USDA
NATURAL RESOURCES
CONSERVATION SERVICE

MARYLAND CONSERVATION
PRACTICE STANDARD

WINDBREAK/SHELTERBELT ESTABLISHMENT

CODE 380
(Reported by Feet)

DEFINITION

Linear plantings of single or multiple rows of trees or shrubs, or sets of linear plantings.

PURPOSE

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

1. To provide shelter for structures, livestock, and recreational areas;
2. To provide living barriers to reduce airborne odors, particulates, and chemical drift;
3. To manage snow deposition;
4. To provide noise screens;
5. To provide visual screens and enhance aethetics;
6. To delineate property and field boundaries;
7. To enhance wildlife habitat.

CONDITIONS WHERE PRACTICE APPLIES

This practice may be applied on any areas where linear plantings of woody plants are desired and are suitable for the intended purpose.

Windbreaks/shelterbelts are generally not used solely for purposes of enhancing aesthetics or providing wildlife habitat. These are usually secondary purposes that may complement a primary purpose such as visual screening or providing shelter.

This practice does not apply to plantings that are intended to function primarily as field borders, hedgerows, or riparian forest buffers, for which other standards are applicable. (Refer to the conservation practice standards for Field Border, Code 386; Hedgerow, Code 422, and Riparian Forest Buffer, Code 391.)

CONSIDERATIONS

Consider the time of year when wind protection is needed, and the direction of the prevailing wind.

Assess site conditions including surrounding land uses, soils, residual herbicides (to the extent known), available moisture during the growing season, and existing vegetation on the site and in adjacent areas, including any noxious weeds that may be present. Selection of plants should favor species or varieties tolerant to herbicides used in the area.

Avoid selecting plant species or planting near existing species that may be alternate hosts to undesirable pests, or that may be considered invasive or undesirable. Species diversity, including use of native species, should be encouraged in order to minimize problems due to species-specific pests.

When selecting and purchasing plants, consider the length of time needed to achieve the desired purpose. Slow-growing species will take longer to reach the design height than fast-growing species. Seedlings will take longer than containerized or balled-and-burlapped stock.

Consider the need for supplemental watering or irrigation when establishing plantings, especially if larger containerized stock or balled-and-burlapped plants will be used.

Consider wildlife when selecting tree and shrub species. When planting around poultry houses, species that are highly attractive to birds are undesirable. In other locations, consider using plants that have multiple wildlife values such as

those suited for nesting habitat, fruit, seeds, browse, and protective cover.

Consider access routes and the need to maintain space for future expansion when designing windbreaks/shelterbelts near buildings. Take note of other constraints such as economic feasibility, regulatory or program requirements, the need for permits or approvals, and visual aspects.

When designing windbreaks/shelterbelts for poultry houses, consider any additional requirements of the individual poultry company and the need to work with the industry representative to develop a feasible plan.

Consider long-term maintenance requirements of the established vegetation.

Consider conservation of archeological, historic, structural and traditional cultural properties, when applicable.

CRITERIA

General Criteria Applicable to All Purposes

Selection of Plant Species - Plant species shall be selected based on the planned purpose(s) of the windbreak/shelterbelt, preferences of the client, and conditions of the site. Do not use weak-wooded species close to buildings where broken limbs can cause damage.

Plant growth rates, shade tolerance, soil moisture requirements, and other plant characteristics shall be considered when selecting species. Within a row, use only one species, or select species that have similar growth forms and growth rates.

Select plant species that are native to Maryland, or are introduced and are non-invasive (i.e., not likely to spread beyond the planted area and displace native species). Plantings consisting of two or more species, especially locally native plant species, shall be encouraged. For best results, use species and varieties with proven conservation traits. Refer to Table 3 for a selected list of tree and shrub species that can be used.

Types of Plant Materials - Vegetation may be established by using bare-root seedlings, containerized stock, or balled-and-burlapped stock. Only viable, high quality planting stock shall be used. If using containerized materials, do not transplant hardwood stock more than 1¾ inches trunk caliper, and pine stock more than 2½ inches trunk caliper. Smaller caliper plants are easier to transplant and usually have higher survival rates than larger caliper stock. Trunk caliper of nursery stock is measured at 6 inches above the soil surface if the plant's caliper is equal to or less than 4 inches, in accordance with American Nursery and Landscape Association standards.

Design and Layout - The maximum design height (H) for the windbreak/shelterbelt shall be the expected height of the tallest row of trees or shrubs at age 20 for the site.

The location, layout, and density of the planting shall be planned to accomplish the purpose and function intended within a 20-year period. The density will be affected by the choice of species (evergreen versus deciduous), the number of rows used, and the spacing of the plants between and within rows. If the windbreak/shelterbelt is also intended to provide shade, select trees that will develop wide crowns and sufficient height to shade the area. Do not plant trees or shrubs where they will interfere with structures and above or below ground utilities.

Where water erosion and/or runoff from melting snow is a concern, tree and shrub rows shall be oriented on or near the contour. Do not allow drainage from snowmelt to flow across confined livestock areas or other heavy use areas. Do not allow drainage of livestock waste from a confined livestock area to flow into the windbreak/shelterbelt. Use supporting practices such as diversions or filter strips as needed to redirect or reduce runoff. Avoid planting windbreaks/shelterbelts in the bottom of swales.

Spacing between and within rows shall be based on the needed growing space for plant type and species, the accommodation of maintenance equipment, and the desired characteristics of the stem(s), branches and canopy as required for a specific purpose.

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.

Access lanes or roads that cut through windbreaks/shelterbelts shall be at an angle to prevailing winds to prevent funneling of wind. Avoid gaps through single-row barriers.

Setbacks for Poultry Houses - If the windbreak/shelterbelt will be constructed around a poultry house, determine the location of access lanes needed for servicing the structure. Then use the following minimum setback distances in areas where access is required:

1. If access is required along the sidewalls, a minimum setback of 50 feet is needed;

2. The minimum setback distance from each end of a poultry house is 80 feet.

If the house does not have tunnel ventilation and has a south or west exposure, the minimum setback is 100 feet to provide for air movement.

If the minimum setback distances listed above are not available, work with the individual poultry company to develop a feasible plan.

Site Preparation and Planting - Site preparation and planting to establish vegetative cover shall be done at a time and manner to insure survival and growth of selected species. Provide supplemental moisture if and when necessary to assure early survival and establishment of selected species.

Use Figure 3 and Table 2 to determine the appropriate planting dates for the different types of plant materials.

All plant materials must be correctly handled before planting. In general, plant materials shall be planted as soon as possible after receiving them from the supplier. For bare-root seedlings, keep the roots moist at all times and keep the plants out of direct sunlight as much as possible.

The method of planting shall include hand or machine planting techniques, suited to achieving proper depths and placement for the selected plant species.

Livestock shall be controlled or excluded as necessary to establish and maintain the windbreak/shelterbelt to meet its intended purpose.

Protect vegetation from unacceptable impacts due to pests, wildlife, livestock, or fire. Exclude livestock as needed to establish vegetative cover.

Control noxious weeds as required by state law.

Comply with applicable federal, state, and local laws and regulations during the installation, operation, and maintenance of this practice. Follow state and local ordinances regarding set backs and traffic visibility requirements.

Additional Criteria To Provide Shelter for Structures, Livestock, and Recreational Areas

Height, Density, and Orientation - For wind protection, the windbreak/shelterbelt shall be oriented as close to perpendicular to the prevailing damaging wind as possible. The area to be protected shall be located within a leeward (downwind) distance of 10H from the planting. Greatest wind speed reduction occurs in the area from two times (2H) to ten times (10H) the height of the windbreak/shelterbelt on the leeward side, depending on the height, density, and orientation of the barrier (see Figures 1 and 2).

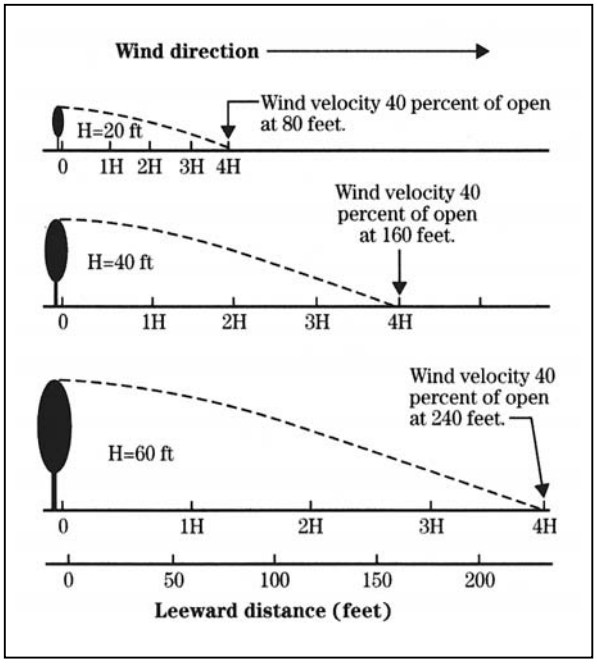
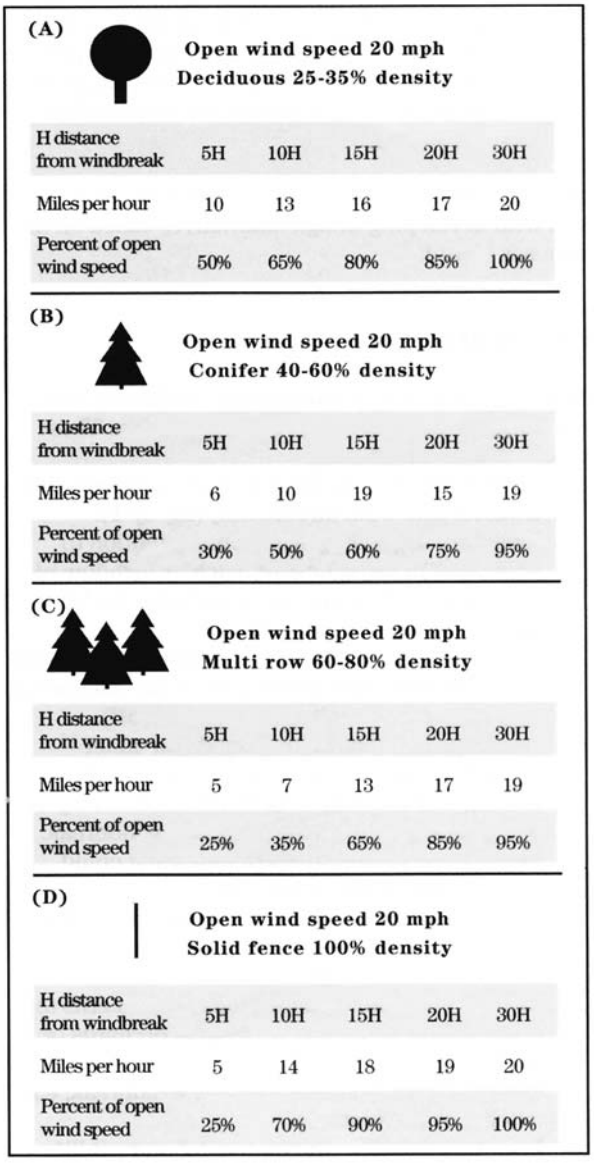


Figure 1. The leeward (downwind) distance of wind protection is proportional to the height of the barrier.

Use a minimum of one row of trees to provide protection from wind. If year-round protection is needed, use at least one row of evergreen trees.

For higher levels of protection, use at least three rows of trees and shrubs, with at least one row being evergreen. Use Table 2 to determine appropriate spacing.

To allow for changes in wind direction, it may be necessary to design the windbreak/shelterbelt to provide protection from multiple directions by using an L, U, or E shape. When orienting the windbreak/shelterbelt, avoid placement that may cause future management problems.



(A) Open wind speed 20 mph — Deciduous 25-35% density

H distance from windbreak	5H	10H	15H	20H	30H
Miles per hour	10	13	16	17	20
Percent of open wind speed	50%	65%	80%	85%	100%

(B) Open wind speed 20 mph — Conifer 40-60% density

H distance from windbreak	5H	10H	15H	20H	30H
Miles per hour	6	10	19	15	19
Percent of open wind speed	30%	50%	60%	75%	95%

(C) Open wind speed 20 mph — Multi row 60-80% density

H distance from windbreak	5H	10H	15H	20H	30H
Miles per hour	5	7	13	17	19
Percent of open wind speed	25%	35%	65%	85%	95%

(D) Open wind speed 20 mph — Solid fence 100% density

H distance from windbreak	5H	10H	15H	20H	30H
Miles per hour	5	14	18	19	20
Percent of open wind speed	25%	70%	90%	95%	100%

Figure 2. The density of the barrier (type of planting, spacing, and number of rows) affects wind speed reduction leeward (downwind) of the windbreak.

Length - The length of the windbreak/shelterbelt determines the amount of total area receiving protection. For best protection, the uninterrupted length of a planting should exceed the height by at least 10:1. For example, if planned height of the planting is 30 feet, the windbreak/shelterbelt needs to be at least 300 feet long to minimize the impact of air turbulence around the end of the planting. The windbreak/shelterbelt should also extend at least 100 feet past the site being protected to account for air turbulence around the end of the planting.

Additional Criteria to Reduce Airborne Odors, Particulates, and Chemical Drift

Windbreaks/shelterbelts that are intended to provide protection from particulates and/or chemical drift shall consist of species that are tolerant of wind-borne particulates and herbicides from adjacent areas. Height, length, and location of plantings shall be determined based on the type of airborne materials to be reduced.

Use a minimum of one row of trees or shrubs for this purpose. If year-round protection is needed, at least one row of evergreen trees or shrubs shall be used. For higher levels of protection, use at least three rows of trees and/or shrubs, with at least one row being evergreen.

Particulates from Poultry Houses - The following criteria apply to controlling particulates vented from poultry house tunnel fans:

At least one row of evergreen trees and/or shrubs shall be planted a minimum distance of 25 feet from the fans. If this distance is not available, other barriers such as fencing, netting, tall grasses, or earthen berms may be needed to control particulates. Plants may need to be planted farther than 25 feet away from the fans if access to the poultry house is needed in this area. Distances in excess of 50 feet may not provide sufficient particulate trapping.

Species suitable for use with tunnel fans are:

1. Trees - Eastern Red Cedar, Leyland Cypress, American Holly, Austrian Pine, and White Pine;

2. Shrubs - Northern Bayberry and Southern Waxmyrtle.

See Table 3 for additional information concerning these species.

Additional Criteria to Manage Snow

The windbreak/shelterbelt shall be oriented as close to perpendicular to the snow-bearing wind as possible.

Windbreaks/shelterbelts shall be located so that snow deposition will not pose a health or safety problem or obstruct human, livestock, or vehicular traffic. A windbreak/shelterbelt setback of 100 to 200 feet from the site being protected is needed to allow adequate space for snowdrifts to accumulate. When that critical distance is met, make sure that the area needing protection (e.g., a farmstead) will be within the 2H to 5H distance downwind of the windbreak/shelterbelt, based on the planned height and orientation of the planting.

Use a minimum of two rows of trees, or one row of trees and one row of shrubs, to provide snow protection. At least one row shall consist of evergreen trees. For higher levels of protection, use at least three rows of trees and shrubs, with at least one row being evergreen. Use Table 2 to determine appropriate spacing.

Additional Criteria to Provide Noise Screens

Noise screens shall be as close to and as tall as the noise source as practicable. The length of the noise screen shall be twice as long as the distance from the noise source to the receiver.

For high-speed traffic noise, the barrier shall not be less than 65 feet wide. For moderate speed traffic noise, the barrier width shall not be less than 20 feet wide. Species selected for traffic noise screens shall be tolerant of noxious emissions, sand and gravel depositions, and salt spray from traffic areas.

Use a minimum of two rows of trees, or one row of trees and one row of shrubs, to provide protection. Select plant species that will result in a high-density barrier (e.g., evergreens), and plant as close together as practical to form a tight barrier. If year-round protection is needed, at least one row shall consist of evergreen trees. Use Table 2 to determine appropriate spacing.

Additional Criteria to Provide Visual Screens

Visual screens shall be located as close to the observer as possible with a density, height and width to sufficiently block the view.

Use a minimum of one row of trees to provide a visual screen. If year-round protection is needed, use at least one row of evergreen trees. Refer to Table 2 to determine appropriate spacing.

Additional Criteria to Enhance Aesthetics

To enhance aesthetics, use evergreen species or species with features such as showy flowers, brilliant fall foliage, or persistent colorful fruits. Height, length, location, and number of rows shall be determined based on the primary purpose of the practice. Use Table 2 to determine appropriate spacing, based on primary purpose.

Additional Criteria for Enhancing Wildlife Habitat

To enhance wildlife habitat, select trees and/or shrubs that will also provide food, nesting cover, and/or protective cover for the desired wildlife species. Use locally native plant species when feasible.

Height, length, location, and number of rows shall be determined based on the primary purpose of the practice. Use Table 2 to determine appropriate spacing, based on primary purpose. For additional information concerning the wildlife value of various native tree and shrub species, refer to the Maryland conservation practice standard for Conservation Cover, Code 327.

Note: Specific cost-sharing programs or other funding sources may impose criteria in addition to, or more restrictive than, those specified in this standard.

SPECIFICATIONS

Plans and specifications for establishment of the windbreak/shelterbelt shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail concerning site preparation and establishment to ensure successful installation of the practice. Documentation shall be in accordance with the section "Supporting Data and Documentation" in this standard.

In addition, follow the establishment recommendations provided in the Maryland Job Sheet for Trees and Shrubs, or other applicable job sheet. The completed job sheet can serve as the planting plan for the windbreak/shelterbelt.

OPERATION AND MAINTENANCE

The completed Job Sheet can serve as the operation and management plan as well as supporting documentation and shall be provided to the client. If necessary, additional management requirements can be developed on a site specific basis to assure performance of the practice as intended.

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

1. Inspect trees and shrubs periodically and protect from adverse impacts including insects, diseases, fire, or damage from livestock and wildlife;

2. Control competitive grasses and weeds around plants by mowing, mulching, and/or chemical control until plants are well-established. Control all noxious weeds as required by state law;

3. Provide supplemental water as needed;

4. Replace dead trees and shrubs until the barrier is functional;

5. Thin or prune the barrier as needed to maintain its function;

6. For windbreaks/shelterbelts that are planted to reduce particulates, build-up of particulates on leaves may threaten to smother and kill the plants. When necessary, periodically remove the accumulated particulate matter from the leaves by hosing the plants with water. Excessive accumulation of particulates may require installation of additional barriers such as fencing or netting to protect the plants.

SUPPORTING DATA AND DOCUMENTATION

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

1. Field location, extent of the windbreak or shelterbelt in length & width, conservation plan map or sketch showing the location and layout of the practice, and assistance notes. Assistance notes shall include dates of site visits, name or initials of the person who made the visit, specifics as to alternatives discussed, decisions made, and by whom;

2. Species selected for establishment, number of rows, spacing, total quantities needed, and planting dates;

3. Completed copy of the appropriate Job Sheet(s) or other specifications, and management plans.

REFERENCES

1. USDA, Natural Resources Conservation Service. *Conservation Practice Standard for Conservation Cover, Code 327*. Maryland Field Office Technical Guide, Section IV.

2. USDA, Natural Resources Conservation Service. *Conservation Practice Standard for Field Border, Code 386.* Maryland Field Office Technical Guide, Section IV.

3. USDA, Natural Resources Conservation Service. *Conservation Practice Standard for Hedgerow, Code 422*. Maryland Field Office Technical Guide, Section IV.

4. USDA, Natural Resources Conservation Service. *Conservation Practice Standard for Riparian Forest Buffer, Code 391*. Maryland Field Office Technical Guide, Section IV.

5. USDA, Natural Resources Conservation Service. *CORE4 Conservation Practices.* Chapter 3j: Windbreak/Shelterbelt.

6. Wight, Bruce, and Kimberly Stuhr, March, 2002. *Windbreaks: An Agroforestry Practice.* USDA, National Agroforestry Center, Agroforestry Note - 25.

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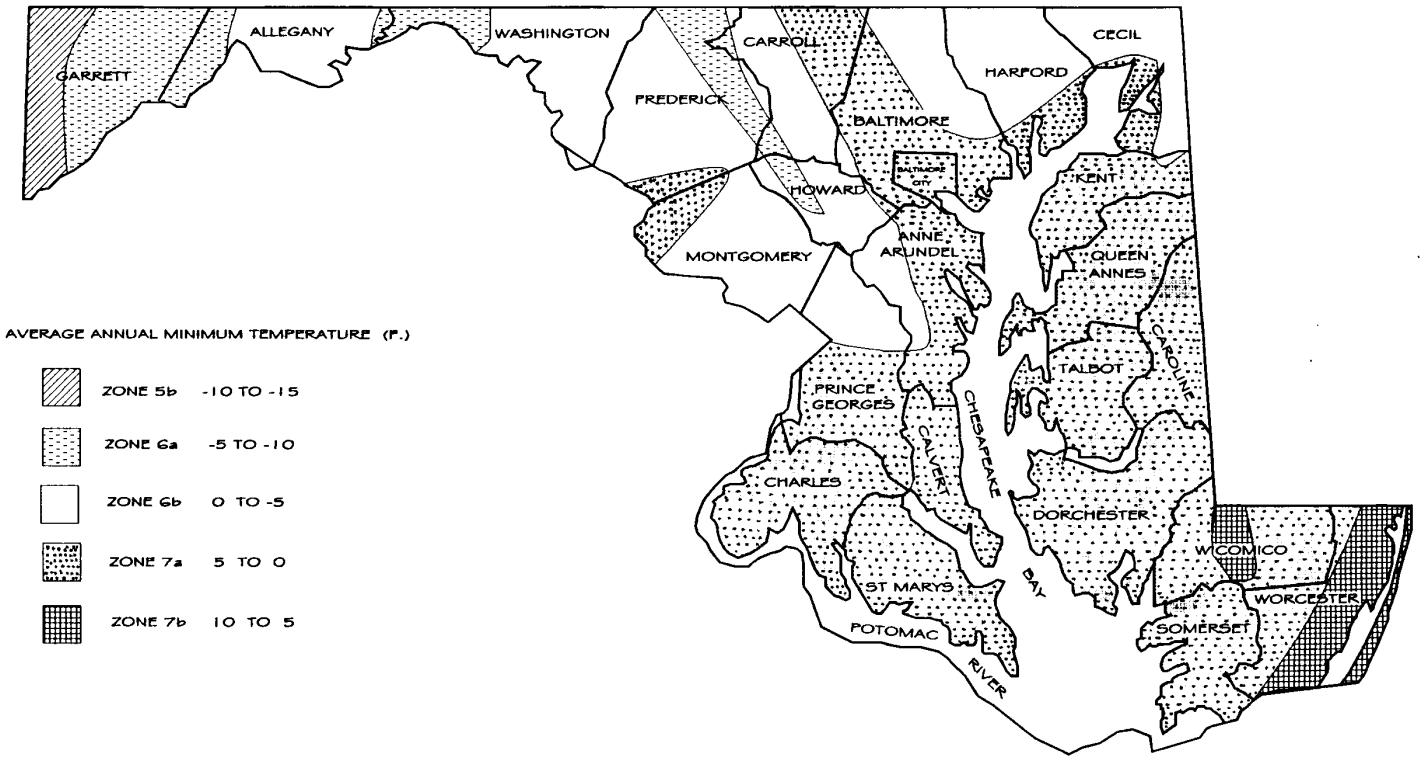
FIGURE 3: USDA Plant Hardiness Zones for Maryland



Plant Hardiness Zones delineate areas where a species can be successfully established based on average annual minimum temperatures.

TABLE 1: Recommended Planting Dates in Maryland [1/]

Type of Plant Material	Plant Hardiness Zones		
	5b and 6a	**6b**	**7a and 7b**
Bare-Root Plants [2/]	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*
Containerized Stock; 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 NOTES:

1. The planting dates listed are averages for each zone. These dates may require adjustment to reflect local conditions, especially near the boundaries of the zones.

2. When planted during the growing season, most of these materials must be purchased and kept in a dormant condition until planting.

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

✦ Frequent freezing and thawing of wet soils may result in frost-heaving of materials planted in late fall, if plants have not sufficiently rooted in place. Large containerized and balled-and-burlapped stock may be planted into the winter months as long as the ground is not frozen and soil moisture is adequate.

TABLE 2: Recommended Spacing Within and Between Rows [1/]

Plant Type	Spacing (feet) Within Rows for:				Spacing (feet) Between Rows for:
	Protection from Wind and Wind-borne Odors, Particulates, Chemicals, Snow		**Noise Screens and Visual Screens**		**All Purposes**
	Single Row	*Multiple Rows*	*Single Row*	*Multiple Rows*	
Shrubs	3 - 5	3 - 6	2 - 4	2 - 5	10 - 20
Deciduous Trees	8 - 12	10 - 18	5 - 8	8 - 10	10 - 20
Evergreen Trees (columnar form)	5 - 8	6 - 10	3 - 5	4 - 8	10 - 20
Evergreen Trees (conical & broad forms)	8 - 12	8 - 16	4 - 6	6 - 10	10 - 20

TABLE 2 NOTE:

1. Use spacings at or near the lower end of the range to create a dense barrier in a shorter period of time.

TABLE 3: Selected List of Trees and Shrubs for Windbreak/Shelterbelt Plantings

Plant Names	Plant Hardiness Zones [1/]	Geographic Distribution in Maryland [1/]	Maryland Native Species	Soil Drainage Class [2/]	Height at 20 Years	Growth Rate	Remarks
DECIDUOUS TREES							
ASH, GREEN *Fraxinus pennsylvanica*	All	Statewide.	Yes	SP -P	35 ft.	Moderate	Naturally occurring on streambanks and floodplains.
ASH, WHITE *Fraxinus americana*	All	Statewide.	Yes	W - SP	35 ft.	Moderate	Attractive fall color (yellow to maroon).
ASPEN, QUAKING *Populus tremuloides*	5b, 6a, 6b	Higher elevations of W. Md. (mostly Garrett Co.)	Yes	W - SP	40 ft.	Fast	Very fast-growing; relatively short-lived tree. White bark and brilliant fall color. Good for visual screening and noise abatement. Use in one row, and add one or more other rows of slower-growing species. Has aggressive roots—keep away from structures, sewers, and tile lines.
BIRCH, RIVER *Betula nigra*	All	Mostly Coastal Plain; Piedmont, Ridge & Valley at lower elevations.	Yes	W - P	30 ft.	Fast	Naturally occurring on streambanks and floodplains. Unique peeling reddish bark. Attractive for landscaping.
BLACKGUM *Nyssa sylvatica*	All	Statewide.	Yes	W - P	30 ft.	Moderate	Foliage turns bright red in early fall.
CYPRESS, BALD *Taxodium distichum*	6a, 6b, 7a, 7b	Lower Eastern Shore (esp. Pocomoke River); also in Calvert Co.	Yes	MW - P	30 ft.	Fast	Naturally occurring on streambanks and in swamps.
MAPLE, RED *Acer rubrum*	All	Statewide.	Yes	W - P	35 ft.	Fast	Red fall color and blooms.
OAK, PIN *Quercus palustris*	All	Statewide, except in Garrett Co.	Yes	MW - P	35 ft.	Fast	Bronze or red fall foliage. Widely planted as an ornamental. Produces small acorns.
OAK, NORTHERN RED *Quercus rubra*	All	Mostly Piedmont & W. Md.; uncommon on Coastal Plain.	Yes	W - SP	35 ft.	Fast	Excellent red fall color. Tolerates urban conditions; perhaps the fastest-growing oak for landscapes.
OAK, SAWTOOTH *Quercus acutissima*	All	Introduced; not native to U.S.	No	W - SP	60 ft.	Fast	Native to eastern Asia. Good shade tree. Tolerates adverse conditions.

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Plant Names	Plant Hardiness Zones [1/]	Geographic Distribution in Maryland [1/]	Maryland Native Species	Soil Drainage Class [2/]	Height at 20 Years	Growth Rate	Remarks
DECIDUOUS TREES (continued)							
OAK, SOUTHERN RED *Quercus falcata*	7a, 7b	Mostly Coastal Plain; infrequent elsewhere.	Yes	W - SP	35 ft.	Slow	Excellent red fall color. Tolerates poor, dry soil.
OAK, SWAMP WHITE *Quercus bicolor*	All	Mostly Coastal Plain; infrequent elsewhere.	Yes	SP - P	30 ft.	Fast	Good choice for wet sites. Requires acid soils.
OAK, WHITE *Quercus alba*	All	Statewide.	Yes	W - SP	35 ft.	Slow	Variable fall color, stately tree.
OAK, WILLOW *Quercus phellos*	6b, 7a, 7b	Mostly Coastal Plain; infrequent elsewhere.	Yes	MW - P	30 ft.	Fast	Frequently used as an ornamental planting. Produces small acorns. Red fall color.
POPLAR, TULIP *Liriodendron tulipifera*	All	Statewide.	Yes	W - SP	40 ft.	Fast	Flowers produce abundant nectar, much used by bees. Dropped flowers and fruits can be messy. Tends to be weak-wooded, not recommended near buildings.
SWEETGUM *Liquidambar styraciflua*	6b, 7a, 7b	Mostly Coastal Plain; infrequent elsewhere.	Yes	MW - P	40 ft.	Fast	Excellent yellow-red fall color. Widely planted as an ornamental. Fallen seed heads are a nuisance on lawns. Fruitless types are available.
EVERGREEN TREES							
ARBORVITAE *Thuja occidentalis*	All	W. Md., along the Potomac River.	Yes	W - P	25 ft.	Slow	Frequently planted statewide as an ornamental. Prefers moist, well-drained soil, but tolerates a wide range of conditions. Prone to bagworms. Can be planted near poultry house tunnel fans.
CEDAR, EASTERN RED *Juniperus virginiana*	All	Mostly Piedmont & W. Md.	Yes	W - SP	20 ft.	Slow	Should not be planted near apple orchards; alternate host of cedar-apple rust. Can be planted near poultry house tunnel fans.
CYPRESS, LEYLAND *X Cupressocyparis leylandii*	6a, 6b, 7a, 7b	Introduced; not native to U.S.	No	W - SP	40 ft.	Fast	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. Can be planted near poultry house tunnel fans.

TABLE 3: Selected List of Trees and Shrubs for Windbreak/Shelterbelt Plantings

Plant Names	Plant Hardiness Zones [1/]	Geographic Distribution in Maryland [1/]	Maryland Native Species	Soil Drainage Class [2/]	Height at 20 Years	Growth Rate	Remarks
EVERGREEN TREES (continued)							
FIR, DOUGLAS *Pseudotsuga menziesii*	5b, 6a, 6b	Introduced; native to Western U.S.	No	W - MW	40 ft.	Moderate	Prefers deep, moist, well-drained soils. Often planted for Christmas trees.
HOLLY, AMERICAN *Ilex opaca*	6a, 6b, 7a, 7b	Mostly Coastal Plain.	Yes	W - P	20 ft.	Slow	Need male and female plants for fruit production. Shade tolerant. Can be planted near poultry house tunnel fans, but is very slow-growing. May be suitable for use in Row 1 to reduce wind velocity from fans, but should be backed by a fine-leaved evergreen to trap particulates.
PINE, AUSTRIAN *Pinus nigra*	All	Introduced; not native to U.S.	No	E - P	35 ft.	Moderate	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. Can be planted near poultry house tunnel fans.
PINE, LOBLOLLY *Pinus taeda*	6b, 7a, 7b	Mostly Coastal Plain.	Yes	MW - P	45 ft.	Fast	Self-prunes lower limbs, so best suited in a multiple-row planting.
PINE, PITCH *Pinus rigida*	5b, 6a, 6b	Mostly Piedmont & W. Md.	Yes	W - SP	30 ft.	Fast	Tolerant of dry, rocky, sandy soils. Mature trees are resistant to fire. Will reproduce from stump sprouts.
PINE, WHITE *Pinus strobus*	All	Mostly Western Maryland.	Yes	W - MW	40 ft.	Fast	Frequently planted statewide as an ornamental. Does not tolerate much pollution. Can be planted near poultry house tunnel fans.
SPRUCE, NORWAY *Picea abies*	All	Introduced; not native to U.S.	No	W - MW	35 ft.	Fast	Fast growth rate when young, slows down with age. Prefers moderately moist, well-drained soil. Does not tolerate hot, dry, or polluted conditions.
SPRUCE, WHITE *Picea glauca*	5b, 6a, 6b	Introduced; native to Northern U.S.	No	W - MW	30 ft.	Moderate	Good ornamental and shade tree. Tolerates heat, drought, and wind better than most spruces.

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Plant Names	Plant Hardiness Zones [1/]	Geographic Distribution in Maryland [1/]	Maryland Native Species	Soil Drainage Class [2/]	Height at 20 Years	Growth Rate	Remarks
SHRUBS							
ARROWWOOD *Viburnum dentatum*	All	Statewide.	Yes	W - P	10 ft.	Fast	Suckers freely. White flowers, bluish-black berries.
BAYBERRY, NORTHERN *Morella pensylvanica* (formerly *Myrica pensylvanica)*	6b, 7a, 7b	Coastal Plain.	Yes	W - SP	10 ft.	Moderate	Need male and female plants for fruit production. Salt tolerant (0-20 ppt.) Suckers to form colonies. Can be planted near poultry house tunnel fans.
BUSH, HIGH TIDE (GROUNDSEL) *Baccharis halimifolia*	All	Coastal Plain	Yes	MW - P	10 ft.	Moderate	Usually in brackish and coastal marshes, 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	Yes	MW - P	10 ft.	Moderate	Usually in brackish and coastal marshes, above MHW. Salinity 0-15 ppt.
DOGWOOD, REDOSIER *Cornus sericea*	All	Statewide; uncommon.	Yes	MW - P	8 ft.	Fast	Attractive red stem color. White flowers and fruit.
DOGWOOD, SILKY *Cornus amomum*	All	Common on Coastal Plain & Piedmont.	Yes	MW - P	10 ft.	Fast	Produces fruit at 3-5 years of age. White flowers with blue berries. Prefers some shade.
LESPEDEZA, SHRUB *Lespedeza bicolor*	6b, 7a, 7b	Introduced; not native to U.S.	No	E - SP	8 ft.	Fast	Perennial semi-woody legume. Cut back periodically to maintain dense, shrubby growth. May become weedy in some habitats and may displace desirable vegetation if not properly managed. Does not tolerate shade or wet soils.
WAXMYRTLE, SOUTHERN *Myrica cerifera*	7a, 7b	Coastal Plain.	Yes	W - SP	10 ft.	Moderate	Need male and female plants for fruit production. Salt tolerant (0-10 ppt). Can be planted near poultry house tunnel fans.

TABLE 3 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.