria rigida*	All	Mostly Coastal Plain & Piedmont	❍ - ◗	<3 ft.	Fast	Seeds and tubers eaten by waterfowl, wading birds, muskrats.	Shallow fresh marshes. White flowers.
CATTAIL, NARROW-LEAF *Typha angustifolia*	All	Mostly Coastal Plain; common	❍	3-6 ft.	Fast	Rootstocks eaten by geese and muskrats. Stems also eaten by muskrats.	Shallow fresh and brackish marshes. Salinity 0 - 15 ppt. **Aggressive species.** Tends to dominate wetlands, to the exclusion of other plants. Should not be planted if a mix of plant species is desired.
CATTAIL, BROAD-LEAF *Typha latifolia*	All	Statewide; common	❍	3-6 ft.	Fast	Rootstocks eaten by geese and muskrats. Stems also eaten by muskrats.	Shallow fresh marshes. **Aggressive species.** Tends to dominate wetlands, to the exclusion of other plants. Should not be planted if a mix of plant species is desired.
CLUB, GOLDEN *Orontium aquaticum*	6a, 6b, 7a, 7b, 8a	Mostly Coastal Plain; uncommon elsewhere	❍	<3 ft.	Fast	Seeds eaten by waterfowl, muskrats.	Tidal fresh marshes, shallow ponds, slow streams. Small yellow flowers on a spathe.
LIZARD'S-TAIL *Saururus cernuus*	All	Statewide; more common on Coastal Plain	❍ - ◗	<3 ft.	Fast	Occasionally eaten by wood ducks.	Shallow fresh marshes and openings in forested wetlands. Nodding spike of small white flowers.
PICKEREL-WEED *Pontederia cordata*	All	Statewide; more common on Coastal Plain	❍ - ◗	<3 ft.	Fast	Seeds and roots eaten by waterfowl. Flowers attractive to butterflies.	Shallow fresh to slightly brackish marshes and slow streams. Salinity 0-3 ppt. Showy, small blue flowers on spikes up to 6" long.
POND-LILY, YELLOW (SPATTERDOCK) *Nuphar lutea*	All	Statewide; common	❍ - ◗	<3 ft.	Fast	Seeds eaten by waterfowl, muskrats. Stems also eaten by muskrats.	Tidal fresh marshes, shallow ponds, slow streams. Tolerates tidal inundation up to 3 feet. Large, heart-shaped leaves. Bright yellow flowers.

TABLE 6.2: Selected List of Native Herbaceous Wetland Plants [1]							
Plant Names	**Plant Hardiness Zones [2]**	**Geographic Distribution in Maryland [2]**	**Sun/ Shade [3]**	**Height at Maturity**	**Rate of Spread [4]**	**Wildlife Value for Food**	**Natural Habitat and Other Characteristics**
Water Regime: +12 inches to +36 inches of Surface Water, and Deeper							
LOTUS, AMERICAN *Nelumbo lutea*	All	Statewide; uncommon	❍	3-6 ft.	Fast	Seeds eaten by waterfowl, muskrats. Stems also eaten by muskrats.	Shallow ponds, slow streams. Large, round leaves, floating or raised above the water. Can grow in water up to 6 feet deep. Pale yellow flowers on stalks extending up to 3 feet above the water.
WATER-LILY, WHITE *Nymphaea odorata*	All	Statewide; common	❍ - ◗	3-6 ft.	Fast	Seeds eaten by waterfowl, muskrats. Stems also eaten by muskrats.	Tidal fresh marshes, shallow ponds and bogs. Can grow in water up to 4 feet deep. Leaves and flowers float on the water surface. Attractive white flowers.

TABLE 6.2 NOTES:

1. **Selected Lists of Native Herbaceous Plants, Trees, and Shrubs:** The term "native" refers to species that occur naturally in one or more geographic regions of Maryland. Due to page limitations, this listing of native species is not all-inclusive. There are many more native plants that occur in Maryland and may be suitable for planting in and around wetlands.

2. The **Plant Hardiness Zones** designate where a species can be successfully planted in Maryland, while the **Geographic Distribution** describes where the species usually occurs under natural conditions.

3. **Sun - Shade:** Sunlight and shade tolerance for each species.

   ❍ Full Sun - 6 or more hours of direct sunlight per day or 4 hours of midday sun.
   ◗ Part Shade - 3 to 6 hours of direct sunlight per day.
   ● Shade - less than 3 hours of direct sunlight per day.

4. **Rate of Spread:** Relative rate of spreading under ideal conditions.

   Slow: spreading at a rate of < 0.5 ft. per year.
   Fast: spreading at a rate of ≥ 0.5 ft. per year.

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SECTION 7 - FORAGE AND BIOMASS PLANTINGS

This section contains recommendations for establishing adapted and/or native species, varieties, or cultivars of herbaceous plants suitable for pasture, hay, or biomass production.

Specifications for Selecting Mixes and Establishing Plantings

These specifications supplement the applicable conservation practice standards (see Section 1, Table 1.1), and contain additional criteria for species selection, planting rates, and methods of establishment.

Refer to the following tables to select the appropriate plant species and seeding rates to meet the client's needs:

- Table 7.1 - Annual Forage and Biomass Plantings for an Extended Grazing Season or Emergency Forage Production.
- Table 7.2 - Selected Mixes for Perennial Cool-Season Forage and Biomass Plantings.
- Table 7.3 - Cool-Season Forage and Biomass Plantings—Establishment, Management, and Use Characteristics.
- Table 7.4 - Cool -Season Forage and Biomass Plantings—Plant Suitability for Site Conditions.
- Table 7.5 - Cool -Season Forage and Biomass Plantings—Seeding Recommendations.
- Table 7.6 - Warm-Season Forage and Biomass Plantings—Establishment, Management, and Use Characteristics.
- Table 7.7 - Warm-Season Forage and Biomass Plantings—Plant Suitability for Site Conditions.
- Table 7.8 - Warm-Season Forage and Biomass Plantings—Seeding Recommendations.

Other species that are native to Maryland, or are introduced and are non-invasive, may also be suitable.

Refer to the Maryland NRCS Conservation Practice Fact Sheet *Pasture and Hay Planting - 512* for additional recommendations concerning species selection, establishment, and maintenance of this type of planting.

TABLE 7.1: Annual Forage and Biomass Plantings for an Extended Grazing Season or Emergency Forage Production [1/]

Plant Species	Seeding Rate [2/] (lbs/ac)	Seeding Depth (inches)	Seeding Dates	Harvest Season	Time to First Harvest	Growth Stage at First Harvest		Regrowth After Grazing	Yield Range (Dry Matter)
						If Grazed	*If Mechanically Harvested*		
GRASSES									
Annual Ryegrass *Lolium perenne* spp. *multiflorum*	30 - 45	0.25 - 0.5	8/15 - 10/15	Fall, spring, early summer	30 - 45 days	At 6 inches	At 15 - 20 inches	Yes	2 - 5 tons
Barley *Hordeum vulgare*	100 - 150	1.0 - 1.5	9/1 - 10/1	Fall, spring	40 - 60 days	Vegetative stage, at 3 - 5 inches	Late boot – early head	Yes	1 - 2 tons
Cereal Rye *Secale cereale*	120 - 180	1.0 - 1.5	8/15 - 11/15	Fall, spring	40 - 60 days	Vegetative stage, at 3 - 5 inches	Late boot – early head	Yes	2 - 3 tons
Corn *Zea mays*	25,000 - 45,000 seeds/acre	1.0 - 2.0	4/15 - 6/1	Summer	40 - 100 days	Above 20 inches	Milk line 1/3 - 1/2 down kernel	No	3 - 8 tons
Oats *Avena sativa*	100 - 150	1.0 - 1.5	3/1 - 4/15, 8/1 - 8/30	Spring, early summer, fall	35 - 50 days	Vegetative stage, at 3 - 5 inches	Late boot - head	Yes	2 - 4 tons
Pearl Millet *Pennisetum glaucum*	25 - 30	0.5 - 1.0	5/1 - 8/1	Summer	30 - 45 days	At 18 inches	Above 18 inches, early head - early bloom	Yes	3 - 5 tons
Sudangrass Sudan x Sorghum *Sorghum bicolor*	20 - 30	1.0 - 1.5	5/1 - 7/15	Summer	30 - 45 days	Minimum of 18 inches, wait 7 days after frost	At 36 - 48 inches, early head - early bloom	Yes	3 - 8 tons
Triticale *Triticale hexaploide*	120 - 180	1.0 - 1.5	8/15 - 11/15	Fall, spring	40 - 60 days	Vegetative stage, at 3 - 5 inches	Late boot - head	Yes	1 - 3 tons
Wheat *Triticum aestivum*	120 - 180	1.0 - 1.5	10/1 - 10/15	Fall, spring	40 - 60 days	Vegetative stage, at 3 - 5 inches	Late boot - head	Yes	1 - 2 tons
BRASSICAS									
Kale *Brassica oleracea*	3 - 4	0.25 - 0.5	5/1 - 6/15	Late summer, fall	120 - 180 days	150 days after seeding	----	No	1 - 5 tons
Rape *Brassica napus*	3 - 4	0.25 - 0.5	5/1 - 8/15	Summer, fall	80 - 90 days	80 - 90 days after establishment	----	Yes	1 - 5 tons
Swede *Brassica napus*	1 - 2	0.25 - 0.5	5/1 - 6/15	Fall	150 - 180 days	150 days after seeding	----	No	1 - 5 tons
Turnips *Brassica rapa*	2	0.25 - 0.5	5/1 - 8/15	Summer, fall	60 - 90 days	70 - 90 days after establishment	----	Yes	1 - 5 tons

TABLE 7.1 NOTES:

1. Animal Health Concerns: Caution--Livestock consumption of sorghum, sudangrass, and sudan-sorghum hybrids (and to some extent, other plants) can result in nitrate poisoning and prussic acid (hydrogen cyanide) poisoning. Plant growth stage, plus environmental and management factors, affect nitrate and prussic acid concentrations in foliage. To minimize health risks to livestock, use careful management when feeding with emergency and late-season forages, and know when to expect potential problems and how to avoid them. Before feeding any suspect forage, have representative samples tested for nitrate and prussic acid content.
2. Seeding rate shall be calculated on a pure live seed (PLS) basis.

TABLE 7.2: Selected Mixes for Perennial Cool-Season Forage and Biomass Plantings [1]					
Mix	**Seeding Rate [2] (lbs/ac)**		**Plant Hardiness Zones [3]**	**Soil Drainage Class [4]**	**Remarks**
	Pasture	***Hay***			
GRASS-ALFALFA MIXES					
1. SELECT ONE GRASS:					Use an endophyte-free or novel endophyte-infected variety of Tall Fescue.
Orchardgrass *Dactylis glomerata*	8 - 10	2 - 6			
Tall Fescue *Schedonorus arundinaceus*	10 - 15	5 - 10	All	W - MW	
AND ADD:					
Alfalfa *Medicago sativa*	8 - 10	8 - 12			
2. SELECT ONE GRASS:					Perennial Ryegrass is useful for quick reseeding – high quality pasture, but is short lived. Smooth Bromegrass and Timothy are suitable for one-cut hay. Timothy is not recommended for pasture. Smooth Bromegrass can be used for less intensive pasturing, as compared to Mix 1.
Perennial Ryegrass *Lolium perenne*	10 - 15	4 - 8			
Smooth Bromegrass *Bromus inermis*	8 - 15	6 - 10			
Timothy *Phleum pretense*	N/A	2 - 6	5a, 6a, 6b	W - MW	
AND ADD:					
Alfalfa *Medicago sativa*	8 - 10	8 - 12			
GRASS-BIRDSFOOT TREFOIL MIXES					
3. SELECT ONE GRASS:					Good for wet sites. "No bloat" mix.
Orchardgrass *Dactylis glomerata*	8 - 10	2 - 4			
Smooth Bromegrass *Bromus inermis*	8 - 15	6 - 8			
Timothy *Phleum pretense*	N/A	4 - 6	5a, 6a, 6b	W - P	
AND ADD:					
Birdsfoot Trefoil *Lotus corniculatus*	6 - 10	5 - 8			
4. USE TWO GRASSES:					"No bloat" mix.
Kentucky Bluegrass *Poa pratensis*	5 - 15				
Timothy *Phleum pretense*	5 - 10	N/A	5a, 6a, 6b	W - SP	
AND ADD:					
Birdsfoot Trefoil *Lotus corniculatus*	6 - 10				

TABLE 7.2: Selected Mixes for Perennial Cool-Season Forage and Biomass Plantings [1/]

Mix	Seeding Rate [2/] (lbs/ac)		Plant Hardiness Zones [3/]	Soil Drainage Class [4/]	Remarks
	Pasture	*Hay*			
GRASS-CLOVER MIXES					
5. SELECT ONE GRASS: Perennial Ryegrass *Lolium perenne* Smooth Bromegrass *Bromus inermis* Timothy *Phleum pretense* **AND ADD:** Ladino (White) Clover *Trifolium repens* Red Clover *Trifolium pratense*	 10 - 15 8 - 15 5 - 10 1 - 2 2 - 4	 N/A	5a, 6a, 6b	W - SP	Perennial Ryegrass is sensitive to drought. Timothy is sensitive to high temperatures. Ladino (White) Clover is intolerant of droughty soils. Red Clover is short-lived and has low winter hardiness. A fungus associated with Red Clover can cause livestock (especially horses) to slobber or drool excessively. When used in horse pastures, plant the Red Clover at 50% of the specified rate if "slobbers" is a concern, or use an all grass mix (e.g., Mix 9 or 10) instead.
6. USE ALL THREE GRASSES: Kentucky Bluegrass *Poa pratensis* Perennial Ryegrass *Lolium perenne* Timothy *Phleum pretense* **AND ADD:** Ladino (White) Clover *Trifolium repens* Red Clover *Trifolium pratense*	 5 - 15 5 - 10 5 - 10 1 - 2 2 - 4	 N/A	5a, 6a, 6b	W - SP	Tall Fescue (endophyte-free or novel endophyte-infected variety) can be substituted for Perennial Ryegrass or Timothy. Perennial Ryegrass is sensitive to drought. Timothy is sensitive to high temperatures. Red Clover is short-lived and has low winter hardiness. For Red Clover in horse pastures, see Remarks for Mix 5.
7. SELECT ONE GRASS: Orchardgrass *Dactylis glomerata* Tall Fescue *Schedonorus arundinaceus* **AND ADD:** Ladino (White) Clover *Trifolium repens* Red Clover *Trifolium pretense*	 8 - 10 10 - 15 1 - 2 6 - 8	 2 - 6 5 - 10 N/A 6 - 8	All	W - SP	Use an endophyte-free or novel endophyte-infected variety of Tall Fescue. For Red Clover in horse pastures, see Remarks for Mix 5.
8. SELECT ONE GRASS: Orchardgrass *Dactylis glomerata* Tall Fescue *Schedonorus arundinaceus* **AND ADD:** Korean Lespedeza *K. stipulacea* Red Clover *Trifolium pratense*	 8 - 10 10 - 15 10 - 15 4 - 6	 2 - 6 5 - 10 10 - 15 N/A	All	W - SP	Use an endophyte-free or novel endophyte-infected variety of Tall Fescue. For Red Clover in horse pastures, see Remarks for Mix 5. The Lespedeza component makes this an especially good mix because lespedeza is more heat-tolerant than most of the other legumes.

TABLE 7.2: Selected Mixes for Perennial Cool-Season Forage and Biomass Plantings [1]					
Mix	**Seeding Rate [2] (lbs/ac)**		**Plant Hardiness Zones [3]**	**Soil Drainage Class [4]**	**Remarks**
	Pasture	***Hay***			
GRASS MIXES WITHOUT LEGUMES					
9. USE ALL THREE GRASSES: Kentucky Bluegrass *Poa pratensis* Smooth Bromegrass *Bromus inermis* Timothy *Phleum pretense*	5 - 15 4 - 8 4 - 8	N/A	5a, 6a, 6b	W - SP	Good grass base for pastures; especially suited for horse pastures.
10. USE TWO GRASSES: Kentucky Bluegrass *Poa pratensis* Tall Fescue *Schedonorus arundinaceus*	5 - 10 15 - 20	N/A	All	W - SP	For heavily grazed horse pastures or other loafing lots, use this mix with a **novel endophyte** variety of Tall Fescue. It will withstand abuse better than the endophyte-free varieties. Follow the Tall Fescue manufacturer's guidelines for establishment.

TABLE 7.2 NOTES:

1. Selected Mixes: These mixes have been selected based primarily on recommendations in the *Penn State Agronomy Guide* and in *Forage Production for Pasture Based Livestock Production, Establishing Forage Stands (Chapter 7)*. Due to page limitations, this list of mixes is not all-inclusive. There are many other combinations of grasses and/or legumes that may be suitable for pasture or hay, depending on site conditions and the producer's needs. All legume seeds shall be inoculated before planting with the appropriate *Rhizobium* bacteria.
2. Seeding Rates: Whenever possible, optimize seed distribution by using a brillion or cultipacker-seeder. If drilling, it is recommended to split rates and apply seed twice, with the second pass going perpendicular across the first drill rows. If broadcast planting, increase the seeding rate by 50%.
3. The Plant Hardiness Zones designate where a species can be successfully grown in Maryland, as shown on the Plant Hardiness Zone map (Figure 1.1).
4. 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.

TABLE 7.3: Cool-Season Forage and Biomass Plantings—Establishment, Management, and Use Characteristics

Species	Seedling Growth Rate [1]	Plant Growth Habit	Stand Persistence [2]	Forage Quality [3]		Relative Maturity [4]	Suitability for Grazing Management [5]		Suitability for Mechanical Harvest [6]		Compatible Species for Mixtures [7]
				Palatability	*Digestibility*		*Rotational Grazing*	*Continuous Grazing*	*Hay*	*Silage*	
GRASSES											
Kentucky Bluegrass *Poa pratensis*	Moderate	Sod	Long	High	Moderate	Early	Excellent	Excellent	Poor	Poor	Timothy Birdsfoot Trefoil Ladino Clover
Orchardgrass *Dactylis glomerata*	Fast	Bunch	Moderate	Moderate	Moderate	Early	Excellent	Good	Excellent	Excellent	Alfalfa Birdsfoot Trefoil Ladino Clover Red Clover
Perennial Ryegrass [8] *Lolium perenne* (Diploid and Tetraploid types)	Very Fast	Bunch	Short	High	High	Early	Excellent	Poor	Good	Excellent	Alfalfa Birdsfoot Trefoil Ladino Clover Red Clover
Prairiegrass [8] *Bromus catharticus*	Fast	Bunch	Short	High	High	Late	Good	Poor	Excellent	Excellent	Alfalfa
Smooth Bromegrass [8] *Bromus inermis*	Moderate	Sod	Short	High	Moderate	Late	Good	Poor	Excellent	Excellent	Alfalfa Birdsfoot Trefoil Ladino Clover
Tall Fescue [9] (endophyte-free or novel endophyte) *Schedonorus arundinaceus* *(*formerly *Festuca arundinacea)*	Moderate	Bunch	Moderate	Moderate	Moderate	Medium	Excellent	Poor	Good	Excellent	Alfalfa Ladino Clover Red Clover
Timothy *Phleum pratense*	Slow	Bunch	Short	Moderate	Moderate	Late	Good	Poor	Excellent	Excellent	Ky. Bluegrass Alfalfa Birdsfoot Trefoil Ladino Clover Red Clover

TABLE 7.3: Cool-Season Forage and Biomass Plantings—Establishment, Management, and Use Characteristics

Species	Seedling Growth Rate [1]	Plant Growth Habit	Stand Persistence [2]	Forage Quality [3]		Relative Maturity [4]	Suitability for Grazing Management [5]		Suitability for Mechanical Harvest [6]		Compatible Species for Mixtures [7]
				Palatability	*Digestibility*		*Rotational Grazing*	*Continuous Grazing*	*Hay*	*Silage*	
LEGUMES											
Alfalfa [10] *Medicago sativa*	Fast	Bunch	Long	High	High	Early	Excellent	Poor	Excellent	Excellent	Orchardgrass, Perennial Ryegrass, Smooth Bromegrass, Tall Fescue, Timothy.
Annual Lespedeza: Korean *Kummerowia stipulacea* or Common *K. striata* (both species formerly in genus *Lespedeza)*	Moderate	Spreading	Moderate	Moderate	High	Medium	Excellent	Poor	Good	Poor	Orchardgrass, Tall Fescue, Timothy, Red Clover.
Birdsfoot Trefoil *Lotus corniculatus*	Slow	Bunch	Long	High	High	Late	Good	Good	Good	Good	Ky. Bluegrass, Orchardgrass, Perennial Ryegrass, Smooth Bromegrass, Tall Fescue, Timothy.
Ladino (White) Clover [10] *Trifolium repens*	Moderate	Spreading	Moderate	High	High	Early	Excellent	Good	Good	Good	Ky. Bluegrass, Orchardgrass, Perennial Ryegrass, Smooth Bromegrass, Tall Fescue, Timothy, Red Clover.
Red Clover [10] *Trifolium pratense*	Fast	Bunch	Short	Moderate	High	Medium	Good	Poor	Good	Good	Orchardgrass, Perennial Ryegrass, Tall Fescue, Timothy, Ladino Clover.

TABLE 7.3 NOTES:

1. Seedling Growth Rate (Slow, Moderate, Fast): Vigor and competitiveness of the species, as compared to other grasses or legumes. Slow-growing seedlings tend to have more problems with weed competition than faster growing species.

2. Stand Persistence (Short, Moderate, Long): Persistence of the species (without replanting) as compared to other grasses or legumes. This is an indication of how soon the planting will need to be renovated or overseeded. Long - Generally 5 years or more; Moderate - 3 to 5 years; Short - 1 or 2 years.

3. Forage Quality (Low, Moderate, High): Values of each species for palatability and digestibility, as compared to other forages. When developing pasture mixes, select species that have similar palatability to minimize selective grazing.

4. Relative Maturity (Early, Medium, Late, Very Late): Relative time of maturity for each species during the growing season. When developing pasture or hay mixes, select species and varieties that are expected to mature at approximately the same time.

5. Suitability for Grazing Management (Poor, Fair, Good, Excellent): Describes the suitability of each species for grazing, depending on the type of grazing system used. Rotational Grazing – A system that provides a rest and regrowth period for pastures. Continuous Grazing – A system that allows livestock to have continuous access to pastures.

6. Suitability for Mechanical Harvest (Poor, Fair, Good, Excellent): Describes the suitability of each species as a mechanically harvested forage crop, depending on whether the forage will be harvested and stored as hay or as silage.

7. Compatible Species for Mixtures: If desired, one or more of these species may be combined with the primary species to make a mixture. When making mixtures, select species that are suited for the geographic location (plant hardiness zone) and local site characteristics and have the desired plant characteristics for establishment, maintenance, and use of the forage. Simple mixtures, such as one species of grass and one or two legumes are generally recommended versus a mix with many species.

8. Perennial Ryegrass, Prairiegrass, and Smooth Bromegrass: In Maryland, stand persistence is significantly reduced for these species due to disease and climate factors.

9. Tall Fescue Varieties: To avoid fescue toxicosis, use certified varieties that are endophyte-free or are novel endophyte-infected. Fescue with the novel endophyte is not toxic to livestock, and has the adaptive advantages of being more resistant to drought, disease, and insects than endophyte-free varieties.

10. Animal Health Issues Associated with Legumes: **Caution**--Livestock consumption of some legume species may result in adverse health effects. To minimize health risks to livestock, use careful management with these species, and know when to expect potential problems and how to avoid them. The following health concerns have been associated with specific legumes:

    Bloat - Associated with consumption of alfalfa, various clovers, cowpeas, and other legumes (but not birdsfoot trefoil).

    Alsike Clover Poisoning - Associated with consumption of alsike clover. This type of poisoning is known to occur in horses and occasionally in cattle, resulting in photodermatitis and long-term liver damage. Alsike clover should not be planted where pastures and hay will be used by horses.

    "Slobbers" (Excessive Salivation) - Associated with consumption of fungal-infected red clover (and sometimes white clover and other legumes) by horses and cattle.

TABLE 7.4: Cool-Season Forage and Biomass Plantings—Plant Suitability for Site Conditions								
Plant Species	**Plant Hardiness Zones [1]**	**Soil Drainage Class [2]**	**Soil pH [3]**	**Fertility Requirements [4]**	**Flooding or Ponding Tolerance [5]**	**Drought Tolerance [6]**	**Salinity Tolerance [7]**	**Winter Hardiness [8]**
GRASSES								
Kentucky Bluegrass *Poa pratensis*	All	W - SP	5.5 - 7.0	Moderate	Low	Low	Low	Good
Orchardgrass *Dactylis glomerata*	All	E - SP	5.5 - 7.0	Moderate	None	Moderate	Low	Good
Perennial Ryegrass *Lolium perenne*	5a, 6a, 6b	W - P	5.0 - 8.0	Moderate-High	Low	Low	Low	Poor
Prairiegrass *Bromus catharticus*	5a, 6a, 6b	E - MW	5.5 - 8.0	Moderate-High	None	Low	Moderate	Fair
Smooth Bromegrass *Bromus inermis*	5a, 6a, 6b	E - P	5.5 - 8.0	High	Low	Moderate	Low	Fair
Tall Fescue (endophyte-free or novel endophyte) *Schedonorus arundinaceus* *(*formerly *Festuca arundinacea)*	All	E - P	4.5 - 9.0	Moderate	Low	Moderate	Moderate	Good
Timothy *Phleum pratense*	5a, 6a, 6b	W - SP	5.0 - 7.5	Moderate	Low	Low	Low	Good
LEGUMES								
Alfalfa *Medicago sativa*	All	E - W	6.5 - 7.0	High	None	High	Low	Excellent
Annual Lespedeza: Korean *Kummerowia stipulacea* or Common *K. striata*	All	E - P	4.5 - 7.0	Low - Moderate	Low	High	Low	None (Annual)
Birdsfoot Trefoil *Lotus corniculatus*	5a, 6a, 6b	W - P	5.0 - 7.5	Moderate	Moderate	Moderate	Moderate	Excellent
Ladino (White) Clover *Trifolium repens*	All	W - P	5.5 - 7.5	Moderate-High	Moderate	Low	Low	Good
Red Clover *Trifolium pratense*	All	W - SP	6.0 - 7.5	Moderate	None	Low	Low	Good

TABLE 7.4 NOTES:

1. The Plant Hardiness Zones designate where a species can be successfully grown in Maryland, as shown on the Plant Hardiness Zone map (Figure 1.1).
2. 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.
3. Soil pH: Preferred soil pH range for fair to excellent forage production.
4. Fertility Requirements (Low, Moderate, High): Indicates the relative need of each species for nutrients to support plant growth. Species with relatively high fertility requirements will require more frequent nutrient applications.
5. Flooding or Ponding Tolerance (None, Low, Moderate, High): Describes the ability of each species to tolerate anaerobic conditions associated with extended ponding or flooding (generally more than 24 hours, continuously).
6. Drought Tolerance (Low, Moderate, High): Describes the ability of each species to withstand long periods of hot, dry weather. For each plant species, some varieties may be more (or less) tolerant than others.
7. Salinity Tolerance (None, Low, Moderate, High): Describes the ability of each species to withstand and flourish in saline soils (i.e., soils that contain water-soluble salts. For each plant species, some varieties may be more (or less) tolerant than others.
8. Winter Hardiness (Poor, Fair, Good, Excellent): Describes the ability of each species to survive typical winters in Maryland. For each plant species, some varieties may be more (or less) winter hardy than others.

TABLE 7.5: Cool-Season Forage and Biomass Plantings—Seeding Recommendations

Plant Species	Recommended Cultivar(s)	Seeding Rate (lbs/ac)			Seeding Depth (inches)	Suitability for Frost Seeding [1/]
		Alone	***Pasture Mix***	***Hay Mix***		
GRASSES						
Kentucky Bluegrass *Poa pratensis*	Ginger, Ken Blue, Park, Slezanka, Troy	15	5 - 15	----	0.25	Poor
Orchardgrass *Dactylis glomerata*	Numerous cultivars available	10 - 15	5 - 15	2 - 6	0.25 - 0.5	Poor
Perennial Ryegrass *Lolium perenne*	Numerous cultivars available	30	10 - 15	4 - 8	0.25 - 0.5	Good
Prairiegrass *Bromus catharticus*	Matua	25 - 40	----	20 - 30	0.25 - 0.5	Poor
Smooth Bromegrass *Bromus inermis*	Baylor, Saratoga	15	4 - 15	6 - 10	0.25 - 0.5	Poor
Tall Fescue (endophyte-free or novel endophyte) *Schedonorus arundinaceus*	Endophyte-free: Numerous cultivars available Novel endophyte: Jesup MaxQ, BarOptima PLUS E34 Endophyte-infected: Not recommended for forage purposes	15 - 35	10 - 15	5 - 10	0.25	Poor
Timothy *Phleum pratense*	Numerous cultivars available	10 - 15	4 - 10	2 - 6	0.25 - 0.5	Poor
LEGUMES						
Alfalfa *Medicago sativa*	Numerous cultivars available	15 - 20	10 - 15	10 - 15	0.25 - 0.5	Poor
Annual Lespedeza: Korean *Kummerowia stipulacea* or Common *K. striata* (both species formerly in genus *Lespedeza)*	Korean: Climax or Rowan Common: Kobe	15 - 25	10 - 15	10 - 15	0.25 - 0.5	Good
Birdsfoot Trefoil *Lotus corniculatus*	Pasture: Dawn, Empire Hay: Fergus, Norcen, Tretana, Viking	10	6 - 10	2 - 6	0.25	Good
Ladino (White) Clover *Trifolium repens*	Alice (a tall variety), Durana	----	1 - 3	1 - 3	0.25	Excellent
Red Clover *Trifolium pratense*	Cultivars resistant to both northern and southern strains of anthracnose	10 - 15	4 - 8	4 - 8	0.25	Excellent

TABLE 7.5 NOTE:

1. Suitability for Frost Seeding (Poor, Fair, Good, Excellent): Describes the suitability of each species for broadcast-overseeding during late winter to reestablish it in an established stand.

TABLE 7.6: Warm-Season Forage and Biomass Plantings—Establishment, Management, and Use Characteristics

Species	Seedling Growth Rate [1]	Plant Growth Habit	Stand Persistence [2]	Forage Quality [3]		Relative Maturity [4]	Suitability for Grazing Management [5]		Suitability for Mechanical Harvest [6]	
				Palatability	*Digestibility*		*Rotational Grazing*	*Continuous Grazing*	*Hay*	*Silage*
Bermudagrass[7] *Cynodon dactylon*	Moderate	Sod	Moderate - Long	High	Moderate	Late	Good	Good	Good	Good
Big Bluestem *Andropogon gerardii*	Slow	Bunch	Long	High	High	Very Late	Good	Poor	Good	Poor
Caucasian Bluestem *Bothriochloa bladhii (B. caucasica)*	Slow	Bunch	Long	High	High	Late	Good	Poor	Good	Poor
Eastern Gamagrass *Tripsacum dactyloides*	Slow	Bunch	Long	Very High	High	Very Late	Good	Poor	Good	Good
Indiangrass *Sorghastrum nutans*	Slow	Bunch	Long	High	Moderate	Very Late	Good	Poor	Good	Poor
Little Bluestem *Schizachyrium scoparium*	Slow	Bunch	Long	Moderate	Moderate	Very Late	Fair	Poor	Poor	Poor
Switchgrass *Panicum virgatum*	Slow	Bunch	Long	Moderate	High	Very Late	Good	Poor	Good	Poor

TABLE 7.6 NOTES:

1. Seedling Growth Rate (Slow, Moderate, Fast): Vigor and competitiveness of the species, as compared to other grasses or legumes. Slow-growing seedlings tend to have more problems with weed competition than faster growing species.
2. Stand Persistence (Short, Moderate, Long): Persistence of the species (without replanting) as compared to other grasses or legumes. This is an indication of how soon the planting will need to be renovated or overseeded. Long - Generally 5 years or more; Moderate - 3 to 5 years; Short - 1 or 2 years.
3. Forage Quality (Low, Moderate, High): Values of each species for palatability and digestibility, as compared to other forages. When developing pasture mixes, select species that have similar palatability to minimize selective grazing.
4. Relative Maturity (Early, Medium, Late, Very Late): Relative time of maturity for each species during the growing season. When developing pasture or hay mixes, select species and varieties that are expected to mature at approximately the same time.
5. Suitability for Grazing Management (Poor, Fair, Good, Excellent): Describes the suitability of each species for grazing, depending on the type of grazing system used. Rotational Grazing – A system that provides a rest and regrowth period for pastures. Continuous Grazing – A system that allows livestock to have continuous access to pastures.
6. Suitability for Mechanical Harvest (Poor, Fair, Good, Excellent): Describes the suitability of each species as a mechanically harvested forage crop, depending on whether the forage will be harvested and stored as hay or as silage.
7. Bermudagrass: **Caution**—This species can spread into other pasture plantings, lawns, and cropland fields. **Do not plant unless containment of the planting is feasible, as determined and approved by NRCS.**

TABLE 7.7: Warm-Season Forage and Biomass Plantings—Plant Suitability for Site Conditions								
Plant Species	**Plant Hardiness Zones [1]**	**Soil Drainage Class [2]**	**Soil pH [3]**	**Fertility Requirements [4]**	**Flooding or Ponding Tolerance [5]**	**Drought Tolerance [6]**	**Salinity Tolerance [7]**	**Winter Hardiness [8]**
Bermudagrass [9] *Cynodon dactylon*	All	E - SP	5.0 - 7.5	Moderate - High	Moderate	High	Moderate	Depends on the variety
Big Bluestem *Andropogon gerardii*	All	E - MW	5.0 - 7.5	Low - Moderate	Low	Very High	Low	Good
Caucasian Bluestem *Bothriochloa bladhii (B. caucasica)*	All	E - MW	5.0 - 8.0	Moderate	None	High	Low	Good
Eastern Gamagrass *Tripsacum dactyloides*	All	W - P	5.0 - 7.5	Moderate - High	Moderate	High	None	Good
Indiangrass *Sorghastrum nutans*	All	E - MW	5.0 - 7.5	Low - Moderate	None	Very High	Moderate	Good
Little Bluestem *Schizachyrium scoparium*	All	E - MW	5.5 - 8.5	Low - Moderate	None	Very High	None	Good
Switchgrass *Panicum virgatum*	All	E - P	4.5 - 7.5	Low - Moderate	Low - High (depends on the variety)	Low - Very High (depends on the variety)	Moderate	Good

TABLE 7.7 NOTES:

1. The Plant Hardiness Zones designate where a species can be successfully grown in Maryland, as shown on the Plant Hardiness Zone map (Figure 1.1).
2. 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.
3. Soil pH: Preferred soil pH range for fair to excellent forage production.
4. Fertility Requirements (Low, Moderate, High): Indicates the relative need of each species for nutrients to support plant growth. Species with relatively high fertility requirements will require more frequent nutrient applications.
5. Flooding or Ponding Tolerance (None, Low, Moderate, High): Describes the ability of each species to tolerate anaerobic conditions associated with extended ponding or flooding (generally more than 24 hours, continuously).
6. Drought Tolerance (Low, Moderate, High): Describes the ability of each species to withstand long periods of hot, dry weather. For each plant species, some varieties may be more (or less) tolerant than others.
7. Salinity Tolerance (None, Low, Moderate, High): Describes the ability of each species to withstand and flourish in saline soils. For each plant species, some varieties may be more (or less) tolerant than others.
8. Winter Hardiness (Poor, Fair, Good, Excellent): Describes the ability of each species to survive typical winters in Maryland. For each plant species, some varieties may be more (or less) winter hardy than others.
9. Bermudagrass: **Caution**—This species can spread into other pasture plantings, lawns, and cropland fields. **Do not plant unless containment of the planting is feasible, as determined and approved by NRCS**.

TABLE 7.8: Warm-Season Forage and Biomass Plantings—Seeding Recommendations				
Plant Species	**Recommended Cultivar(s)**	**Seeding Rate (PLS lbs/ac) [1/]**	**Seeding Depth (inches)**	**Planting Implement**
Bermudagrass[2/] *Cynodon dactylon*	Quickstand, Ozark, Tifton 44	20 bushels/acre, sprigged	N/A	Sprigger
Big Bluestem *Andropogon gerardii*	Niagara	8 - 10	0.25 - 0.5	Warm-Season Grass Drill
Caucasian Bluestem *Bothriochloa bladhii (B. caucasica)*	Common	6 - 8	0.25 - 0.5	Warm-Season Grass Drill
Eastern Gamagrass [3/] *Tripsacum dactyloides*	Iuka, Pete, PMK-24	10	0.75 - 1.0	Corn Planter
Indiangrass *Sorghastrum nutans*	Rumsey	8 - 10	0.25 - 0.5	Warm-Season Grass Drill
Little Bluestem *Schizachyrium scoparium*	Blaze, Camper	7	0.25 - 0.5	Warm-Season Grass Drill
Switchgrass *Panicum virgatum*	Lowland Ecotypes: Cave-in-Rock, Kanlow Upland Ecotypes: Blackwell, Carthage	8 - 10	0.25 - 0.5	Conventional Grass Drill or Broadcast and Cultipack

TABLE 7.8 NOTES:

1. Seeding Rate: Seeding rates for the warm-season grasses are in pounds of Pure Live Seed (PLS). Actual planting rates shall be adjusted to reflect percent seed germination and purity, as tested. Adjustments are usually not needed for the cool-season grasses or legumes. Whenever possible, optimize seed distribution by using a brillion or cultipacker-seeder. If drilling, it is recommended to split rates and apply seed twice, with the second pass going perpendicular across the first drill rows. Chaffy, warm season seeds require a specialized seed drill or native grass drill.
2. Bermudagrass: **Caution**—This species can spread into other pasture plantings, lawns, and cropland fields. **Do not plant unless containment of the planting is feasible, as determined and approved by NRCS.**
3. For Eastern Gamagrass, recommend using dry, stable seed that is pre-treated to break dormancy.