

Table 1. Species Characteristics

Shrubs

	Height Spread	Rooting Pattern	Growth Rate	Drainage Adaptation	Soil Reaction	Shade Tolerance	Flooding Tolerance	Drought Sensitivity	Native to Ohio	Other Attributes or Concerns
Canada Yew <i>Taxus canadensis</i>	3-6 3-6	Sh. Lat.	Slow	SPD – WD	5.0 – 6.0	Tolerant	Intolerant	Intermediate	Yes	prefers cool, shaded situations
Common Juniper <i>Juniperus communis</i>	5-10 3-5	Taproot	Slow	SPD - WD	5.5 – 7.0	Intolerant	Intolerant	Intermediate	Yes (rare)	spreading form is most common
Bankers Dwarf Willow <i>Salix cottetii</i>	3-6 3-6	Sh. Lat. Suckers	Fast	PD - MWD	4.5 – 7.0	Intermediate	Tolerant	Sensitive	No	
Purpleosier Willow <i>Salix purpurea</i>	10-20 8-15	Sh. Lat. Suckers	Fast	PD - WD	6.1 – 7.5	Tolerant	Very Tolerant	Sensitive	No	can spread by layering
Hazelnut <i>Corylus americana</i>	6-12 5-10	Sh. Lat. Suckers	Medium	MWD - WD	6.0 – 7.0	Intermediate	Intolerant	Sensitive	Yes	often spreads to form large colonies
Hazel (Common) Alder <i>Alnus serrulata</i>	10-20 8-15	Sh. Lat.	Fast	PD - WD	5.5 – 6.0	Very Intolerant	Very Tolerant	Sensitive	Yes	prefers wet to moist soils
Steeplebush <i>Spirea tomentosa</i>	2-4 1-2	Sh. Lat.	Fast	SPD - WD	6.5 – 7.5	Intolerant	Intermediate	Sensitive	Yes	
Red Chokeberry <i>Aronia arbutifolia</i>	5-10 3-5	Sh. Lat. Suckers	Medium	SPD - MWD	5.0 – 6.5	Intolerant	Intermediate	Sensitive	No	
Black Chokeberry <i>Aronia melanocarpa</i>	5-10 3-5	Sh. Lat.	Medium	SPD - WD	5.0 – 6.5	Intolerant	Intermediate	Sensitive	Yes	grows in wide variety of sites
Blackberry/Raspberry <i>Rubus sp.</i>	2-5 2-3	Sh. Lat. Suckers	Fast	MWD - WD	6.0 – 7.0	Intolerant	Intolerant	Sensitive	Yes	
Shrub Lespedeza <i>Lespedeza thunbergii</i>	4-6 4-6	Dp. Lat.	Fast	SPD - ED	5.5 – 7.0	Intolerant	Intolerant	Intermediate	No	
Rugosa Rose <i>Rosa rugosa</i>	4-5 4-5	Sh. Lat.	Fast	MWD - ED	5.5 – 7.5	Intolerant	Intolerant	Intermediate	No	
Staghorn Sumac <i>Rhus hirta</i>	20-40 15-30	Sh. Lat. Suckers	Fast	MWD - ED	6.1 – 7.0	Very Intolerant	Intolerant	Resistant	Yes	tolerates dry, infertile soils
Smooth Sumac <i>Rhus glabra</i>	10-20 10-20	Sh. Lat. Suckers	Fast	MWD - ED	6.1 – 7.0	Very Intolerant	Intolerant	Resistant	Yes	often forms colonies
Winterberry <i>Ilex verticillata</i>	6-12 6-12	Dp. Lat.	Slow	VPD - WD	4.5 – 7.5	Tolerant	Tolerant	Resistant	Yes	fruit stays on plant through winter
Bristly Locust <i>Robinia hispida</i>	5-10 5-10	Sh. Lat. Suckers	Fast Short lived	MWD - ED	4.2 – 7.5	Intolerant	Intolerant	Resistant	No	forms thickets

Table 1. Species Characteristics (cont.)

	Height Spread	Rooting Pattern	Growth Rate	Drainage Adaptation	Soil Reaction	Shade Tolerance	Flooding Tolerance	Drought Sensitivity	Native to Ohio	Other Attributes or Concerns
Silky Dogwood <i>Cornus amomum</i>	6-10 6-10	Sh. Lat. Suckers	Medium to Fast	SPD - WD	6.0 – 8.0	Tolerant	Tolerant	Intermediate	Yes	
Gray Dogwood <i>Cornus racemosa</i>	10-15 10-15	Sh. Lat. Suckers	Fast	MWD - WD	6.0 – 7.5	Intermediate	Intolerant	Intermediate	Yes	
Red-osier Dogwood <i>Cornus sericea</i>	7-9 6-8	Sh. Lat. Suckers	Medium to Fast	PD - WD	6.0 – 7.5	Intermediate	Tolerant	Sensitive	Yes	
Buttonbush <i>Cephalanthus occidentalis</i>	6-12 8-16	Sh. Lat.	Medium	VPD - MWD	5.5 – 8.5	Tolerant	Very Tolerant	Intermediate	Yes	can withstand deep, long flooding
American Cranberrybush <i>Viburnum trilobum</i>	8-12 8-12	Sh. Lat.	Medium	SPD - WD	5.0 – 7.0	Tolerant	Intermediate	Resistant	Yes	
Arrowwood <i>Viburnum recognitum</i>	8-10 6-10	Sh. Lat.	Fast	MWD - WD	6.0 – 7.0	Intermediate	Intolerant	Intermediate	Yes	
Blackhaw <i>Viburnum prunifolium</i>	12-15 8-12	Sh. Lat.	Slow to Medium	MWD - WD	6.6 – 8.0	Intolerant	Very Intolerant	Resistant	Yes	
American Elderberry <i>Sambucus canadensis</i>	8-10 6-10	Sh. Lat. Suckers	Medium	SPD - WD	5.5 – 7.0	Intermediate	Intermediate	Intermediate	Yes	

Coniferous Trees

	Height Spread	Rooting Pattern	Growth Rate	Drainage Adaptation	Soil Reaction	Shade Tolerance	Flooding Tolerance	Drought Sensitivity	Native to Ohio	Other Attributes or Concerns
Fraser Fir <i>Abies fraseri</i>	50-60 15-20	Sh. Lat.	Slow	PD - MWD	4.5 – 6.5	Tolerant	Intolerant	Intermediate	No	subject to windthrow
Balsam Fir <i>Abies balsamea</i>	50-70 20-35	Sh. Lat.	Slow	PD - WD	5.0 – 7.0	Tolerant	Tolerant	Sensitive	No	
White Fir <i>Abies concolor</i>	80-100 20-35	Dp. Lat.	Slow Long lived	SPD - WD	4.0 – 6.5	Tolerant	Intolerant	Intermediate	No	
Douglas Fir <i>Pseudotsuga menziesii</i>	75-100 20-35	Dp. Lat.	Medium Long lived	MWD - WD	5.5 – 7.0	Intermediate	Intolerant	Intermediate	No	relatively disease and insect free
Eastern Hemlock <i>Tsuga canadensis</i>	60-100 30-60	Sh. Lat.	Med. Slow Long lived	PD - WD	4.6 – 6.5	Very Tolerant	Very Intolerant	Very Sensitive	Yes	prefers cool, moist sites
Tamarack <i>Larix laricina</i>	50-70 35-50	Sh. Lat. Suckers	Fast	VPD - PD	4.8 – 7.5	Intolerant	Very Tolerant	Sensitive	Yes	typical in wet soils, lake margins
Austrian Pine <i>Pinus nigra</i>	45-60 20-35	Dp. Lat.	Medium	MWD - WD	5.5 – 8.0	Intolerant	Intolerant	Resistant	No	needs deep soils, does well on limestone soils

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Appendix B – Tree/Shrub Recommendations

Table 1. Species Characteristics (cont.)

	Height Spread	Rooting Pattern	Growth Rate	Drainage Adaptation	Soil Reaction	Shade Tolerance	Flooding Tolerance	Drought Sensitivity	Native to Ohio	Other Attributes or Concerns
Eastern White Pine <i>Pinus strobus</i>	75-100 50-75	Dp. Lat.	Medium Long lived	MWD - SED	4.5 – 6.5	Intermediate	Intolerant	Resistant	Yes	requires moist, fertile, acidic soils
Virginia Pine <i>Pinus virginiana</i>	40-70 15-30	Sh. Lat.	Medium Short lived	MWD - WD	4.6 – 7.9	Intolerant	Intolerant	Intermediate	Yes	does well in poor soils
Red Pine <i>Pinus resinosa</i>	70-90 35-45	Dp. Lat.	Medium Long lived	SPD - ED	4.6 – 6.5	Intermediate	Intolerant	Intermediate	No	susceptible to many diseases, insects
Pitch Pine <i>Pinus rigida</i>	50-75 50-75	Sh. Tap.	Fast Short lived	WD- ED	4.6 – 6.5	Very Intolerant	Very Intolerant	Resistant	Yes	can grow on very poor sites
Scotch Pine <i>Pinus sylvestris</i>	45-55 30-40	Taproot	Medium	MWD - WD	4.5 – 6.0	Intolerant	Intolerant	Resistant	No	
Loblolly Pine <i>Pinus taeda</i>	80-100 40-60	Dp. Lat.	Fast	SPD - WD	5.5 – 6.5	Intermediate	Intolerant	Intermediate	No	only suited to extreme S and SE Ohio
Arbor Vitae <i>Thuja occidentalis</i>	50-75 35-50	Sh. Lat.	Med. Fast Long lived	PD - WD	5.5 – 7.5	Tolerant	Tolerant	Sensitive	Yes	tolerates shade, moisture extremes
Red Cedar <i>Juniperus virginiana</i>	50-75 35-50	Taproot	Slow Long. lived	SPD - ED	6.1 – 7.8	Intolerant	Intolerant	Resistant	Yes	pioneer plant
Norway Spruce <i>Picea abies</i>	60-80 25-30	Sh. Lat.	Med. Fast	SPD - WD	5.5 – 7.0	Intolerant	Moderate	Sensitive	No	
Blue Spruce <i>Picea pungens</i>	70-90 20-30	Dp. Lat.	Slow Long lived	SPD - WD	6.5 – 7.2	Intermediate	Intolerant	Sensitive	No	
Bald Cypress <i>Taxodium distichum</i>	70-90 20-35	Sh. Lat. “Knees”	Medium Long lived	VPD - MWD	6.1 – 6.5	Intermediate	Very Tolerant	Sensitive	No	grows in standing water

Deciduous Trees

	Height Spread	Rooting Pattern	Growth Rate	Drainage Adaptation	Soil Reaction	Shade Tolerance	Flooding Tolerance	Drought Sensitivity	Native to Ohio	Other Attributes or Concerns
Black Willow <i>Salix nigra</i>	35-50 20-35	Sh. Lat. Suckers	Fast Short-lived	VPD - SPD	6.5 – 8.0	Very Intolerant	Very Tolerant	Sensitive	Yes	wetland species
Eastern Cottonwood <i>Populus deltoides</i>	100-150 100-150	Sh. Lat. Suckers	Fast Short lived	PD - SED	6.5 – 7.5	Very Intolerant	Tolerant	Intermediate	Yes	tolerates wet, dry, polluted sites
Hybrid Poplar <i>Populus X canadensis</i>	50-80 15-20	Sh. Lat. Suckers	Fast Short lived	SPD - ED	6.5 – 7.5	Very Intolerant	Intermediate	Intermediate	No	
Black Walnut <i>Juglans nigra</i>	80-100 75-100	Taproot	Mod. Fast Long lived	MWD - WD	6.6 – 8.0	Intolerant	Intermediate	Resistant	Yes	sensitive to soil conditions

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Appendix B – Tree/Shrub Recommendations

Table 1. Species Characteristics (cont.)

	Height Spread	Rooting Pattern	Growth Rate	Drainage Adaptation	Soil Reaction	Shade Tolerance	Flooding Tolerance	Drought Sensitivity	Native to Ohio	Other Attributes or Concerns
Butternut <i>Juglans cinerea</i>	50-75 50-75	Taproot	Fast Short lived	MWD - WD	6.6 – 8.0	Intolerant	Intermediate	Intermediate	Yes	
Shagbark Hickory <i>Carya ovata</i>	70-80 35-50	Taproot	Slow Long lived	SPD - WD	6.0 – 7.0	Intermediate	Intolerant	Intermediate	Yes	
River Birch <i>Betula nigra</i>	50-75 35-50	Sh. Lat.	Fast Short lived	PD - MWD	4.5 – 6.5	Intolerant	Tolerant	Intermediate	Yes	tolerant of wet and poor soils
European Black Alder <i>Alnus glutinosa</i>	50-75 20-40	Sh. Lat.	Fast	PD - WD	3.4 – 7.0	Intolerant	Intermediate	Intermediate	No	good for infertile, open sites
American Beech <i>Fagus grandifolia</i>	70-90 50-75	Sh. Lat. Suckers	Slow Long lived	MWD - WD	5.5 – 6.5	Very Tolerant	Very Intolerant	Sensitive	Yes	
Allegheny Chinquapin <i>Castanea pumila</i>	15-20 15-20	Dp. Lat.	Mod. Fast	SPD - WD	6.0 – 7.0	Intermediate	Intolerant	Intermediate	No	adapted to southern Ohio
Chinese Chestnut <i>Castanea mollissima</i>	40-60 40-60	Taproot	Med. Slow	SPD - WD	5.5 – 7.0	Intermediate	Intolerant	Intermediate	No	resistant to chestnut blight
White Oak <i>Quercus alba</i>	80-100 75-110	Taproot	Slow Long lived	MWD - SED	6.1 – 7.5	Intermediate	Intolerant	Resistant	Yes	tolerates variety of soils
English Oak <i>Quercus robur</i>	55-80 50-80	Dp. Lat.	Fast Long lived	MWD - WD	6.0 – 7.0	Intermediate	Intolerant	Intermediate	No	very similar to native white oak
Swamp White Oak <i>Quercus bicolor</i>	60-80 40-60	Sh. Lat.	Med. – Fast	VPD - SPD	6.0 – 6.5	Intermediate	Tolerant	Resistant	Yes	tolerates droughty to flooded sites
Bur Oak <i>Quercus macrocarpa</i>	60-90 60-100	Taproot	Slow Long lived	SPD - WD	5.0 – 8.0	Intermediate	Intermediate	Very Resistant	Yes	one of most drought resistant trees
Swamp Chestnut Oak <i>Quercus michauxii</i>	60-80 50-75	Sh. Lat.	Medium	SPD -WD	6.1 – 6.8	Intolerant	Intermediate	Intermediate	No	
Chinquapin Oak <i>Quercus muehlenbergii</i>	35-50 35-50	Dp. Lat.	Slow Long lived	WD - ED	6.6 – 8.0	Intolerant	Very Intolerant	Resistant	Yes	
Northern Red Oak <i>Quercus rubra</i>	70-100 70-100	Taproot	Medium Long lived	MWD - WD	5.0 – 6.5	Intermediate	Intolerant	Intermediate	Yes	
Black Oak <i>Quercus velutina</i>	60-80 50-75	Taproot	Medium	MWD - ED	6.1 – 6.5	Intermediate	Very Intolerant	Resistant	Yes	can grow in infertile dry sand or clay
Shumard Oak <i>Quercus shumardii</i>	80-100 60-80	Sh. Lat.	Medium	SPD - WD	6.5 – 7.5	Intolerant	Tolerant	Intermediate	Yes	
Pin Oak <i>Quercus palustris</i>	50-75 40-75	Sh. Lat.	Med. - Fast	PD - MWD	5.5 – 6.5	Intolerant	Intermediate	Sensitive	Yes	intolerant of high neutral and alkaline

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Appendix B – Tree/Shrub Recommendations

Table 1. Species Characteristics (cont.)

	Height Spread	Rooting Pattern	Growth Rate	Drainage Adaptation	Soil Reaction	Shade Tolerance	Flooding Tolerance	Drought Sensitivity	Native to Ohio	Other Attributes or Concerns
Cherrybark Oak <i>Quercus falcata pagodifolia</i>	80-100 50-75	Dp. Lat.	Fast	SPD - WD	5.2 – 6.8	Intolerant	Intermediate	Intermediate	No	
Sawtooth Oak <i>Quercus acutissima</i>	50-70 50-70	Dp. Lat.	Medium	MWD - WD	5.0 – 7.0	Intermediate	Intolerant	Intermediate	No	best suited to southern Ohio
Hackberry <i>Celtis occidentalis</i>	40-80 40-80	Dp. Lat.	Medium	SPD - WD	6.5 – 8.0	Intermediate	Intermediate	Intermediate	Yes	
Red Mulberry <i>Morus rubra</i>	20-50 20-50	Dp. Lat.	Fast Short lived	PD - WD	6.3 – 8.0	Intermediate	Intermediate	Resistant	Yes	
Osage-Orange <i>Maclura pomifera</i>	30-50 30-50	Dp. Lat.	Fast Long lived	SPD - ED	6.1 – 8.0	Intolerant	Intermediate	Resistant	No	tolerant of variety of site conditions
Yellow Poplar <i>Liriodendron tulipifera</i>	75-125 35-60	Dp. Lat.	Med. Fast	MWD - WD	6.1 – 6.5	Intermediate	Intolerant	Intermediate	Yes	requires fertile soils
Sweet Gum <i>Liquidambar styraciflua</i>	75-100 50-75	Dp. Lat.	Med. Slow Long lived	PD - WD	6.0 – 6.5	Intolerant	Tolerant	Intermediate	Yes	very extensive root system
Sycamore <i>Platanus occidentalis</i>	80-100 80-100	Sh. Lat. Suckers	Fast Long lived	PD - WD	6.0 – 8.0	Intermediate	Tolerant	Sensitive	Yes	
Mountain Ash <i>Sorbus decora</i>	20-35 15-25	Sh. Lat.	Medium Short lived	SPD - WD	5.1 – 7.0	Intolerant	Tolerant	Intermediate	Yes	
Serviceberry <i>Amelanchier canadensis</i>	35-50 35-50	Sh. Lat.	Medium	MWD -WD	5.5 – 6.5	Very Tolerant	Intolerant	Sensitive	Yes	
Crabapple <i>Malus sp.</i>	15-20 15-20	Sh. Lat.	Medium Short lived	SPD - WD	6.0 – 7.5	Intolerant	Intolerant	Intermediate	Some Yes	many varieties are available
Washington Hawthorn <i>Crataegus phaenopyrum</i>	20-35 20-35	Taproot	Slow Short lived	SP - ED	6.1 – 8.0	Intolerant	Intermediate	Resistant	Yes	large thorns
Wild Plum <i>Prunus americana</i>	20-35 20-35	Sh. Lat. Suckers	Fast Short lived	MWD - ED	6.6 – 7.5	Intolerant	Very Intolerant	Resistant	Yes	
Wild Black Cherry <i>Prunus serotina</i>	45-70 35-50	Taproot	Fast	MWD - WD	6.1 – 7.5	Intolerant	Very Intolerant	Resistant	Yes	can be weedy in some situations
Honey Locust <i>Gleditsia triacanthos</i>	50-75 50-75	Dp. Lat. Suckers	Fast	SPD - WD	6.1 – 7.5	Intolerant	Intermediate	Intermediate	Yes	thornless varieties are available
Redbud <i>Cercis canadensis</i>	20-35 20-35	Sh. Lat.	Slow Short lived	MWD - WD	6.1 – 8.0	Tolerant	Intermediate	Resistant	Yes	
Black Locust <i>Robinia pseudoacacia</i>	40-60 25-50	Sh. Lat. Suckers	Fast Short lived	MWD - ED	5.1 – 7.7	Intolerant	Intolerant	Resistant	Yes	

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Appendix B – Tree/Shrub Recommendations

Table 1. Species Characteristics (cont.)

	Height Spread	Rooting Pattern	Growth Rate	Drainage Adaptation	Soil Reaction	Shade Tolerance	Flooding Tolerance	Drought Sensitivity	Native to Ohio	Other Attributes or Concerns
American Holly <i>Ilex opaca</i>	15-30 12-25	Sh. Lat.	Med. Fast	SPD - WD	5.0 – 6.0	Tolerant	Intermediate	Intermediate	Yes southern	
Red Maple <i>Acer rubrum</i>	60-90 40-70	Sh. Lat.	Med. Fast	VPD - WD	4.5 – 6.5	Tolerant	Tolerant	Intermediate	Yes	
Silver Maple <i>Acer saccharinum</i>	75-100 75-100	Sh. Lat.	Very Fast Short lived	PD - WD	5.5 – 6.5	Intermediate	Tolerant	Resistant	Yes	adapts to many soil conditions
Sugar Maple <i>Acer saccharum</i>	75-100 50-75	Sh. Lat.	Slow	MWD - WD	6.0 – 7.5	Very Tolerant	Intolerant	Sensitive	Yes	best in fertile, moist soils
Boxelder <i>Acer negundo</i>	35-50 35-50	Dp. Lat	Very Fast Short lived	PD - ED	5.0 – 6.5	Very Intolerant	Tolerant	Very Resistant	Yes	
Ohio Buckeye <i>Aesculus glabra</i>	35-50 20-35	Taproot	Slow	SPD - WD	6.1 – 6.5	Intermediate	Intermediate	Intermediate	Yes	disease problems common in plantings
Basswood <i>Tilia americana</i>	75-110 50-75	Dp. Lat. Suckers	Medium	MWD - WD	6.5 – 7.5	Intermediate	Intolerant	Intermediate	Yes	
Black Gum <i>Nyssa sylvatica</i>	50-75 35-50	Taproot	Slow	PD - WD	6.1 – 6.5	Intolerant	Intermediate	Intermediate	Yes	brilliant early autumn color
Flowering Dogwood <i>Cornus florida</i>	30-50 30-50	Dp. Lat.	Medium	SPD - WD	5.5 – 6.5	Very Tolerant	Very Intolerant	Sensitive	Yes	potential for disease problems
Persimmon <i>Diospyros virginiana</i>	40-60 30-45	Taproot	Slow Short lived	MWD -WD	6.1 – 6.6	Intolerant	Intermediate	Resistant	Yes	
White Ash <i>Fraxinus americana</i>	75-100 50-75	Sh. Lat.	Medium	SPD -WD	6.1 – 7.5	Tolerant	Intermediate	Intermediate	Yes	
Green Ash <i>Fraxinus pennsylvanica</i>	50-75 35-50	Sh. Lat.	Fast	SPD - WD	6.0 – 7.9	Tolerant	Intermediate	Intermediate	Yes	adaptable to saline, dry, sterile soils
Northern Catalpa <i>Catalpa speciosa</i>	75-100 35-50	Taproot	Fast Short lived	PD -WD	6.1 – 8.0	Intolerant	Tolerant	Resistant	No	

Table 1 Legend

Height/Spread - the normal range of height and crown spread of mature plants in feet; size may vary due to growing conditions which are better or poorer than normal; forest grown trees may typically have narrower crowns than open grown trees

Rooting Pattern – typical rooting patterns of plants under normal conditions; limiting layers or conditions may restrict root development; Sh. Lat = shallow lateral systems typically found in upper 2-3 feet and extending 1 to 3 times the crown spread; Dp. Lat. = deep lateral systems which extend out from tree and deepen as the tree grows; taproots indicates that typical system is a deeply-penetrating taproot; also, if the species is known to commonly form suckers or root sprouts, this is indicated as “Suckers”

Growth Rate – relative growth rates for plants under preferred conditions; growth typically slows as the plant ages; for trees, fast =24 inches or more per year, medium=12-24 inches per year and slow =less than 12 inches per year; for trees, a relative typical life span is indicated for long-lived (>200 years) and short-lived (<100 years) species.

Drainage Adaptation – the range of soil drainage classes in which the species is known to survive; the preferred conditions under which the species achieves best growth may be a narrower range; VPD = very poorly drained, PD = poorly drained, SPD = somewhat poorly drained, MWD = moderately well drained, WD = well drained, SED = somewhat excessively drained, ED = excessively drained

Soil Reaction – the range of soil pH values in which the species is known to survive; the preferred conditions under which the species achieves best growth may be a narrower range

Shade Tolerance – the relative degree to which species will grow and survive under shade; very tolerant will grow and survive in state of health and vigor under dense shade; tolerant will do so under moderately dense shade; intermediate will do so under moderate shade; intolerant will do so only under light shade; very intolerant are suppressed under shade and demand full sunlight for best growth and survival

Flooding Tolerance - the relative ability to withstand flooding during the growing season (flooding during the dormant season usually has little effect on trees or shrubs); very tolerant usually survive even when flooded more than 40% of the growing season; tolerant, 30-40%; intermediate, 20-30%; intolerant, 5-20%; very intolerant, immediate and rapid decline if inundated for more than 5% of growing season

Drought Sensitivity – the relative ability of plants to withstand periods of dry soils/high air temperatures; sensitive = shows decline even during short periods of drought, repeated or continual drought condition may cause death; resistant = generally shows no decline during drought periods and may be able to survive extended periods of drought

Native to Ohio – yes indicates species was found within Ohio at time of European settlement; no indicates species was not found in Ohio at that time; native species may not have been found throughout the state and the species may have become naturalized throughout the state over the last several hundred years

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Appendix B – Tree/Shrub Recommendations

Table 2. Suitability and Recommendations

Shrubs

	Wood Products	Windbreak Density Summer/Winter	Wildlife Use Function Use Groups	Reclamation
Canada Yew		----	Cover SB, MA	
Common Juniper		High/High	Food, cover SB, GB	
Bankers Dwarf Willow		Medium/Low	Cover SB	X streambanks
Purpleosier Willow		Medium/Low	Cover SB	X
Hazelnut	Edible Products	Low/Low	Food, cover GB, MA	
Common Alder		Medium/Low	Food SB, MA	X
Steeplebush		----	Food SB, BF	
Red Chokeberry	Edible Products	Medium/Low	Food, cover SB, MA	X
Black Chokeberry	Edible Products	Medium/Low	Food, cover SB, MA	X
Blackberry Raspberry	Edible Products	----	Food, cover SB, MA, BF	
Shrub Lespedeza		----	Food GB, MA	X
Rugosa Rose		----	-----	X
Staghorn Sumac		Low/Low	Food SB, GB, MA	X
Smooth Sumac		Low/Low	Food SB, GB, MA	X
Winterberry		---	Food SB	
Bristly Locust		Medium/Low	-----	X
Silky Dogwood		----	Food, cover SB, GB	
Gray Dogwood		Medium/Low	Food, cover SB, GB	
Red-osier Dogwood		----	Food, cover SB, GB	
Buttonbush		----	Food, cover BF, SB	
American Cranberrybush	Edible Products	Medium/Low	Food, cover SB, GB, MA	X
Arrowwood		Medium/Low	Food, cover SB, GB, MA	X
Blackhaw		High/Medium	Food, cover SB, GB, MA	X

Appendix B – Tree/Shrub Recommendations

Table 2. Suitability and Recommendations (cont.)

	Wood Products	Windbreak Density Summer/Winter	Wildlife Use Function Use Groups	Reclamation
American Elderberry	Edible Products	Medium/Low	Food SB, GB	

Coniferous Trees

	Wood Products	Windbreak Density Summer/Winter	Wildlife Use Function Use Groups	Reclamation
Fraser Fir	Christmas Trees	High/High	Cover SB	
Balsam Fir	Christmas Trees	High/High	Cover SB	
White Fir	Christmas Trees	High/High	Cover SB, GB	
Douglas Fir	Christmas Trees	High/High	Cover SB, GB	
Eastern Hemlock	Biomass	Medium/Medium	Cover SB	
Tamarack		Medium/Low	Cover SB	
Austrian Pine	Christmas Trees Lumber-Low	Medium/Medium	Cover SB	X
Eastern White Pine	Christmas Trees Lumber-Medium	Medium/Medium	Cover SB	X
Virginia Pine	Lumber-Low	Medium/Medium	Cover SB	X
Pitch Pine		Medium/Medium	Cover SB	X
Red Pine	Lumber-Low	Medium/Medium	Cover SB	X
Scotch Pine	Christmas Trees	Medium/Medium	Cover SB	
Loblolly Pine	Lumber-Medium	Medium/Medium	Cover SB, MA	X
Arbor Vitae		High/High	Cover SB	
Red Cedar	Posts	High/High	Food, cover SB, GB	X
Norway Spruce	Christmas Trees	High/High	Cover SB	
Blue Spruce	Christmas Trees	High/High	Cover SB	
Bald Cypress	Lumber-Low	Medium/Low	Cover SB	X

Deciduous Trees

	Wood Products	Windbreak Density Summer/Winter	Wildlife Use Function Use Groups	Reclamation
Black Willow	Biomass	Medium/Low	Food SB, GB	

Appendix B – Tree/Shrub Recommendations

Table 2. Suitability and Recommendations (cont.)

	Wood Products	Windbreak Density Summer/Winter	Wildlife Use Function Use Groups	Reclamation
Eastern Cottonwood	Firewood Biomass	Medium/Low	Food, cover SB, MA	X
Hybrid Poplar	Firewood Biomass	Medium/Low	-----	X
Butternut	Lumber-Low	Medium/Low	Food MA	
Black Walnut	Lumber-High Edible Products	Medium/Low	Food MA	
Shagbark Hickory	Firewood	Low/Low	Food MA	
River Birch	Biomass	Medium/Low	Food SB, MA	X
European Black Alder	Biomass	Medium/Low	Food SB, MA	X
American Beech	Lumber-Low	Low/Low	Food, cover SB, GB, MA	
Allegheny Chinquapin		Medium/Low	Food MA	X
Chinese Chestnut		Low/Low	Food MA	
White Oak	Firewood Lumber-High	Medium/Low	Food GB, MA	
English Oak	Lumber-Medium	Medium/Low	Food CG, MA	
Swamp White Oak	Firewood Lumber-Medium	Medium/Low	Food GB, MA	
Bur Oak	Firewood	Medium/Low	Food GB, MA	
Swamp Chestnut Oak	Firewood Lumber-Low	Medium/Low	Food GB, MA	
Red Oak	Firewood Lumber-High	Medium/Low	Food GB, MA	
Black Oak	Firewood Lumber-Medium	Medium/Low	Food GB, MA	
Shumard Oak	Firewood Lumber-Medium	Medium/Low	Food GB, MA	
Pin Oak	Firewood Lumber-Medium	Medium/Low	Food GB, MA	
Cherrybark Oak	Firewood Lumber-Medium	Medium/Low	Food MA	
Sawtooth	Firewood	Medium/Low	Food GB, MA	
Hackberry		Medium/Low	Food, cover SB, MA	
Red Mulberry	Posts Firewood	Medium/Low	Food SB, GB, MA	

Appendix B – Tree/Shrub Recommendations

Table 2. Suitability and Recommendations (cont.)

	Wood Products	Windbreak Density Summer/Winter	Wildlife Use Function Use Groups	Reclamation
Osage-Orange	Posts Firewood	Medium/Low	Food, cover SB, GB	
Yellow Poplar	Lumber-Medium	Low/Low	Food BF	X
Sweet Gum	Lumber-Medium	Medium/Low	-----	X
Sycamore	Biomass Lumber-Medium	Medium/Low	Cover SB	X
Mountain Ash		Medium/Low	Food SB	
Serviceberry		Medium/Low	Food, cover SB, GB, MA	
Crabapple		Medium/Low	Food SB, GB, MA	X
Washington Hawthorn		Medium/Low	Food SB, BF	X
Wild Plum		Medium/Low	Food SB, MA	X
Wild Black Cherry	Edible Products Lumber-High	Medium/Low	Food SB, MA	
Honey Locust	Firewood	Low/Low	-----	
Redbud		Medium/Low	-----	X
Black Locust	Posts Firewood	Low/Low	Food MA	X
American Holly		High/Low	Food, cover SB, MA	
Red Maple	Lumber-Medium	Medium/Low	Food SB, MA	X
Silver Maple	Biomass	Medium/Low	Food SB, MA	X
Sugar Maple	Firewood Lumber-High	Medium/Low	Food SB, MA	
Boxelder	Biomass	Medium/Low	Food SB, MA	X
Ohio Buckeye		Low/Low	-----	
Basswood	Lumber-Medium	Medium/Low	-----	
Black Gum		Medium/Low	Food SB	
Flowering Dogwood		Medium/Low	Food SB, GB, MA, BF	
Persimmon	Edible Products	Medium/Low	Food MA	

Appendix B – Tree/Shrub Recommendations

Table 2. Suitability and Recommendations (cont.)

	Wood Products	Windbreak Density Summer/Winter	Wildlife Use Function Use Groups	Reclamation
White Ash	Firewood Lumber-Medium	Medium/Low	Food SB	X
Green Ash	Firewood Lumber-Low	Medium/Low	Food SB	X
Northern Catalpa	Posts	Medium/Low	-----	

Wood Products – items for which species are particularly well suited for production; for lumber, a relative rating (high, medium, or low) of lumber value for the species is given

Windbreak Density – relative ratings of species for summer (protection from wind) and winter (protection from wind and snow drifting); ----- indicates low potential for use in windbreaks

Wildlife Use – species with moderate to high value for providing food, escape cover or both are indicated; the animal species groups for which the plant species is most valuable are indicated; SB = songbirds, GB = game birds, MA = small mammals, BF = butterflies and moths; ----- indicates low wildlife habitat value

Reclamation - species with an “X” are well-suited to reclaiming sites such as mine spoil, cuts, infertile areas or other sites with limitations which require relatively rapid or dependable growth of woody species

Table 3. Spacing Recommendations

Shrubs			
	Spacing (ft.)		Comments
	within rows	between rows	
Canada Yew	3-6	6-10	
Common Juniper	3-6	6-10	
Bankers Dwarf Willow	2-4	2-4	
Purpleosier Willow	4-6	6-10	may be interplanted in rip-rap
Hazelnut	3-6	4-8	
Common Alder	4-6	6-10	
Steeplebush	3-4	4-8	
Red and Black Chokeberry	3-6	6-10	wider spacing promotes fruit production
Blackberry/Raspberry	2-4	4-6	wider spacing promotes fruit production
Shrub Lespedeza	3-4	4-8	may also be direct seeded
Rugosa Rose	3-6	4-10	
Staghorn Sumac	3-6	6-10	
Smooth Sumac	3-6	6-10	
Winterberry	3-6	6-10	
Bristly Locust	3-6	4-6	user closer spacing for erosion control
Silky Dogwood	3-6	4-8	wider spacing promotes fruit production
Gray Dogwood	4-6	6-10	wider spacing promotes fruit production
Red-osier Dogwood	3-6	4-8	wider spacing promotes fruit production
Buttonbush	4-8	6-10	may be planted in clumps
American Cranberrybush	3-6	6-12	
Arrowwood	3-6	6-12	
Blackhaw	6-8	8-12	
American Elderberry	3-4	6-10	
Coniferous Trees			
Fraser Fir	6-12	8-12	Christmas trees 4-5 X 5-7
Balsam Fir	6-12	8-12	Christmas trees 4-5 X 5-7
White Fir	6-12	8-12	Christmas trees 4-5 X 5-7
Douglas Fir	6-12	8-12	Christmas trees 4-5 X 5-7
Eastern Hemlock	10-12	10-12	
Tamarack	6-10	8-12	
Austrian Pine	8-12	8-12	use wider spacing if no management is planned
Eastern White Pine	7-10	8-12	use wider spacing if no management is planned
Virginia Pine	10-12	10-12	use wider spacing if no management is planned
Red Pine	10-12	10-12	use wider spacing if no management is planned
Pitch Pine	8-12	10-12	
Scotch Pine	6-10	10-12	
Loblolly Pine	10-12	10-12	
Arbor Vitae	8-10	10-12	
Red Cedar	6-10	8-12	
Norway Spruce	7-10	7-12	use wider spacing if no management is planned
Blue Spruce	7-10	7-12	
Bald Cypress	6-12	10-12	
Deciduous Trees			
Black Willow	8-12	10-12	
Eastern Cottonwood	6-12	10-12	

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Table 3. Spacing Recommendations (cont.)

	Spacing (ft.)		Comments
	within rows	between rows	
Hybrid Poplar	6-10	8-12	
Black Walnut	10-12	10-12	
Butternut	10-12	10-12	
Shagbark Hickory	10-12	10-12	use wider spacing if no management is planned
River Birch	8-12	10-12	
European Black Alder	8-12	10-12	
American Beech	10-12	10-12	
Allegheny Chinquapin	8-10	10-12	
Chinese Chestnut	8-10	10-12	
White Oak	10-12	10-12	use wider spacing if no management is planned
English Oak	10-12	10-12	use wider spacing if no management is planned
Swamp White Oak	10-15	10-15	
Bur Oak	10-15	10-15	
Swamp Chestnut Oak	10-12	10-12	
Red Oak	10-12	10-12	use wider spacing if no management is planned
Black Oak	10-12	10-12	use wider spacing if no management is planned
Shumard Oak	10-12	10-12	use wider spacing if no management is planned
Pin Oak	10-15	10-15	
Cherrybark Oak	10-12	10-12	
Sawtooth Oak	8-12	10-12	
Hackberry	10-12	10-12	
Red Mulberry	10-15	10-15	wider spacing promotes fruit production
Osage-Orange	10-12	10-12	
Yellow Poplar	10-12	10-12	
Sweet Gum	10-12	10-12	
Sycamore	10-15	10-15	
Mountain Ash	8-12	10-12	
Serviceberry	8-12	10-12	
Crabapple	8-10	10-12	
Washington Hawthorn	8-12	10-12	wider spacing promotes fruit production
Wild Plum	8-12	8-12	wider spacing promotes fruit production
Wild Black Cherry	8-12	8-12	use wider spacing if no management is planned
Honey Locust	10-12	10-12	
Redbud	8-10	8-12	
Black Locust	8-12	8-12	closer spacing for erosion control
American Holly	8-10	10-12	
Red Maple	8-12	8-12	
Silver Maple	8-12	8-12	
Boxelder	8-10	10-12	
Sugar Maple	10-12	10-12	special spacings may be used if to be used for sugarbush
Ohio Buckeye	10-12	10-12	
Basswood	10-12	10-12	
Black Gum	10-12	10-12	
Flowering Dogwood	8-12	8-12	
Persimmon	8-10	10-12	
White Ash	8-12	8-12	use wider spacing if no management is planned

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Table 3. Spacing Recommendations (cont.)

	Spacing (ft.)		Comments
	within rows	between rows	
Green Ash	8-12	8-12	use wider spacing if no management is planned
Northern Catalpa	10-12	10-12	

Remarks

1. These spacings are for typical block plantings unless stated otherwise. Recommended spacings for specific purposes can be found other references. Consult the appropriate technical standard for the suggested spacings for practices such as windbreaks or hedgerows.
2. In general, plantings for reclamation and erosion control purposes would be planted closer together than those for general reforestation purposes.
3. For wildlife habitat purposes, consideration must be given to whether the plants are primarily for food or cover purposes. For fruit and berry producing trees and shrubs, the fruiting capacity is improved by the increased sunlight to the plant available with wider spacings. Closer spacings will diminish the fruit producing capacity but will provide quicker and denser cover.
4. The type of management planned and the equipment to be used will influence the spacing used. If good management, including thinning is to be used, narrower spacings may be used. Spacings must take into account the size of equipment to be used for weed control (mowing, herbicide, etc.) or other management activities.

Quantity of plants per acre

		Spacing between rows (ft.)												
		3	4	5	6	7	8	9	10	12	15	20	30	40
Spacing within rows (ft.)	3	4840	3630	2904	2420	2074	1815	1613	1452	1210	968	726	484	363
	4	3630	2723	2178	1815	1556	1361	1210	1089	908	726	545	363	272
	5	2904	2178	1742	1452	1245	1089	968	871	726	581	436	290	218
	6	2420	1815	1452	1210	1037	908	807	726	605	484	363	242	182
	7	2074	1556	1245	1037	889	778	691	622	519	415	311	207	156
	8	1815	1361	1089	908	778	681	605	545	454	363	272	182	136
	9	1613	1210	968	807	691	605	538	484	403	323	242	161	121
	10	1452	1089	871	726	622	545	484	436	363	290	218	145	109
	12	1210	908	726	605	519	454	403	363	303	242	182	121	91
	15	968	726	581	484	415	363	323	290	242	194	145	97	73
	20	726	545	436	363	311	272	242	218	182	145	109	73	54
	30	484	363	290	242	207	182	161	145	121	97	73	48	36
40	363	272	218	182	156	136	121	109	91	73	54	36	27	

DIRECT SEEDING INFORMATION

Species suitable for direct seeding:

Heavy Seeded Species

Black Walnut (*Juglans nigra*)
Oak (*Quercus spp.*)
Hickory (*Carya spp.*)
Persimmon (*Diospyros virginiana*)
Kentucky Coffeetree (*Gymnocladus dioica*)

Light Seeded Species

Ash (*Fraxinus spp.*)
Yellow Poplar (*Liriodendron tulipifera*)
Black Cherry (*Prunus serotina*)
Maple (*Acer spp.*)
Basswood (*Tilia americana*)
Sycamore (*Platanus occidentalis*)
Hackberry (*Celtis occidentalis*)
Black Gum (*Nyssa sylvatica*)
Sweetgum (*Liquidambar styraciflua*)

Row/Seed Spacing for 3000 Plants per Acre

Row Spacing (feet)	Seed Spacing (feet)
3	4.8
4	3.6
5	2.9
6	2.4
7	2.0
8	1.8
9	1.6
10	1.5
11	1.3
12	1.2
14	1.0
16	0.9
18	0.8

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Direct Seeding Rates Table (Note: walnut and all hickory species are husked)

Common Name	Scientific Name	Seeds per Pound Average (Range)	Lbs/Ac. For 3000 Seeds/Ac	Lbs/Ac. For 4500 Seeds/Ac
Common Persimmon	<i>Diospyros virginiana</i>	1200 (665-1764)	2.5	4
Black Walnut	<i>Juglans nigra</i>	40 (11-100)	75	112
Bitternut Hickory	<i>Carya cordiformis</i>	156 (125-185)	20	30
Mockernut Hickory	<i>Carya tomentosa</i>	90 (34-113)	34	51
Pecan	<i>Carya illinoensis</i>	162 (151-174)	19	28.5
Pignut Hickory	<i>Carya glabra</i>	200 (175-225)	15	22.5
Shagbark Hickory	<i>Carya ovata</i>	100 (80-150)	30	45
Shellbark Hickory	<i>Carya laciniosa</i>	30 (25-35)	100	150
White Oak	<i>Quercus alba</i>	120 (70-210)	25	37.5
Chinquapin Oak	<i>Quercus muhlenbergii</i>	395 (263-520)	8	12
Swamp White Oak	<i>Quercus bicolor</i>	85 (60-175)	35	52.5
Shingle Oak	<i>Quercus imbricaria</i>	415 (315-795)	8	12
Bur Oak	<i>Quercus macrocarpa</i>	75 (40-145)	40	60
Swamp Chestnut Oak	<i>Quercus michauxii</i>	85 (35-195)	35	52.5
Pin Oak	<i>Quercus palustris</i>	410 (320-540)	8	12
Northern Red Oak	<i>Quercus rubra</i>	125 (75-256)	24	36
Shumard Oak	<i>Quercus shumardii</i>	100 (78-128)	30	45
Black Oak	<i>Quercus velutina</i>	245 (125-400)	13	20
Green Ash	<i>Fraxinus pennsylvanica</i>	17,000	0.17	0.26
White Ash	<i>Fraxinus americana</i>	13,000	0.25	0.354
Black Cherry	<i>Prunus serotina</i>	4,200	0.71	1.07
Yellow Poplar	<i>Liriodendron tulipifera</i>	10,000 (5,000-18,000)	0.3	0.45
Sycamore	<i>Platanus occidentalis</i>	150,000	0.02	0.03

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Sweetgum	<i>Liquidambar styraciflua</i>	82,000 (65,000-98,400)	0.04	0.05
Sugar Maple	<i>Acer saccharum</i>	6,100 (3,200-9,100)	0.49	0.73
Silver Maple	<i>Acer saccharinum</i>	1,400 (900-1,900)	2.14	3.21
Red Maple	<i>Acer rubrum</i>	22,800 (12,700-38,200)	0.13	0.20
Basswood	<i>Tilia americana</i>	5,000 (3,000-8,000)	0.60	0.90
Hackberry	<i>Celtis occidentalis</i>	4,300 (3,500-5,400)	0.70	1.05
Black Gum	<i>Nyssa sylvatica</i>	600	5.00	7.50

PLANTING SPECIFICATIONS

The following are general specifications for most tree/shrub planting purposes. Planting specifications should be adapted to the intended planting purpose and site conditions. Specific requirements related to a particular standard will be found in that standard. More detailed specifications are found in the Tree/Shrub Planting (612), Windbreak/Shelterbelt Establishment (380), Hedgerow Planting (422), Riparian Forest Buffer (391) and Forest Site Preparation (490) standards.

A. Planting Stock Selection

Select species that best meet the intended purpose(s) and are best suited to the planting site. Multi-species plantings may meet a variety of purposes better than single species plantings and will provide better protection against large losses due to insects or diseases. In addition, multi-species plantings will better respond to variations in site conditions if the species selected are adapted to the range of conditions present.

Use Tables 1 and 2 of this appendix to select the appropriate species. In addition, specific practice standards may give recommendations on the most appropriate species. Section II of the Field Office Technical Guide and the county soil survey also have information on site suitability for tree and shrub species. Forestry professionals, such as ODNR service foresters, may also be consulted for recommendations; their expertise may be particularly valuable in selecting species for localized areas.

B. Layout

Trees and shrubs shall be planted in a way that maximizes the intended uses(s), takes advantage of site conditions and accommodates future management needs.

Spacing recommendations are given in Table 3. Use a spacing that fits the desired objectives and meets equipment sizes. Species with similar spacing requirements should be planted together. Interplanting into established stands may require variable plant spacings.

Space should be provided for roads, firebreaks, management activities and harvesting as planned. Consider adjacent land uses when laying out tree plantings and the effect that different species will have on that land use; make appropriate setbacks, if necessary.

C. Site Preparation

The planting site shall be prepared in a manner that will make planting easier, maximize seedling survivability and provide a good starting point for long-term landowner objectives. Any

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vegetation that would hinder planting or provide excessive competition to the seedlings should be controlled or removed.

In general, the methods to be used include a) mechanical means such as plowing, discing or rototilling; b) chemical control of vegetation and c) hand scalping the area where trees are to be planted. In some cases extensive grading or land clearing with heavy equipment may be needed where severe limitations to planting exist. See Woodland Site Preparation standard for details on site preparation measures.

Existing brush or trees may be maintained if the site is to be interplanted and the retained trees/shrubs will provide functions consistent with the planned use. For wildlife purposes, consider retaining some trees that will provide den sites or mast production while the new planting is becoming established. Undesirable trees that will hamper planting or provide excessive shade should be removed or killed.

Prior to planting, adequate protection from fire and livestock should be established.

To improve planting efficiency and improve management during the first several years, rows should be marked with stakes, wire flags or other means to aid in locating rows.

D. Planting Dates

Balled and burlapped or container-grown plants may be planted any time that soil conditions are suitable as long as proper watering procedures are followed.

Bare-rooted stock shall be planted according to the following schedule:

South of I-70: in late winter or spring as soon as the ground thaws until April 15.

North of I-70: in late winter or spring as soon as the ground thaws until April 30.

E. Storage and Preparation of Plant Materials

Seedlings, cuttings, seeds or other material shall be stored and handled in a way that maximizes their viability and increases effectiveness of the selected establishment method. In general, materials should be kept cool and moist and protected from excessive dessication and sunlight. Preparations for storage and handling of materials should be made before the materials arrive.

Plant materials to be used should be inspected prior to use. Grading or selection of materials should be done to increase planting success. If necessary, materials may be pruned, scarified or otherwise prepared for use.

F. Planting Methods

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The planting method selected will be based on the intended use, species desired, stock availability, site conditions and landowner capabilities. The method(s) selected shall be ones that maximize stand establishment while meeting other landowner objectives. More than one method may be used. Planting shall be carried out in accordance with the appropriate NRCS standard or other recognized professional standards.

G. Care after Planting

Watering Typically, large plantings are not watered. However, specialized or smaller plantings such as windbreaks may be watered to increase survival and growth. If trees are watered, the water should be applied gradually through sprinklers, soaker hoses, drip buckets or other means. If water is to be applied in large amounts or dumped on the plants, this should be done in two passes to increase irrigation effectiveness. Watering should be discontinued after July to allow trees to properly harden off in the fall.

Weed Control Elimination of competing vegetation is normally carried out for one to five years after planting. Weed control may be the most important factor in tree and shrub seedling survival, especially for hardwood species. Weed control may be accomplished through mulching, cultivation, mowing or herbicide usage. The method to be used will be based on landowner capability; level of control desired and site conditions. In all cases, the vegetation should be controlled in a band 12 to 18 inches along each side of the tree row or in a 2 to 3 foot diameter circle around each tree.

Mechanical or hand cultivation should be kept at least 6 inches from the seedling and no deeper than 3 inches to avoid damage to the seedling. Additional methods may be needed to control weeds closer to the seedling. Mowing generally does not provide as good of control since the weeds are still competing for nutrients and water; also potential damage to seedlings is high. Mulching provides good control but may be impractical on large plantings. The use of herbicides usually provides good weed control but may be limited by availability of equipment or landowner experience.

Pest Management Plant injury or death should be controlled through preventative measures. Domestic animals that might graze on seedlings should be excluded. Control of weeds (which may hide rodents or rabbits), repellants or poisons, hunting and the use of tree shelters should be considered to reduce damage from wild animals. New plantings should be monitored for potential insect and disease problems and appropriate control measures taken if significant problems are found.

Fire Firebreaks shall be maintained through discing or mowing, as appropriate.

Pruning Typically, pruning is necessary only to repair sever damage done by browsing, frost or storm damage or to maintain tree form for specialized uses. Pruning shall maintain an open crown and a strong, central single stem.

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Replanting Some plants will be lost over time to a variety of causes. The decision to re-plant for some or all of the losses will be based on whether or not the remaining trees and shrubs will likely provide the desired functions. For some specialized uses (windbreaks, high-value lumber) the need to re-plant will be made even for relatively low losses; more general purposes may allow for higher losses. The reasons for losses should be determined and corrective measures taken before re-planting.

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