



APEX
NORTH CAROLINA

Design and Development Manual

Updated 2021

Native and Adaptive Plant Lists

Section	Page #
Landscaping	1
Native and Adaptive Plant List	1-23
Large Trees	1-4
Medium Trees	5
Small Trees	6-8
Large Shrubs	9-11
Small Shrubs	12-14
Parking Lot Shade Trees	15
Parking Lot Screening Shrubs	16
Trees Under Power Lines	17-18
Suggested Type A Buffer Trees & Shrubs	19-21
High-Quality Shade Trees	22-23
RCA Establishment Requirements	24-25
Tree Planting Guidelines	26
Planting in Special Situations	27
Tree Pruning	28
Recommended Plant List for BMPs	29-31
Mulch Standards	32-33
Protection Fencing Standard	34
Transportation	35-40
Typical Asphalt Greenway	35
Typical Keyed Concrete	36
Safety Railing Details	37
Locking Bollard Detail	38
Accessible Parking Spaces	39
Bicycle Parking	40
Site Details	41
Dumpster Enclosure Standard	41
Small Town Character Residential Design Standards	42-49
Architectural Features	43
Decorative Features	44
Residential Standards-Roofs	45
Residential Standards-Facades	46
Residential Standards-Windows	47
Residential Standards-Sides facing public streets	48
Residential Standards-Entryways & Materials	49

Native and Adaptive Plant Lists

The Native and Adaptive Plant Lists are in chart form and include descriptions of trees and shrubs. Native species shown are native to the eastern half of the United States. These plant lists are not intended to be all-inclusive. The intent of these lists is to encourage the use of landscape plants that are hardy in Apex and exhibit tolerance of urban conditions. Plants not on the native and adaptive plant list may be used with approval from the Planning Department.

Invasive species are prohibited. Please refer to the NC Invasive Plant Council for a list of prohibited plants.

<http://nc-ipc.weebly.com/nc-invasive-plants.html>

The Native and Adaptive Plant Lists are divided into the following categories:

- Large Trees (50+ feet tall)
- Medium Trees (30 – 50 feet tall)
- Small Trees (up to 30 feet tall)
- Large Shrubs (8+ feet tall)
- Small/Medium Shrubs (2 to 8 feet tall)

The following additional lists are provided, which show specific tree and shrub recommendations for specific situations.

- Parking Lot Shade Trees
- Parking Lot Screening Shrubs
- Trees & Large Shrubs Under Power Lines
- Suggested Type A Buffer Trees & Shrubs
- High-Quality Shade Trees

Large Trees (height ≥ 50 ft)					
Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
Native Species:					
<i>Acer rubrum</i>	Red Maple	40-60	30-40	D	Don't Plant Near Pavement; Natural Areas Only; Pollinator Friendly
<i>Acer saccharum</i>	Sugar Maple	60-75	40-50	D	Pollinator Friendly
<i>Acer x fremanii</i>	Freeman Maple	40-60	20-40	D	
<i>Betula nigra</i>	River Birch	40-70	40-60	D	
<i>Carya cordiformis</i>	Bitternut Hickory	50-70	40-50	D	Pollinator Friendly
<i>Carya glabra</i>	Pignut Hickory	50-60	25-35	D	Pollinator Friendly
<i>Carya illinoensis</i>	Pecan	70-100	40-75	D	Large Edible Nuts
<i>Carya ovata</i>	Shagbark Hickory	60-80	30-50	D	Pollinator Friendly

Native and Adaptive Plant Lists

Large Trees (height ≥ 50 ft)					
Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
<i>Celtis laevigata</i>	Sugarberry	40-60	40-60	D	Bird & Pollinator Friendly
<i>Celtis occidentalis</i>	Common Hackberry	40-60	40-60	D	Bird & Pollinator Friendly
<i>Cladrastis lutea</i>	American Yellowwood	30-50	40-55	D	Large Attractive Flowers; Pollinator Friendly
<i>Diospyros virginiana</i>	American Persimmon	30-70	25-30	D	Large Fruit; Plant Away From Parking & Sidewalk
<i>Fagus grandiflora</i>	American Beech	50-70	30-40	D	Edible Nuts
<i>Fraxinus americana</i>	White Ash	50-80	40-50	D	Pollinator Friendly
<i>Fraxinus pennsylvanica</i>	Green Ash	50-60	20-30	D	Pollinator Friendly
<i>Gleditsia triacanthos var. inermis</i>	Thornless Honeylocust	30-70	30-70	D	Pollinator Friendly
<i>Gymnocladus dioicus</i>	Kentucky Coffeetree	60-75	40-50	D	
<i>Ilex opaca</i>	American Holly	40-50	20-40	E	Tolerates Some Shade
<i>Juglans nigra</i>	Eastern Black Walnut	50-75	50-75	D	Edible Nuts
<i>Juniperus virginiana</i>	Eastern Red Cedar	40-50	10-20	E	Bird Friendly
<i>Liquidambar styraciflua 'Rotundiloba'</i>	Sweetgum, Fruitless	60-75	20-30	D	Quick Growth
<i>Liriodendron tulipifera</i>	Tulip Poplar	70-90	30-40	D	Quick Growth; Pollinator Friendly
<i>Magnolia acuminata</i>	Cucumber Magnolia	40-70	20-35	D	Pollinator Friendly
<i>Magnolia grandiflora</i>	Southern Magnolia	60-80	40-50	E	Pollinator Friendly
<i>Nyssa sylvatica</i>	Black Gum	30-50	20-30	D	Bird & Pollinator Friendly
<i>Pinus echinata</i>	Shortleaf Pine	50-60	20-35	E	
<i>Pinus palustris</i>	Longleaf Pine	60-80	30-40	E	
<i>Pinus taeda</i>	Loblolly Pine	60-100	25-35	E	Pollinator Friendly
<i>Platanus occidentalis</i>	American Sycamore	75-100	75-100	D	Large Root System; Not Good For Small Areas
<i>Prunus serotina</i>	Black Cherry	50-80	30-50	D	Bird & Pollinator Friendly; Tasty Fruit
<i>Quercus alba</i>	White Oak	50-80	50-80	D	
<i>Quercus bicolor</i>	Swamp White Oak	50-60	50-60	D	
<i>Quercus coccinea</i>	Scarlet Oak	60-80	40-50	D	
<i>Quercus falcata</i>	Southern Red Oak	60-80	60-70	D	
<i>Quercus imbricaria</i>	Shingle Oak	50-60	50-60	D	

Native and Adaptive Plant Lists

Large Trees (height ≥ 50 ft)					
Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
<i>Quercus laurifolia</i>	Laurel Oak	60-70	35-45	D	
<i>Quercus lyrata</i>	Overcup Oak	40-70	35-50	D	
<i>Quercus michauxii</i>	Swamp Chestnut Oak	40-60	30-50	D	
<i>Quercus nuttallii</i>	Nuttall Oak	40-60	35-50	D	
<i>Quercus phellos</i>	Willow Oak	40-60	30-40	D	
<i>Quercus prinus</i>	Chestnut Oak	60-70	60-70	D	
<i>Quercus rubra</i>	Northern Red Oak	60-75	35-45	D	
<i>Quercus shumardii</i>	Shumard Oak	40-60	40-60	D	
<i>Quercus velutina</i>	Black Oak	50-60	40-70	D	
<i>Quercus virginiana</i>	Live Oak	40-80	60-100	E	
<i>Salix nigra</i>	Black Willow	30-60	30-60	D	Pollinator Friendly
<i>Sassafras albidum</i>	Sassafras	30-60	25-40	D	Pollinator Friendly
<i>Taxodium distichum</i>	Baldcypress	50-70	30-40	D	Drought Tolerant
<i>Tilia americana</i>	Basswood	50-80	30-50	D	Quick Growth; Pollinator Friendly
<i>Tsuga canadensis</i>	Eastern Hemlock	40-70	25-35	E	Susceptible To Hemlock Wolly Adelgid
<i>Ulmus americana 'Princeton'</i>	Princeton Elm	50-70	30-50	D	Susceptible to Dutch Elm Disease
Introduced Adaptive Species:					
<i>Cedrus deodara</i>	Deodar Cedar	40-70	20-40	E	
<i>Cercidiphyllum japonicum</i>	Katsuratree	40-60	20-30	D	
<i>Cryptomeria japonica</i>	Japanese Cryptomeria	50-60	20-30	E	Not Drought Tolerant
<i>Cunninghamia lanceolata</i>	Chinese Fir	30-70	10-30	E	
<i>Fagus sylvatica</i>	European Beech	50-60	35-45	D	
<i>Ginkgo biloba</i>	Ginkgo	25-50	25-35	D	Female Trees Have Unpleasant Odor
<i>Metasequoia glyptostroboides</i>	Dawn Redwood	70-100	20-30	E	
<i>Pinus nigra</i>	Austrian Pine	50-60	20-40	E	
<i>Pinus sylvestris</i>	Scotch Pine	30-60	30-40	E	
<i>Pinus thunbergi</i>	Japanese Black Pine	20-60	10-20	E	
<i>Ostrya carpinifolia</i>	European Hop Hornbeam	40-50	30-40	D	

Native and Adaptive Plant Lists

Large Trees (height ≥ 50 ft)

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
<i>Quercus acutissima</i>	Sawtooth Oak	40-60	40-60	D	
<i>Quercus robur 'Fastigiata'</i>	Fastigiante English Oak	50-60	10-20	D	Narrow Canopy
<i>Salix alba</i>	Weeping Willow	30-40	30-40	D	
<i>Tilia cordata</i>	Little Leaf Linden	50-60	30-40	D	
<i>Tilia tomentosa</i>	Silver Linden	50-70	30-50	D	
<i>Thuja standishii x plicata 'Green Giant'</i>	Green Giant Arborvitae	50-60	10-20	E	Quick Growth
<i>X Cupressocyparis leylandii</i>	Leyland Cypress	60-70	15-25	E	Quick Growth
<i>Zelkova serrata</i>	Japanese Zelkova	50-80	50-75	D	

Native and Adaptive Plant Lists

Medium Trees (height 30-50 ft)

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
Native Species:					
<i>Acer negundo</i>	Boxelder	30-50	35-40	D	
<i>Carpinus caroliniana</i>	American Hornbeam	20-35	20-35	D	
<i>Catalpa bignonioides</i>	Southern catalpa	30-40	30-40	D	Pollinator Friendly
<i>Chamaecyparis thyoides</i>	Atlantic white cedar	40-50	10-20	E	
<i>Cladrastis kentuckea</i>	American yellowwood	30-50	40-55	D	Pollinator Friendly
<i>Halesia Carolina</i>	Carolina Silverbell	30-40	20-35	D	Pollinator Friendly
<i>Ilex opaca</i>	American Holly	40-50	20-40	E	Pollinator & Bird Friendly
<i>Maclura pomifera</i>	Osage orange	30-40	20-40	D	Thorns
<i>Magnolia macrophylla</i>	Bigleaf magnolia	30-40	20-30	D	Large Flowers
<i>Magnolia tripetelata</i>	Umbrella magnolia	20-40	30-40	D	Large Flowers
<i>Oxydendrum arboreum</i>	Sourwood	20-50	10-25	D	Pollinator Friendly
<i>Pinus virginiana</i>	Virginia Pine	15-40	10-30	E	
<i>Thuja occidentalis</i>	Eastern Arborvitae	20-40	10-15	E	Many Cultivars Available; Shrub-Forms Available
Introduced Adaptive Species:					
<i>Acer buergerianum</i>	Trident Maple	25-35	15-25	D	
<i>Alnus cordata</i>	Italian alder	30-50	20-40	D	
<i>Carpinus betulus</i>	European Hornbeam	30-40	20-30	D	
<i>Cupressus arizonica</i>	Arizona cypress	30-40	8-12	E	
<i>Parrotia persica</i>	Persian ironwood	20-40	20-35	D	
<i>Phellodendron amurense</i>	Amur corktree	30-45	30-45	D	
<i>Ulmus parvifolia</i>	Chinese elm	40-50	35-50	D	

Native and Adaptive Plant Lists

Small Trees (height ≤30 ft)					
Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
Native Species:					
<i>Acer leucoderme</i>	Chalkbark Maple	20-30	20-25	D	
<i>Aesculus pavia</i>	Red Buckeye	15-20	15-20	D	Toxic; Pollinator Friendly
<i>Amelanchier arborea</i>	Downy Serviceberry	10-25	10-15	D	Very Early Spring Flowers; Pollinator & Bird Friendly
<i>Amelanchier canadensis</i>	Shadblow Serviceberry	25-30	15-20	D	Very Early Spring Flowers; Pollinator & Bird Friendly
<i>Asimina triloba</i>	Pawpaw	15-30	15-20	D	Large Edible Fruit
<i>Cercis canadensis</i>	Eastern Redbud	20-30	25-35	D	Early Spring Flowers; Pollinator Friendly
<i>Chionanthus virginicus</i>	White Fringe Tree	15-20	15-20	D	Pollinator Friendly
<i>Cornus florida</i>	Flowering Dogwood	10-30	15-30	D	Spring Flowers; Pollinator & Bird Friendly
<i>Cornus alternatifolia</i>	Pagoda Dogwood	15-30	10-20	D	Spring Flowers; Pollinator & Bird Friendly
<i>Cotinus obovatus</i>	American Smoketree	10-30	15-20	D	Pollinator Friendly
<i>Crataegus phaenopyrum</i>	Washington Hawthorn	25-30	20-25	D	Pollinator & Bird Friendly
<i>Crataegus viridis</i>	Green Hawthorn	20-30	20-30	D	Pollinator & Bird Friendly
<i>Halesia diptera</i>	Two-Wing Silverbell	20-30	20-30	D	Showy Flowers; Pollinator Friendly
<i>Hamamelis virginiana</i>	Common Witchhazel	15-30	15-30	D	Pollinator Friendly
<i>Ilex cassine</i>	Dahoon Holly	20-30	10-15	E	Pollinator Friendly
<i>Ilex decidua</i>	Possumhaw	20-30	15-20	E	Pollinator & Bird Friendly
<i>Ilex vomitoria</i>	Yaupon Holly	15-20	10-15	E	Pollinator & Bird Friendly
<i>Ilex x 'Emily Bruner'</i>	Emily Bruner Holly	15-20	8-10	E	
<i>Magnolia grandiflora</i> 'Little Gem'	Little Gem Magnolia	15-20	8-10	E	Pollinator & Bird Friendly
<i>Magnolia virginiana</i>	Sweetbay Magnolia	10-30	15-20	E	Pollinator & Bird Friendly
<i>Malus angustifolia</i>	Southern Crabapple	25-30	25-30	D	Pollinator & Bird Friendly
<i>Malus coronaria</i>	American/Sweet Crabapple	15-30	20-30	D	Needs Moist Soils; Pollinator Friendly
<i>Morus rubra</i>	Red Mulberry	20-45	35-40	D	Pollinator & Bird Friendly; Messy Edible Fruit
<i>Myrica cerifera</i>	Southern Wax Myrtle	15-25	15-25	E	Bird Friendly
<i>Myrica pennsylvanica</i>	Northern Bayberry	5-10	5-10	D	Bird Friendly
<i>Prunus americana</i>	American Red Plum	15-25	15-20	D	Pollinator & Bird Friendly

Native and Adaptive Plant Lists

Small Trees (height ≤30 ft)					
Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
<i>Prunus caroliniana</i>	Carolina Cherrylaurel	20-30	15-25	E	Toxic; Pollinator & Bird Friendly
<i>Prunus virginiana</i>	Common Chokecherry	15-20	10-15	D	Pollinator & Bird Friendly
<i>Rhus copallina</i>	Shining Or Winged Sumac	15-25	15-25	D	Pollinator & Bird Friendly
<i>Rhus typhina</i>	Staghorn Sumac	15-25	15-25	D	Pollinator & Bird Friendly
Introduced Adaptive Species:					
<i>Abies firma</i>	Japanese Fir	20-30	10-15	E	
<i>Acer carpiniifolium</i>	Hornbeam Maple	15-25	15-25	D	
<i>Acer cissifolium</i>	Ivy-Leaved Maple	20-30	20-30	D	
<i>Acer ginnala</i>	Amur Maple	15-20	15-30	D	
<i>Acer griseum</i>	Paperbark Maple	20-30	15-20	D	
<i>Acer palmatum</i>	Japanese Maple	15-20	10-15	D	
<i>Acer tartaricum</i>	Tatarian Maple	15-25	10-15	D	
<i>Acer truncatum</i>	Purpleblow Maple	20-25	15-20	D	
<i>Cephalotaxus harringtonia</i>	Japanese Plum Yew	10-25	20-30	E	
<i>Cercis reniformis</i>	Oklahoma Redbud	15-25	15-25	D	Spring Flowers; Pollinator Friendly
<i>Chionanthus retusus</i>	Chinese Fringe Tree	15-25	10-25	D	Spring Flowers; Pollinator Friendly
<i>Cornus kousa</i>	Kousa Dogwood	10-30	15-30	D	Spring Flowers; Pollinator Friendly
<i>Cornus mas</i>	Cornelian Cherry Dogwood	20-25	15-20	D	Spring Flowers; Pollinator Friendly
<i>Cotinus coggygria</i>	Common Smoketree	10-30	15-20	D	
<i>Hamamelis x intermedia</i>	Hybrid Witchhazel	12-15	12-15	D	
<i>Ilex x attenuata</i>	Hybrid Holly	15-30	10-15	E	
<i>Ilex x 'Dr. Kassab'</i>	Dr. Kassab Holly	15-20	10-15	E	
<i>Ilex x 'Nellie R. Stevens'</i>	Nellie R. Stevens	15-25	10-15	E	Bird & Pollinator Friendly
<i>Lagerstroemia fauriei</i>	Japanese Crapemyrtle	10-25	20-25	D	Summer Flowers
<i>Lagerstroemia indica & hybrids</i>	Common Crapemyrtle	10-25	20-25	D	Summer Flowers
<i>Magnolia stellata</i>	Star Magnolia	15-20	10-15	D	Spring Flowers
<i>Magnolia x loebneri</i>	Loebner Magnolia	20-30	20-40	D	Spring Flowers
<i>Magnolia x soulangiana</i>	Saucer Magnolia	20-30	20-30	D	Spring Flowers

Native and Adaptive Plant Lists

Small Trees (height ≤30 ft)					
Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
<i>Malus spp.</i>	Flowering Crabapple	15-25	10-20	D	Most Crabapples Are Non-Native; Spring Flowers; Bird & Pollinator Friendly
<i>Photinia x fraseri</i>	Fraser Photinia	15-25	10-20	E	
<i>Pistachia chinensis</i>	Chinese Pistache	30-35	25-35	D	
<i>Prunus hybrids</i>	Cherry	Varies	Varies	D	Spring Flowers; Bird & Pollinator Friendly
<i>Prunus mume</i>	Japanese Apricot	15-20	15-20	D	Spring Flowers; Pollinator Friendly
<i>Prunus persica</i>	Common Peach	15-25	15-25	D	Spring Flowers; Pollinator Friendly
<i>Prunus sargentii</i>	Sargent Cherry	20-30	20-30	D	Spring Flowers; Bird & Pollinator Friendly
<i>Prunus serrulata</i>	Flowering Cherry	15-30	20-30	D	Spring Flowers; Bird & Pollinator Friendly
<i>Prunus subhirtella</i>	Higan Cherry	20-40	15-30	D	Spring Flowers; Bird & Pollinator Friendly
<i>Prunus x yedoensis</i>	Yoshino Cherry	20-30	20-30	D	Spring Flowers; Bird & Pollinator Friendly
<i>Quercus glauca</i>	Blue Japanese Oak	20-30	10-15	D	
<i>Styrax japonicus</i>	Japanese Snowbell	20-30	15-30	D	Spring Flowers; Pollinator Friendly
<i>Syringa reticulata</i>	Japanese Tree Lilac	25-30	20-25	D	Spring Flowers; Pollinator Friendly
<i>Thuja orientalis</i>	Western Arborvitae	20-25	10-25	E	

Native and Adaptive Plant Lists

Large Shrub List (8-25 ft)

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
Native Species:					
<i>Aesculus parviflora</i>	Bottlebrush buckeye	8-12	8-15	D	Summer Flowers; Pollinator Friendly;
<i>Aronia arbutifolia</i>	Red Chokecherry	6-10	3-5	D	Pollinator & Bird Friendly;
<i>Calycanthus floridus</i>	Carolina Allspice	6-9	6-12	D	Great Fragrance.
<i>Camellia sasanqua</i>	Sasanqua Camellia	6-10	5-7	E	Showy Early Spring Flowering.
<i>Chimonanthus virginicus</i>	Fringetree	12-20	12-20	D	Showy Flowers.
<i>Clethra acuminata</i>	Cinnamonbark	8-15	4-6	D	Summer Flowers; Pollinator Friendly;
<i>Cornus amomum</i>	Silky Dogwood	10-15	6-12	D	Summer Flowers; Pollinator Friendly;
<i>Corylus americana</i>	American Hazelnut	12-15		D	Edible Nuts. Suckers. Pollinator & Bird Friendly;
<i>Fothergilla major</i>	Large Fothergilla	6-10	6-8	D	Showy Flowers; Pollinator Friendly;
<i>Hamamelis vernalis</i>	Witchhazel	6-10	6-10	D	Showy Flowers; Pollinator Friendly;
<i>Ilex verticillata</i>	Winterberry Holly	6-10	6-10	D	Berries; Pollinator & Bird Friendly;
<i>Ilex vomitoria</i>	Yaupon Holly	15-20	8-12	E	Many Cultivars Available.
<i>Illicium floridanum</i>	Florida Anise	10-15	6-8	E	Showy Flowers; Pollinator Friendly
<i>Illicium parviflorum</i>	Yellow Anise	10-15	6-10	E	Showy Flowers; Pollinator Friendly
<i>Kalmia latifolia</i>	Mountain Laurel	7-15	7-15	E	Showy Flowers; Pollinator Friendly
<i>Leucothoe populifolia</i>	Florida Leucothoe	8-12	6-8	E	Toxic; Forms Thickets; Pollinator & Bird Friendly;
<i>Lindera benzoin</i>	Spicebush	8-15	6-10	D	Pollinator & Bird Friendly;
<i>Myrica cerifera</i>	Wax Myrtle	10-15	8-12	E	Good For Light Screening. Ice Damage.
<i>Rhododendron catawbiense</i>	Mountain Rosebay	6-10	8-10	E	Spring Flowers; Pollinator Friendly;
<i>Rhododendron periclymenoides</i>	Pinxter Azalea	4-10	4-5	D	Spring Flowers; Pollinator Friendly;
<i>Rhododendron vaseyi</i>	Pinkshell Azalea	5-15	5-10	E	Spring Flowers; Pollinator Friendly;
<i>Sambucus canadensis</i>	American Elderberry	5-12	6-12	D	Suckers; Pollinator & Bird Friendly; Tasty Berries
<i>Vaccinium corymbosum</i>	Highbush blueberry	6-12	3-10	D	Good Fall Color; Pollinator & Bird Friendly; Tasty Berries
<i>Viburnum dentatum</i>	Arrowwood Viburnum	6-10	6-10	D	Pollinator & Bird Friendly;
<i>Viburnum lentago</i>	Nannyberry Viburnum	12-18	6-12	D	Pollinator & Bird Friendly;
<i>Viburnum prunifolium</i>	Smooth Blackhaw	12-15	6-12	D	Pollinator & Bird Friendly;
<i>Viburnum nudum</i>	Possumhaw or Witherod	5-12	5-12	D	Pollinator & Bird Friendly;
<i>Viburnum trilobum</i>	American Cranberrybush	8-15	8-10	D	Pollinator & Bird Friendly;

Native and Adaptive Plant Lists

Large Shrub List (8-25 ft)

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
<i>Weigela florida</i>	Weigela	6-9	6-12	D	Showy Spring Flowers.
Introduced Adaptive Species:					
<i>Aucuba japonica</i>	Acuba	6-10	4-8	E	Dwarf Varieties Available. Tolerates Poor Drainage
<i>Berberis julianae</i>	Wintergreen Barberry	6-8	6-8	E	Thorns. Good For Screening.
<i>Buxus sempervirens</i>	Common Boxwood	15-20	15-20	E	Many Cultivars Available
<i>Camellia japonica</i>	Japanese Camellia	10-15	6-10	E	Showy Early Spring Flowering
<i>Chimonanthus praecox</i>	Fragrant Wintersweet	10-15	8-12	D	Fragrant Winter Flowers.
<i>Cleyera japonica</i>	Japanese Cleyera	8-12	6-7	E	
<i>Cotoneaster salicifolius</i>	Willowleaf Cotoneaster	10-15	7-12	E	
<i>Deutzia scabra</i>	Pride of Rochester	6-10	4-8	D	Showy Spring Flowers.
<i>Euonymus japonicus</i>	Dwarf Japanese Euonymus	10-15	5-7	E	
<i>Euonymus kiautschovicus</i>	Spreading Euonymus	8-10	4-8	D	
<i>Exochorda racemosa</i>	Pearlbush	10-15	10-15	D	Spring Flowering.
<i>Forsythia x</i>	Forsythia	8-10	10-12	D	Early Spring Flowers.
<i>Hibiscus syriacus</i>	Rose of Sharon	8-12	6-10	D	Showy Summer Flowers; Aggressively Self-Seeds.
<i>Hydrangea paniculata</i>	Panicle Hydrangea	10-20	10-20	D	
<i>Ilex aquifolia</i>	English Holly	8-12	8-12	E	
<i>Ilex cornuta</i>	Chinese or Burford Holly	8-10	8-10	E	Many Cultivars Available
<i>Ilex latifolia</i>	Lusterleaf Holly	20-25	7-11	E	
<i>Ilex x 'Nellie R. Stevens'</i>	Nellie Stevens Holly	15-25	15-25	E	Good For Screening; Bird Friendly.
<i>Illicium anisatum</i>	Anisetree	6-10	6-10	E	Good For Screening.
<i>Lonicera fragrantissima</i>	Winter Honeysuckle	8-12	6-10	D	
<i>Loropetalum chinense</i>	Chinese Fringe-flower	6-10	6-10	E	
<i>Magnolia figo</i>	Banana Shrub	6-8	6-8	E	
<i>Magnolia stellata</i>	Star Magnolia	15-20	10-15	D	
<i>Osmanthus fragrans</i>	Sweet Osmanthus	10-12	10-14	E	
<i>Osmanthus heterophyllus</i>	False Holly	8-10	8-10	E	
<i>Prunus laurocerasus</i>	English Laurel	10-18	25-30	E	Many Cultivars Available
<i>Viburnum dilatatum</i>	Linden Viburnum	8-10	6-8	D	Red Fruit.

Native and Adaptive Plant Lists

Large Shrub List (8-25 ft)

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
<i>Viburnum opulus</i>	Cranberrybush Viburnum	8-12	10-15	D	
<i>Viburnum plicatum</i>	Doublefile Viburnum	8-10	9-12	D	Accent Plant. Spring Flowers.
<i>Viburnum rhytidophyllum</i>	Leatherleaf Viburnum	10-15	10-15	E	
<i>Viburnum x burkwoodii</i>	Burkwood Viburnum	8-10	5-7	D	Fragrant Pink Spring Blossoms. Nice Accent Plant.
<i>Vitex agnus castus</i>	Chaste Tree	10-12	8-10	D	Summer Flowers; Bee Favorite

Native and Adaptive Plant Lists

Small to Medium Shrub List (height ≤ 8 ft)

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
Native Species:					
<i>Amorpha canescens</i>	Lead Plant	2-3	2-6	D	Pollinator Friendly; Showy Flowers.
<i>Amorpha nana</i>	Fragrant False Indigo	1-2	1-3	D	Pollinator Friendly; Showy Flowers.
<i>Aronia melanocarpa</i>	Black Chokeberry	3-5	3-5	D	Pollinator Friendly; Spring Flowers.
<i>Callicarpa americana</i>	American Beautyberry	3-8	4-6	D	Pollinator & Bird Friendly; Showy Berries.
<i>Ceanothus americanus</i>	New Jersey Tea	2-3	3-4	D	Pollinator Friendly; Showy Flowers.
<i>Cephalanthus occidentalis</i>	Buttonbush	5-8	3-6	D	Pollinator Friendly; Showy Flowers.
<i>Clethra alnifolia</i>	Summersweet Clethra	4-8	4-6	D	Pollinator Friendly; Summer Flowers
<i>Cornus stolonifera</i>	Red Osier Dogwood	7-8	4-6	D	Pollinator Friendly; Summer Flowers
<i>Diervilla sessilifolia</i>	Southern Bush Honeysuckle	3-5	3-5	D	Pollinator Friendly; Summer Flowers
<i>Diervilla lonicera</i>	Bush Honeysuckle	2-4	2-4	D	Pollinator Friendly; Showy Flowers.
<i>Euonymus americanus</i>	Strawberry Bush	4-5	3-5	D	Pollinator Friendly; Summer Flowers
<i>Fothergilla gardenii</i>	Dwarf Fothergilla	2-3	2-3	D	Pollinator Friendly; Summer Flowers
<i>Hydrangea arborescens</i>	Smooth Hydrangea	3-5	3-5	D	Pollinator Friendly; Summer Flowers
<i>Hydrangea quercifolia</i>	Oakleaf Hydrangea	6-8	6-8	D	Pollinator Friendly; Summer Flowers
<i>Hypericum densiflorum</i>	Dense St. Johns Wort	4-6	4-6	D	Pollinator Friendly; Summer Flowers
<i>Hypericum prolificum</i>	Shrubby St. Johns Wort	1-4	1-4	D	Pollinator Friendly; Summer Flowers
<i>Ilex glabra</i>	Inkberry Holly	6-8	8-10	E	Pollinator & Bird Friendly
<i>Itea virginica</i>	Virginia Sweetspire	3-5	4-6	D	Pollinator Friendly; Summer Flowers
<i>Juniperus horizontalis</i>	Creeping Juniper	1	4-8	E	Good For Banks/Slopes As A Groundcover.
<i>Leucothoe axillaris</i>	Doghobble	3-4	4-6	D	Pollinator Friendly; Spring Flowers.
<i>Leucothoe fontanesiana</i>	Drooping Leucothoe	3-5	2-3	E	Pollinator Friendly; Spring Flowers.
<i>Lyonia lucida</i>	Fetterbush	3-6	3-6	E	Pollinator Friendly; Spring Flowers.
<i>Physocarpus opulifolius</i>	Ninebark	5-8	4-8	D	Pollinator Friendly; Summer Flowers.
<i>Rhododendron atlanticum</i>	Dwarf or Coastal Azalea	2-6	2-5	D	Spring Flowers; Pollinator & Bird Friendly
<i>Rhododendron carolinianum</i>	Carolina Rhododendron	3-6	3-6	E	Spring Flowers; Pollinator & Bird Friendly
<i>Rhododendron calendulaceum</i>	Flame Azalea	4-8	8-10	D	Pollinator Friendly; Late Spring Flowers
<i>Rhus aromatica</i>	Fragrant Sumac	2-6	6-10	D	Stabilizes Slopes; Pollinator Friendly; Appearance Similar To Poison Ivy.
<i>Rosa carolina</i>	Carolina Rose	3-6	5-10	D	Stabilizes Slopes; Pollinator Friendly

Native and Adaptive Plant Lists

Small to Medium Shrub List (height ≤ 8 ft)

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
<i>Rosa paulstris</i>	Swamp Rose	3-6	3-6	D	Pollinator Friendly
<i>Spiraea alba</i>	Meadowsweet	3-4	3-4	D	Pollinator Friendly
<i>Spiraea betulifolia</i>	White Spirea	2-3	2-3	D	Pollinator Friendly
<i>Spiraea tomentosa</i>	Steeplebush	2-4	3-5	D	Pollinator Friendly
<i>Vaccinium ashei</i>	Rabbiteye Blueberry	4-6	3-5	D	Edible Fruit; Pollinator & Bird Friendly
<i>Vaccinium pallidum</i>	Lowbush Blueberry	2-3	2-3	D	Pollinator & Bird Friendly; Spring Flowers; Edible Fruit;
<i>Virburnum acerifolium</i>	Mapleleaf Viburnum	4-6	3-4	D	Pollinator & Bird Friendly; Spring Flowers.
<i>Viburnum cassinoides</i>	Witherod Viburnum	5-6	5-8	D	Pollinator & Bird Friendly; Spring Flowers.
<i>Viburnum nudum</i>	Smooth Witherod	4-6	5-8	D	Pollinator & Bird Friendly; Spring Flowers.
Introduced adaptive species:					
<i>Abelia x grandiflora</i>	Glossy Abelia	4-6	3-5	E	Showy Summer Flowers.
<i>Berberis verruculosa</i>	Warty Barberry	3-6	3-6	E	Thorns; Many Cultivars Available;
<i>Berberis x chenaultii</i>	Chenault Barberry	3-4	3-4	E	Thorns; Many Cultivars Available;
<i>Berberis x mentorensis</i>	Mentor Barberry	4-6	5-7	D	
<i>Buxus microphylla</i>	Littleleaf Boxwood	3-4	3-4	E	
<i>Callicarpa japonica</i>	Japanese Beautyberry	4-6	4-6	D	Showy Berries
<i>Chaenomeles japonica</i> <i>Japanese</i>	Flowering Quince	2-3	2-3	D	Spring Flowering.
<i>Cotoneaster divaricatus</i>	Spreading Cotoneaster	5-6	6-8	D	Red Berries.
<i>Cotoneaster horizontalis</i>	Rockspray Cotoneaster	2-3	5-8	E	Red Berries.
<i>Cytisus scoparius</i>	Scotch Broom	5-6	5-8	D	
<i>Deutzia</i>	Deutzia	2-4	3-4	D	Showy Spring Flowers.
<i>Hydrangea macrophylla</i>	Mophead Hydrangea	3-6	3-6	D	Large Flowers;
<i>Ilex crenata</i>	Japanese Holly	5-10	5-10	E	Many Cultivars Available. Low Screening.
<i>Jasminum nudiflorum</i>	Winter Jasmine	3-4	4-7	D	Showy Flowers. Stabilizes Slopes
<i>Juniperus chinensis</i>	Chinese Juniper	2-6	2-6	E	
<i>Juniperus conferta</i>	Shore Juniper	1-2	6-9	E	Many Cultivars Available; Stabilizes Slopes.
<i>Juniperus procumbens</i>	Japanese Garden Juniper	1-2	10-15	E	
<i>Kerria japonica</i>	Japanese Kerria	3-6	6-9	D	Yellow Flowers In The Spring.
<i>Lonicera nitida</i>	Box Honeysuckle	5-6	3-4	E	Fragrant White Flowers.

Native and Adaptive Plant Lists

Small to Medium Shrub List (height ≤ 8 ft)

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
<i>Mahonia aquifolium</i>	Oregon Grape Holly	3-6	3-5	E	
<i>Prunus laurocerasus</i>	Dwarf English Laurel	3-4	3-4	E	
<i>Rosmarinus officianalis</i>	Rosemary	4-6	3-6	E	Edible;
<i>Spiraea japonica</i>	Japanese Spiraea	4-5	4-5	D	
<i>Spiraea thunbergii</i>	Thunberg Spirea	3-5	3-5	D	
<i>Spiraea x bumalda</i>	Bumald Spiraea	2-3	3-5	D	Good Fall Color, Spring Flowers.

Native and Adaptive Plant Lists

Parking Lot Shade Tree List

This list is intended to provide trees that adapt well to parking lot conditions and meet the requirements of UDO Sec. 8.2.5.C.2.

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
Native Species:					
<i>Amelanchier canadensis</i>	Shadblow Serviceberry	25-30	15-20	D	Very Early Spring Flowers; Pollinator & Bird Friendly
<i>Gleditsia triacanthos</i> var. <i>inermis</i>	Thornless Honeylocust	30-70	30-70	D	Pollinator Friendly
<i>Liquidambar styraciflua</i> 'Rotundiloba'	Sweetgum, Fruitless	60-75	20-30	D	Quick Growth
<i>Nyssa sylvatica</i>	Black Gum	30-50	20-30	D	Pollinator & Bird Friendly
<i>Quercus lyrata</i>	Overcup Oak	40-70	35-50	D	
<i>Quercus nuttallii</i>	Nuttall Oak	40-60	35-50	D	
<i>Quercus shumardii</i>	Shumard Oak	40-60	40-60	D	
<i>Taxodium distichum</i>	Baldcypress	50-70	30-40	D	Drought Tolerant
<i>Ulmus americana</i> 'Princeton'	Princeton Elm	50-70	30-50	D	Susceptible to Dutch Elm Disease
Introduced Adaptive Species:					
<i>Acer buergerianum</i>	Trident Maple	25-35	15-25	D	
<i>Acer truncatum</i>	Purpleblow Maple	20-25	15-20	D	
<i>Carpinus betulus</i>	European Hornbeam	40-60	30-40	D	
<i>Gingko biloba</i>	Gingko	25-50	25-35	D	Flowers On Female Trees Have Unpleasant Odor
<i>Lagerstroemia indica</i> & hybrids	Common Crapemyrtle	10-25	20-25	D	Summer Flowers
<i>Parrotia persica</i>	Persian ironwood	20-40	20-35	D	
<i>Pistachia chinensis</i>	Chinese Pistache	30-35	25-35	D	
<i>Tilia tomentosa</i>	Silver Linden	50-70	30-50	D	
<i>Ulmus parvifolia</i>	Chinese elm	40-50	35-50	D	
<i>Zelkova serrata</i>	Japanese Zelkova	50-80	50-75	D	

Native and Adaptive Plant Lists

Vehicle Use Area Screening Shrubs

This list is intended to provide evergreen shrubs that adapt well to parking lot conditions and meet the requirements of UDO Sec. 8.2.5.B.2.a.

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Sun/Shade	Comments
Native Species:					
<i>Ilex glabra</i>	Inkberry	6-8	8-10	Sun	Pollinator & Bird Friendly
<i>Ilex vomitoria</i>	Yaupon Holly	3-5	3-5	Sun	Pollinator & Bird Friendly
<i>Illicium floridanum</i>	Florida Anise	10-15	6-8	Shade – Part Shade	Showy Flowers; Pollinator Friendly
<i>Juniperus virginiana</i>	Red Cedar – shrub form	3-8	3-6	Sun	Bird Friendly
<i>Kalmia latifolia</i>	Mountain Laurel	7-15	7-15	Sun – Part Sun	Showy Flowers; Pollinator Friendly
<i>Myrica pusilla</i>	Dwarf Wax Myrtle	5	5	Sun – Part Sun	Bird Friendly
<i>Pinus strobus</i> ‘Nana’	Dwarf Eastern White Pine ‘Nana’	6	10	Sun	
<i>Rhododendron carolinianum</i>	Carolina Rhododendron	3-6	3-6	Sun – Part Shade	Pollinator & Bird Friendly
<i>Thuja occidentalis</i>	Arborvitae – shrub form	2-10	2-6	Sun	
<i>Tsuga Canadensis</i>	Dwarf Eastern Hemlock	5-8	3-6	Sun – Part Shade	
Introduced Adaptive Species:					
<i>Abelia x grandiflora</i>	Glossy Abelia	4-6	3-5	Sun – Part Sun	Bird Friendly
<i>Acuba japonica</i>	Japanese Acuba	6-10	4-8	Shade	
<i>Buxus microphylla</i>	Littleleaf Boxwood	3-4	3-4	Sun – Part Sun	
<i>Buxus sempervirens</i>	Boxwood	15-20	15-20	Sun – Part Sun	
<i>Camellia japonica</i>	Japanese Camellia	10-15	6-10	Shade – Full Shade	
<i>Euonymus japonicus</i>	Japanese Euonymus	10-15	5-7	Sun – Part Sun	
<i>Gardenia jasminoides</i>	Gardenia	3-10	2-10	Part Sun	
<i>Ilex cornuta</i>	Chinese Holly	8-10	8-10	Sun – Part Sun	
<i>Juniperus chinensis</i>	Chinese Juniper	2-6	2-6	Sun – Part Sun	
<i>Prunus laurocerasus</i>	English Laurel	3-4	3-4	Sun – Part Sun	
<i>Rhododendron x</i>	Azalea	3-15	3-12	Shade – Part Shade	
<i>Spirea japonica</i>	Japanese Spirea	4-5	4-5	Sun – Part Sun	
<i>Viburnum awabuki</i>	Chindo Viburnum	6-12	6-10	Sun – Part Sun	Bird Friendly
<i>Viburnum tinus</i>	Laurustinus ‘Compactum’	6-10	6-10	Sun – Part Sun	Bird Friendly
<i>Viburnum x pragense</i>	Prague Viburnum	10-12	8-10	Sun – Part Sun	Bird Friendly

Native and Adaptive Plant Lists

Recommended Trees & Large Shrubs Under Electric Lines

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
Native Species:					
<i>Aesculus pavia</i>	Red Buckeye	15-20	15-20	D	
<i>Amelanchier arborea</i>	Downy Serviceberry	10-25	10-15	D	Very Early Spring Flowers; Pollinator & Bird Friendly
<i>Amelanchier x grandiflora</i> 'Autumn Brilliance'	Autumn Brilliance Serviceberry	15-20	15-20	D	Very Early Spring Flowers; Pollinator & Bird Friendly
<i>Aronia arbutifolia</i>	Red Chokecherry	8-12	4-6	D	Spring Flowers; Pollinator & Bird Friendly
<i>Chionanthus virginicus</i>	White Fringe Tree	15-20	15-20	D	Spring Flowers; Pollinator & Bird Friendly
<i>Cotinus obovatus</i>	American Smoketree	15-25	20-25	D	Spring Flowers; Pollinator & Bird Friendly
<i>Ilex vomitoria</i>	Yaupon Holly	15-20	10-15	E	Pollinator & Bird Friendly
<i>Ilex x 'Emily Bruner'</i>	Emily Bruner Holly	15-20	8-10	E	Pollinator & Bird Friendly
<i>Juniperus virginiana 'Blue Arrow'</i>	Blue Arrow Red Cedar	10-15	4-6	E	Bird Friendly
<i>Juniperus virginiana 'Skyrocket'</i>	Skyrocket Red Cedar	10-20	3-4	E	Bird Friendly
<i>Magnolia grandiflora 'Little Gem'</i>	Little Gem Magnolia	15-20	8-10	E	Pollinator & Bird Friendly
<i>Magnolia virginiana</i>	Sweetbay Magnolia	10-30	15-20	E	Pollinator & Bird Friendly
<i>Myrica cerifera</i>	Southern Wax Myrtle	15-25	15-25	E	Bird Friendly
<i>Prunus americana</i>	American Red Plum	15-25	15-20	D	Pollinator & Bird Friendly
<i>Prunus caroliniana</i>	Carolina Cherrylaurel	10-20	10-15	E	Pollinator & Bird Friendly
<i>Prunus virginiana</i>	Common Chokecherry	15-20	10-15	D	Pollinator & Bird Friendly
<i>Rhus copallina</i>	Shining Or Winged Sumac	15-25	15-25	D	Pollinator & Bird Friendly
<i>Rhus typhina</i>	Staghorn Sumac	15-25	15-25	D	Pollinator & Bird Friendly
<i>Thuja occidentalis</i>	"Emerald" Arborvitae	15-20	5	E	
<i>Viburnum lentago</i>	Nannyberry Viburnum	12-18	15	D	Pollinator & Bird Friendly
Introduced Adaptive Species:					
<i>Acer buergerianum</i>	Trident Maple	30	30	D	
<i>Acer carpinifolium</i>	Hornbeam Maple	15-25	15-25	D	
<i>Acer ginnala</i>	Amur Maple	15-20	15-30	D	
<i>Acer palmatum</i>	Japanese Maple	15-20	10-15	D	
<i>Acer tartaricum</i>	Tatarian Maple	15-25	10-15	D	
<i>Acer truncatum</i>	Purpleblow Maple	20-25	15-20	D	
<i>Cephalotaxus harringtonia</i>	Japanese Plum Yew	10-25	20-30	E	

Native and Adaptive Plant Lists

Recommended Trees & Large Shrubs Under Electric Lines

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
<i>Cercis reniformis</i>	Oklahoma Redbud	15-25	15-25	D	Pollinator Friendly
<i>Chionanthus retusus</i>	Chinese Fringe Tree	15-25	10-25	D	Spring Flowers; Pollinator Friendly
<i>Cornus mas</i>	Cornelian Cherry Dogwood	20-25	15-20	D	Spring Flowers; Pollinator Friendly
<i>Cornus kousa</i>	Kousa Dogwood	20	20	D	Spring Flowers; Pollinator Friendly
<i>Cotinus coggyria</i>	Smoketree	15	15	D	Spring Flowers; Pollinator Friendly
<i>Ilex x 'Dr. Kassab'</i>	Dr. Kassab Holly	15-20	10-15	E	Bird Friendly
<i>Ilex x 'Nellie R. Stevens'</i>	Nellie R. Stevens	15-25	10-15	E	Bird & Pollinator Friendly
<i>Juniperus scopulorum 'Wichita Blue'</i>	Wichita Blue Juniper	10-15	6-8	E	Bird Friendly
<i>Lagerstroemia fauriei</i>	Japanese Crapemyrtle	10-25	20-25	D	Summer Flowers
<i>Lagerstroemia indica & hybrids</i>	Common Crapemyrtle	10-25	20-25	D	Summer Flowers
<i>Magnolia stellata</i>	Star Magnolia	15-20	10-15	D	
<i>Photinia x fraseri</i>	Fraser Photinia	15-25	10-20	E	Bird Friendly
<i>Prunus cerasifera</i>	Cherry Plum	15-20	15-20	D	Spring Flowers; Bird & Pollinator Friendly
<i>Prunus mume</i>	Japanese Apricot	15-20	15-20	D	Spring Flowers; Pollinator Friendly
<i>Prunus persica</i>	Common Peach	15-25	15-25	D	Spring Flowers; Pollinator Friendly
<i>Prunus serrulata</i>	Flowering Cherry	15-25	20-30	D	Spring Flowers; Bird & Pollinator Friendly
<i>Styrax japonicas</i>	Japanese Snowbell	20-25	20-25	D	Spring Flowers; Pollinator Friendly
<i>Syringa oblata</i>	Early Lilac	10-15	10	D	Spring Flowers; Pollinator Friendly
<i>Syringa reticulata</i>	Japanese Tree Lilac	25	20-25	D	Spring Flowers; Pollinator Friendly
<i>Viburnum sieboldii</i>	Siebold Viburnum	20	15	D	Spring Flowers; Bird & Pollinator Friendly

Native and Adaptive Plant Lists

Type A Buffer Tree List

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Sun/Shade	Comments
Native Species:					
<i>Chamaecyparis thyoides</i>	Atlantic white cedar	40-50	10-20	sun	
<i>Ilex cassine</i>	Dahoon Holly	20-30	10-15	sun	Pollinator Friendly
<i>Ilex opaca</i>	American Holly	40-50	20-40	sun	Pollinator & Bird Friendly
<i>Ilex vomitoria</i>	Yaupon Holly	15-20	10-15	sun	Pollinator Friendly
<i>Juniperus virginiana</i>	Eastern Red Cedar	40-50	10-20	sun	Bird Friendly
<i>Magnolia grandiflora</i>	Southern Magnolia	60-80	40-50	sun – part sun	Pollinator & Bird Friendly
<i>Magnolia virginiana</i>	Sweetbay Magnolia	10-30	15-20	sun – part sun	Pollinator & Bird Friendly
<i>Pinus virginiana</i>	Virginia Pine	15-40	10-30	sun	
<i>Prunus caroliniana</i>	Carolina Cherry Laurel	20-30	15-25	sun	Toxic; Pollinator & Bird Friendly
<i>Thuja occidentalis</i>	Eastern Arborvitae	20-40	10-15	sun	Many Cultivars Available; Shrub-Forms Available
<i>Tsuga canadensis</i>	Canadian Hemlock	40-70	25-35	sun	
Introduced Adaptive Species:					
<i>Abies firma</i>	Japanese Fir	20-30	10-15	sun – part sun	
<i>Cedrus deodara</i>	Deodar Cedar	40-70	20-40	sun – part sun	
<i>Cryptomeria japonica</i>	Japanese Cryptomeria	50-60	20-30	shade	
<i>Cunninghamia lanceolata</i>	Chinese Fir	30-70	10-30	sun – part sun	
<i>Cupressus arizonica</i>	Arizona cypress	30-40	8-12	sun – part sun	
<i>Ilex x attenuata</i>	Hybrid Holly	15-30	10-15	sun – part sun	
<i>Ilex x 'Dr. Kassab'</i>	Dr. Kassab Holly	15-20	10-15	sun – part sun	Bird Friendly
<i>Ilex x 'Nellie R. Stevens'</i>	Nellie R. Stevens	15-25	10-15	sun – part sun	Pollinator & Bird Friendly
<i>Metasequoia glyptostroboides</i>	Dawn Redwood	70-100	20-30	sun – part sun	
<i>Photinia x fraseri</i>	Fraser Photinia	15-25	10-20	sun – part sun	Pollinator Friendly
<i>Pinus nigra</i>	Austrian Pine	50-60	20-40	sun – part sun	
<i>Pinus sylvestris</i>	Scotch Pine	30-60	30-40	sun – part sun	
<i>Pinus thunbergi</i>	Japanese Black Pine	20-60	10-20	sun – part sun	
<i>Thuja orientalis</i>	Western Arborvitae	20-25	10-25	sun – part sun	
<i>Thuja standishii x plicata 'Green Giant'</i>	Green Giant Arborvitae	50-60	10-20	sun – part sun	
<i>X Cupressocyparis leylandii</i>	Leyland Cypress	60-70	15-25	sun – part sun	

Native and Adaptive Plant Lists

Type A Buffer Shrub List

This list is intended to provide evergreen shrubs that meet the requirements of UDO Sec. 8.2.2.B.3.d. and 8.2.6.B.5.a.

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Sun/Shade	Comments
Native Species:					
<i>Camellia sasanqua</i>	Sasanqua Camellia	6-10	5-7	Part Shade	Showy Flowers; Pollinator Friendly
<i>Ilex glabra</i>	Inkberry Holly	6-8	8-10	Sun	Pollinator & Bird Friendly
<i>Ilex verticillata</i>	Winterberry Holly	6-10	6-10	Sun – Part Sun	Berries; Pollinator & Bird Friendly;
<i>Illicium floridanum</i>	Florida Anise	10-15	6-8	Sun – Part Sun	Showy Flowers; Pollinator Friendly
<i>Illicium parviflorum</i>	Yellow Anise	10-15	6-10	Shade – Part Shade	Showy Flowers; Pollinator Friendly
<i>Juniperus virginiana</i>	Eastern Cedar – shrub form	2-10	2-10	Sun	Bird Friendly
<i>Kalmia latifolia</i>	Mountain Laurel	7-15	7-15	Shade – Part Shade	Showy Flowers; Pollinator Friendly
<i>Leucothoe populifolia</i>	Florida Leucothoe	8-12	6-8	Shade – Part Shade	Toxic; Forms Thickets; Pollinator & Bird Friendly;
<i>Myrica cerifera</i>	Wax Myrtle	10-15	8-12	Sun – Part Sun	Good For Light Screening. Ice Damage.
<i>Rhododendron catawbiense</i>	Mountain Rosebay	6-10	8-10	Part Shade	Spring Flowers; Pollinator Friendly;
<i>Rhododendron vaseyi</i>	Pinkshell Azalea	5-15	5-10	Shade – Part Shade	Spring Flowers; Pollinator Friendly
<i>Thuja occidentalis</i>	Arborvitae – shrub form	3-15	2-6	Sun	
<i>Tsuga canadensis</i>	Eastern Hemlock – shrub form	2-8	2-6	Sun – Part Sun	Susceptible To Hemlock Woolly Adelgid.
Introduced Adaptive Species:					
<i>Aucuba japonica</i>	Acuba	6-10	4-8	Shade – Part Shade	Dwarf Varieties Available. Tolerates Poor Drainage
<i>Buxus sempervirens</i>	Common Boxwood	15-20	15-20	Sun	Many Cultivars Available
<i>Camellia japonica</i>	Camellia	10-15	6-10	Shade – Part Shade	Showy Early Spring Flowering
<i>Cleyera japonica</i>	Japanese Cleyera	8-12	6-7	Sun – Part Sun	
<i>Ilex crenata</i>	Japanese Holly	5-10	5-10	Sun – Part Sun	Many Cultivars Available. Low Screening.
<i>Ilex aquifolia</i>	English HollyS	8-12	8-12	Sun – Part Sun	Bird Friendly
<i>Ilex cornuta</i>	Chinese or Burford Holly	8-10	8-10	Sun – Part Sun	
<i>Ilex latifolia</i>	Lusterleaf Holly	20-25	7-11	Sun – Part Sun	
<i>Illicium anisatum</i>	Anisetree	6-10	6-10	Sun – Part Sun	
<i>Juniperus chinensis</i>	Chinese Juniper	Varies	Varies	Sun – Part Sun	Choose Disease Resistant Cultivars.
<i>Lonicera nitida</i>	Box Honeysuckle	5-6	3-4	Sun – Part Sun	Fragrant White Flowers.
<i>Mahonia aquifolium</i>	Oregon Grape Holly	3-6	3-5	Sun – Part Sun	Bird Friendly

Native and Adaptive Plant Lists

Type A Buffer Shrub List

This list is intended to provide evergreen shrubs that meet the requirements of UDO Sec. 8.2.2.B.3.d. and 8.2.6.B.5.a.

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Sun/Shade	Comments
<i>Prunus laurocerasus</i>	English Laurel	10-18	25-30	Sun – Part Sun	Many Cultivars Available.
<i>Rosmarinus officianalis</i>	Rosemary	4-6	3-6	Sun – Part Sun	Edible
<i>Viburnum rhytidophyllum</i>	Leatherleaf Viburnum	10-15	10-15	Sun – Part Sun	Bird Friendly

Native and Adaptive Plant Lists

High Quality Shade Trees					
Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
Native Species:					
<i>Acer rubrum</i>	Red Maple	40-60	30-40	D	Don't Plant Near Pavement; Natural Areas Only
<i>Acer saccharum</i>	Sugar Maple	60-75	40-50	D	
<i>Acer x fremanii</i>	Freeman Maple	40-60	20-40	D	
<i>Amelanchier canadensis</i>	Shadblow Serviceberry	25-30	15-20	D	Very Early Spring Flowers; Pollinator & Bird Friendly
<i>Betula nigra</i>	River Birch	40-70	40-60	D	
<i>Carya glabra</i>	Pignut Hickory	50-60	25-35	D	Bird & Pollinator Friendly
<i>Carya illinoensis</i>	Pecan	70-100	40-75	D	Edible Nuts
<i>Carya ovata</i>	Shagbark Hickory	60-80	30-50	D	Pollinator Friendly
<i>Celtis laevigata</i>	Sugarberry	40-60	40-60	D	Bird & Pollinator Friendly
<i>Cladrastis lutea</i>	American Yellowwood	30-50	40-55	D	Large Attractive Flowers; Pollinator Friendly
<i>Fagus grandiflora</i>	American Beech	50-70	30-40	D	Edible Nuts
<i>Fraxinus americana</i>	White Ash	50-80	40-50	D	
<i>Juglans nigra</i>	Eastern Black Walnut	50-75	50-75	D	Edible Nuts
<i>Liquidambar styraciflua</i> 'Rotundiloba'	Sweetgum, Fruitless	60-75	20-30	D	Quick Growth
<i>Nyssa sylvatica</i>	Black Gum	30-50	20-30	D	Bird & Pollinator Friendly
<i>Platanus occidentalis</i>	American Sycamore	75-100	75-100	D	Large Root System; Not Good For Small Areas
<i>Tilia americana</i>	Basswood	50-80	30-50	D	Quick Growth; Pollinator Friendly
<i>Quercus alba</i>	White Oak	50-80	50-80	D	
<i>Quercus bicolor</i>	Swamp White Oak	50-60	50-60	D	
<i>Quercus coccinea</i>	Scarlet Oak	60-80	40-50	D	
<i>Quercus lyrata</i>	Overcup Oak	40-70	35-50	D	
<i>Quercus michauxii</i>	Swamp Chestnut Oak	40-60	30-50	D	
<i>Quercus phellos</i>	Willow Oak	40-60	30-40	D	
<i>Quercus rubra</i>	Northern Red Oak	60-75	35-45	D	
<i>Taxodium distichum</i>	Baldcypress	50-70	30-40	D	Drought Tolerant
<i>Ulmus americana</i> 'Princeton'	Princeton Elm	50-70	30-50	D	Susceptible to Dutch Elm Disease

Native and Adaptive Plant Lists

High Quality Shade Trees

Scientific Name	Common Name	Height (Feet)	Spread (Feet)	Evergreen/Deciduous	Comments
Introduced Adaptive Species:					
<i>Acer truncatum</i>	Purpleblow Maple	20-25	15-20	D	
<i>Metasequoia glyptostroboides</i>	Dawn Redwood	70-100	20-30	E	
<i>Parrotia persica</i>	Persian Ironwood	20-40	20-35	D	
<i>Pistachia chinensis</i>	Chinese Pistache	30-35	25-35	D	
<i>Quercus acutissima</i>	Sawtooth Oak	40-60	40-60	D	
<i>Ulmus parvifolia</i>	Chinese Elm	40-50	35-50	D	
<i>Zelkova serrata</i>	Japanese Zelkova	50-80	50-75	D	

Meadows and Open Fields

The replacement or establishment of forests or woodlands to meet the requirements of disturbed buffers and/or Resource Conservation Areas shall replicate the surrounding indigenous vegetation. Plantings shall assure a diversified plant population by including a canopy layer, an under-story layer, a shrub layer, and groundcover layer.

Recently timbered or cutover areas must include supplemental plantings to discourage the establishment of non-native, invasive and weedy species. Other types of plantings may be approved where it is necessary to correct an existing soil stabilization problem.

Areas used for Resource Conservation Areas must provide stabilization or protection of steep slopes, wetlands or riparian buffers, or act as functional woodlands or wildlife corridors. Resource Conservation Areas that act as functional woodlands and wildlife corridors must contain plants that provide both food and shelter for wildlife and be at least 30 feet wide and 2,000 square feet. RCA may be allowed to combine with buffers to meet this minimum size standard where it can be demonstrated that the existing buffer is undisturbed and already provides a natural, wooded environment. When combined with natural buffers, the RCA portion cannot be less than 10 feet wide. RCA and buffers will still be calculated separately.

Planting Standards

Plants used to meet any of the conditions stated above must meet the standard sizes and quantities found in Section 8.2.3 C) – Replacement of Existing, Original Vegetation, of the Town's Unified Development Ordinance. Plant types and species must meet those found in the Native and Adaptive Plant List found herein or an approved alternative. Upon approval by the Planning Director, trees may meet smaller substitution sizes as long as an adequate amount of the larger sizes are used. Smaller or substitution sizes are not intended to be used for entire sections of required buffers, only where existing buffers have been partially disturbed or where the non-vegetated section of an existing buffer makes up a small percentage of the overall buffer. Entire buffer areas with no existing vegetation must be planted according to the standards found in Section 8.2 of the UDO. Where substitutions are allowed, the sizes and quantities are as follows:

Each unit represents plants needed for 200 square feet of disturbed or non-vegetated area.

- | | | |
|----|--|---------------------------|
| a) | One Large Deciduous Tree, 2 ¹ / ₂ -inch caliper, 12'tall = | Two, 10 gallon, 6' tall |
| b) | One Large Evergreen Tree, 2 ¹ / ₂ -inch caliper, 8' tall = | Two, 10 gallon, 4' tall |
| c) | Two Small Trees, 1 ¹ / ₂ -inch caliper, 8' tall = | Three, 10 gallon, 4' tall |
| d) | Four evergreen *shrubs, at least 24" tall, 3 gallon = | No substitute |



Meadows and Open Fields

In addition to the above, provide 1-gallon size groundcover type plants on all slopes equal to or greater than a ratio of 2:1. Plants must be spaced approximately 2 feet on center. Native or adaptive species must be used. Additional slope stabilization such as matting or geo-textile fabric may be required. Other unplanted and open areas must be planted with non-turf type plants (native grasses, clover, wildflowers, etc.).

Spacing of plants may vary depending upon site conditions, but no large deciduous tree should be planted closer than 10 feet on center, and no large evergreen tree or small tree should be planted closer than six feet on center.

Resource Conservation Areas may include meadows and open fields provided that these areas do not occupy a large percentage of the total required RCA (i.e.: 10 % or less). The Planning Director must approve the final size of any meadows or open fields used for RCA. Areas such as, but not limited to: recently timbered and cutover areas, lawns, cultivated fields, picnic grounds, overflow parking, play areas or ball fields, do not qualify as meadows and open fields.

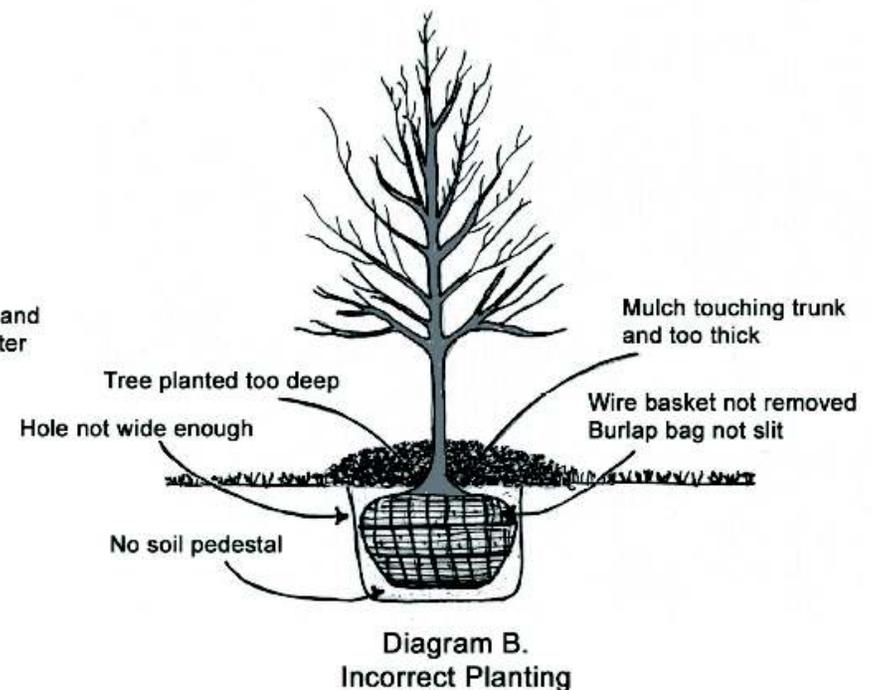
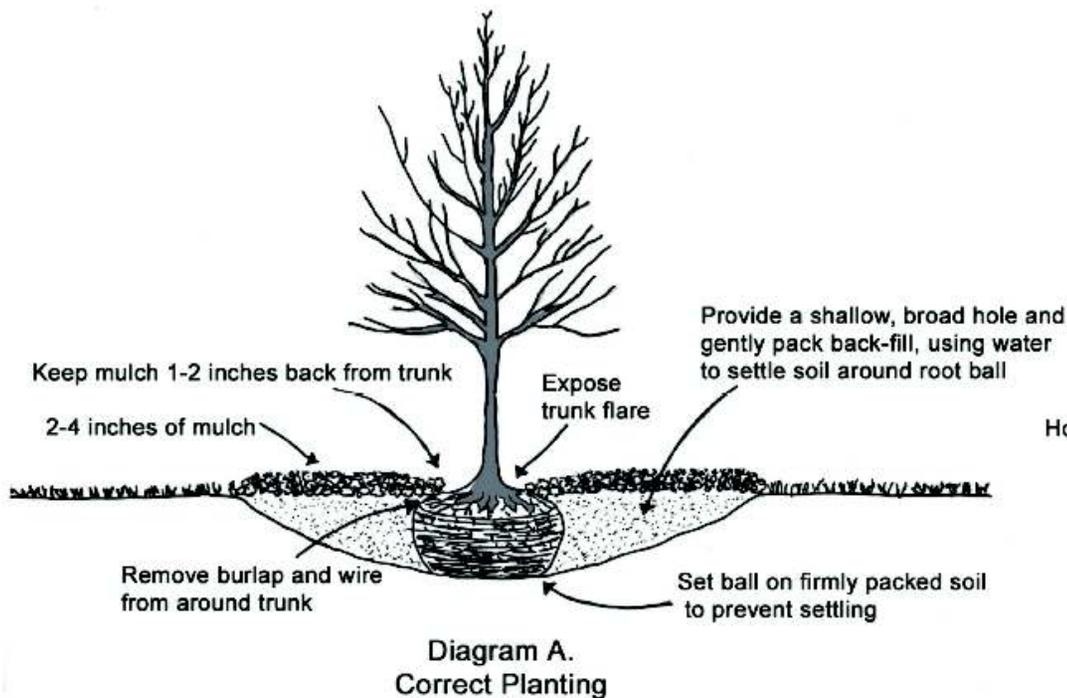
Meadows and open fields must provide protection for wetlands or riparian buffers, or function as wildlife habitat. Low maintenance native grasses and wildflowers with individual or groups of shrubs or small trees characterize these areas. Meadows and open fields when combined with other wooded sections of RCA or wooded and undisturbed buffers must provide a contiguous area at least 30 feet wide and 2,000 square feet. When combined with natural buffers, the RCA portion cannot be less than 10 feet wide. RCA and buffers will still be calculated separately.

Planting Standards

Plantings for meadows and open fields must utilize native or adaptive plants, grasses, wildflowers, and/or perennials. Selection should be based on the particular location and its use such as but not limited to wetland or riparian areas, wildlife habitat, and aesthetic and scenic value. Plant selection, planting/seeding and maintenance of these natural areas must be based on recommendations of a recognized local authority such as but not limited to, the NC Wildlife Resource Commission, Agricultural Extension Agency, and NCDOT Roadside Environmental Unit.

TREE PLANTING GUIDELINES

1. Dig a shallow, broad hole three times the diameter of the root ball, but only as deep as the root ball.
2. Identify the trunk flare. The trunk flare is where the roots spread at the base of the tree. This point should be partially visible after the tree has been planted. (see diagram A)
3. Place the tree at the proper height. Check to see that the hole has been dug to the proper depth and no more. If the tree is too deep, the roots will have difficulty developing due to lack of oxygen. It is better to plant the tree a little high. This may be necessary in areas with compacted or poor soil that causes drainage problems. (see diagram C on next page)
4. Straighten the tree in the hole.
5. Fill the hole, gently but firmly. Fill about 1/3 full and gently pack the soil around the base of the root ball. Cut and remove the string and wire from around the trunk and top 1/3 of the root ball. Fill the rest of the hole by adding soil a few inches at a time and settling it with water. Continue this process until the hole is filled and the tree is firmly planted.
6. Stake the tree, only if necessary. Protective staking may be required on some sites. Remove the stakes and ties after one year.
7. Cover the ground with 2-4 inches of mulch. Keep a mulch free area, one to two inches wide at the base of the tree to avoid moist bark conditions and prevent decay.
8. Provide follow-up care for the tree. Keep the soil moist, but not soaked. Maintain 2-4 inches of mulch. Control weeds. Remove any stakes and ties before they start girdling the tree.



PLANTING IN SPECIAL SITUATIONS

Poor Soils

When planting in a poorly drained or severely compacted site, follow the previous guidelines, except set the plant so the root ball is partially above the existing grade (*Diagram C*). Also, create a ring of mulch approximately 2-3 inches high to encourage water to drain into the roots of the plant. This water basin does not need to be a permanent fixture and can be removed after the tree has become established. Take care not to pile the mulch too high or to pile it on the trunk or root flare of the tree.

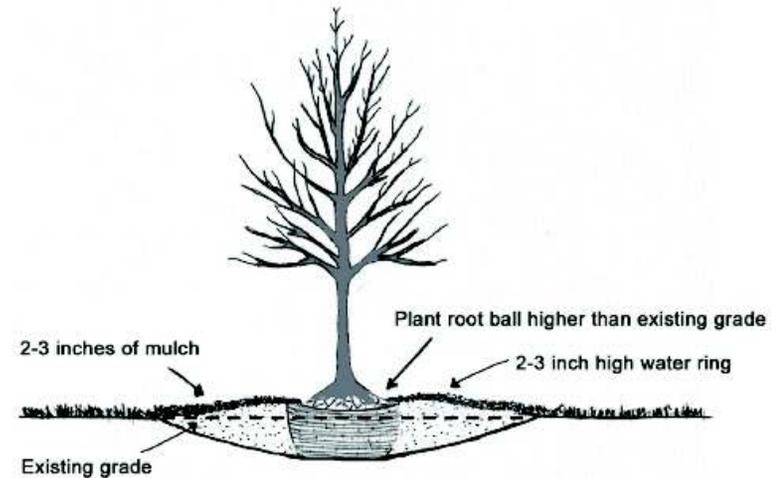


Diagram C.
Correct planting for poor soil/drainage issues

Steep Slopes

When planting on a slope, it is best to use a combination of smaller plants, such as shrubs, small trees, and groundcovers to stabilize the ground and prevent erosion. Using grass alone does not control erosion effectively because the roots are too shallow. An example of a planting scheme for a 2:1 slope is provided (*Diagram D*), incorporating shrubs, perennials, groundcovers, and tall native grasses.

Specific site conditions, such as sun/shade, wet or dry soil and steepness will vary the plant species appropriate for each location. For examples of appropriate plant species see the recommended plants listed in the "Stormwater Ponds for Water Quality and Wildlife Habitat" worksheet and the lists of Native and Adaptive Plants in this book. Note in particular the plants listed for embankment areas, such as groundcovers, grasses, legumes, clovers, and wildflowers.

For extremely steep slopes a stabilization fabric, such as jute, may be necessary to help prevent erosion until the roots of the plantings take hold. The material should be laid out and pinned down with a layer of approximately 2-3 inches of mulch spread on top. Cut a hole in the fabric in order to install the plants. Engineered types of slope stabilization may be required.

The second drawing shows an inappropriate planting scheme that uses only turf grass. (*Diagram E*) This type of planting is not allowed. Turf grasses will not prevent erosion as effectively, will require more maintenance, and will limit the site's attraction as a wildlife habitat.

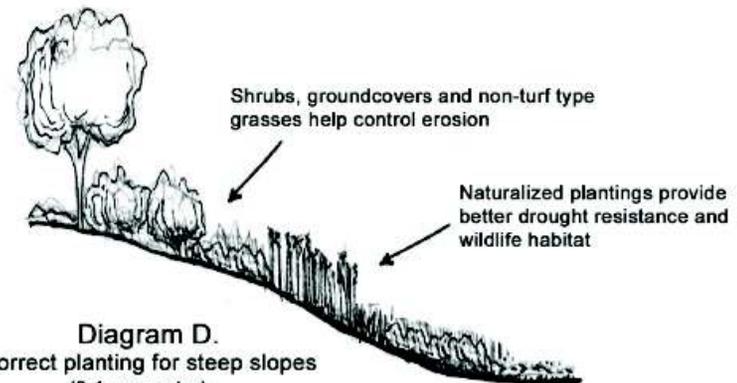


Diagram D.
Correct planting for steep slopes
(3:1 or greater)

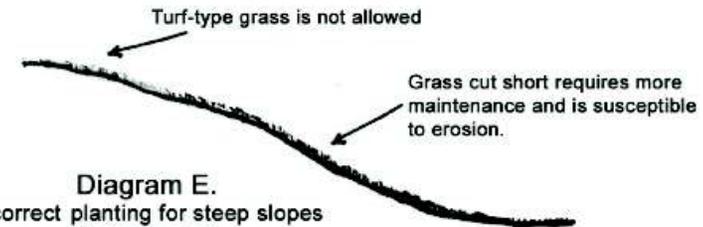


Diagram E.
Incorrect planting for steep slopes
(3:1 or greater)

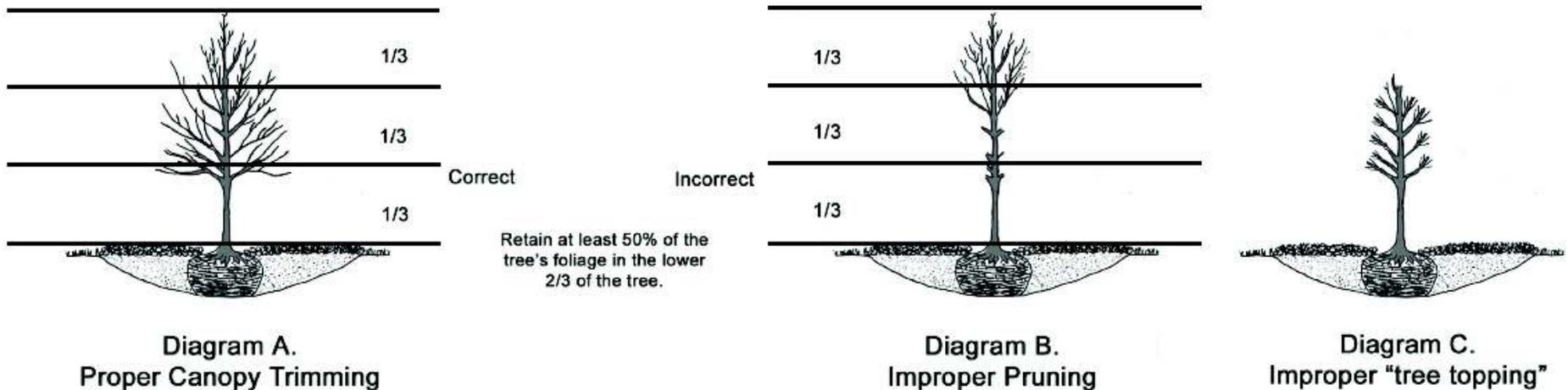
TREE PRUNING

Any pruning of a newly planted tree should be kept to a minimum and should only be done to maintain a single trunk to the top of the tree (it is best to purchase a tree with a strong central leader so that pruning is unnecessary) and to remove any branches that were damaged during the planting process. Wait to begin corrective pruning (see below) until after a full season of growth in the new location.

Canopy Pruning

Generally, the natural shape of trees should be encouraged but it may be necessary to remove lower limbs so they are out of the way of people and vehicles. On smaller specimen trees in a planting bed and evergreen trees, lower branching is preferred and limbs should be left alone. Keeping lower limbs helps to develop a stronger trunk and reduces sunscald to bark.

At least 1/2 of the foliage of a tree should be in the lower 2/3 of the tree. (*Diagram A*) Temporary branches on the lower trunk of the tree are important to the tree's early growth and should not be removed until the tree has become established.



Tree topping is the indiscriminate cutting of branches to stubs or lateral branches that are not large enough to assume the central leader role. (*Diagram C*) Other names for topping include "heading", "tipping", "hat-racking" and "rounding over." This is an unacceptable practice that often removes 50-100% of the leaf-bearing crown of a tree, temporarily starving the tree and causing stress that can lead to insect and disease infestations. The tree will send out multiple shoots below each cut in an effort to survive. These shoots grow very quickly, but are weaker and prone to breaking, thus making the tree a hazard, especially during ice storms and high winds.

Recommended Plant List for Storm Water BMPs (Constructed Wetlands & Wet Ponds)

DeepWater Areas (permanent pool 1 to 6 feet deep).

The deeper pools of storm water BMPs such as those found in constructed wetlands and wet ponds are generally colonized by submergent plants if any at all. Typically these areas are not planted due to the limited availability of adequate plant material and the concern that introduced submergent plants may become too aggressive and eventually clog storm water outlet structures. Some submergent plants usually establish themselves naturally, but if plants are needed for specific reasons such as to help control algae, then the following plants may be used in limited quantities:

Yellow Lotus, *Nelumbo lutea*; Spatterdock / Cow Lily, *Nuphar lutea*; Fragrant White Lily, *Nymphaea odorata*.



Low Marsh (regular to permanent inundation up to 1 foot deep).

These wet areas are typified by their location within the normal pool up to a permanent depth of about one foot such as aquatic benches along the shore and low earthen mounds located below the surface of the water within ponds and channels.

Emergent plants grow in this area. These plants help to stabilize the bottom and edges of the pond by absorbing wave actions and reducing erosion when water levels fluctuate. They slow water velocities, decrease sediment deposition rates, and reduce re-suspension of wind-driven sediments.

These plants supply an important habitat for many aquatic and non-aquatic animals, including predators that provide a natural control of mosquito populations. Wetland plants also enhance pollutant uptake and improve oxidation levels.

The following plants should be planted within the shallow parts of the permanent pool:

Sweet Flag, *Acorus calamus*; space 2-foot on center; small pots or bare root; plant approximately 20% of the area.

Pickerel Weed, *Pontederia pectinatus*; space 2-foot on center; small pots or bare root; plant 25% of area.

Arrowhead/Duck Potato, *Sagittaria latifolia*; space 2-foot on center; small pots or bare root; plant 25% of area.

A mix of the following plants (provide at least four species) – Soft-stem Bulrush, *Schoenoplectus tabernaemontani*; *Striped Sweet Flag*, *Acorus calamus* “*Variegatus*”; Narrow Leaf Arrowhead, *Sagittaria lancifolia*; Arrow Arum, *Peltandra virginica*; Square Stem Spike Rush, *Eleocharis quadrangulata*; Three-way Sedge, *Dulichium arundinaceum*; Lizard Tail, *Saururus cernuus*; Powdery Thalia, *Thalia dealbata*; space 2-foot on center; small pots or bare root; plant 30% of area.



Cattails, *Typha* species, **must not be planted** and should be controlled.

Cattails are highly invasive, and once established fill the pool area with vegetative mass that provides habitat for mosquitoes while limiting access from mosquitoes’ natural predators. Cattail’s aggressive nature may also limit the ability of the storm water structure to fully function as designed.



Recommended Plant List for Storm Water BMPs (Constructed Wetlands & Wet Ponds)

High Marsh (regular inundation along shoreline fringe):

This area encompasses the wetter fringe of the shoreline up to a vertical elevation of about one foot above the permanent pool line. It is subject to regular inundation by normal storm events.

Plants in this area must be vigorously planted to stabilize the soil against flooding storm waters and wind. Plants should also be able to tolerate occasional periods of drought. These plants also shade the shoreline helping to reduce water temperature. They enhance pollutant uptake, and often provide food and cover for wildlife. A good stand of vegetation may also discourage Canada geese from establishing.

The following plants should be planted along the permanent pool from the shoreline to approximately three feet inland:

Soft Rush, *Juncus effusus*; space 2-foot on center; small pots or bare root; plant 50% of area.

Southern Blue Flag, *Iris virginica*; space 2-foot on center; small pots or bare root; plant 20% of area.

A mix of the following plants (provide at least four species) – White Top Sedge, *Rhynchospora colorata*; Wool Grass, *Scirpus cyperinus*; Tussock Sedge, *Carex stricta*; Cardinal Flower, *Lobelia cardinalis*; Copper Iris, *Iris fulva*; Northern Blue Flag, *Iris versicolor*; Golden Club, *Orontium aquaticum*; Eastern Grasswort, *Lilaeopsis carolinensis*; space 2-foot on center; small pots or bare root; plant 30% of area.



The following plants should be planted farther inland along the shore (four feet plus from the permanent pool line), but still within areas that are regularly inundated by normal storm events:

Virginia Sweetspire, *Itea virginica*; space 5-feet on center; 3-gallon container; plant 30% of area.

Switchgrass, *Panicum virgatum*; space 4-feet on center if using 1-quart or 1-gallon containers, or 2-feet on center if using smaller pots; plant 30% of area.

A mix of the following plants – Red Chokeberry, *Aronia arbutifolia*; Florida Anise, *Illicium floridanum*; space 6-feet on center; 3-gallon container; plant 5% of area.

A mix of the following plants (at least four species): Swamp Rose, *Rosa palustris*; Buttonbush, *Cephalanthus occidentalis*; Possumhaw, *Viburnum nudum*; Titi, *Cyrilla racemiflora*; Swamp Sweetbells, *Leucothoe racemosa*; Silky Dogwood, *Cornus amomum*; Redosier Dogwood, *Cornus sericea*; Yellowstem Dogwood, *Cornus sericea* “Flaviramea”; space 4-feet on center; 1-quart or 1-gallon container; plant 15% of area.

A mix of the following plants (at least three species): Marsh Hibiscus, *Hibiscus moscheutos*; Red Rose Mallow, *Hibiscus coccineus*; Swamp Sunflower, *Helianthus angustifolius* or *H. simulans*; Yellowroot, *Xanthorhiza simplicissima*; Joe-Pye Weed, *Eupatoriadelphus fistulosus*; space 4-feet on center; 1-quart or 1-gallon container; plant 10% of area.

A mix of the following plants (at least three species): Spider Lily, *Hymenocallis occidentalis*; Plymouth Rose Gentian, *Sabatia kennedyana*; Great Blue Lobelia, *Lobelia siphilitica*; Marsh Eryngo, *Eryngium aquaticum*; River Oats, *Chasmanthium latifolium*; Macbridea, *Macbridea caroliniana*; New England Aster, *Aster novae-angliae*; space 2-foot on center; small pots to 1-quart container; plant 5% of area.

A mix of the following trees (at least two species) - Bald Cypress, *Taxodium distichum*; Pond Cypress, *Taxodium ascendens*; Water Tupelo, *Nyssa aquatica*; Sweet-Bay Magnolia, *Magnolia virginiana*; River Birch, *Betula nigra*; Overcup Oak, *Quercus lyrata*; space trees randomly along the shore at least 30 feet apart; do not plant on the dam side or within 20 feet of any storm water structure or inlet/outlet device; provide one tree for every 100 linear feet of permanent pool shoreline; provide at least 10-gallon container size plants or equivalent.



Recommended Plant List for Storm Water BMPs (Constructed Wetlands & Wet Ponds)

Riparian Fringe / Floodplain Terrace (periodic to infrequent inundation):

These areas may be flooded from time to time, mostly during a significant storm event. The waters should quickly recede within a few days or less.

Plants in these areas must be able to withstand some occasional flooding and longer periods of drought. For the most part, plants should be low maintenance native species.

The following plants should be planted in areas one foot or more vertically above the permanent pool elevation where periodic to infrequent flooding is likely to occur:

A mix of the following plants (at least four species): Sweet Pepperbush, *Clethra alnifolia*; Witch Alder, *Fothergilla gardenii*; Ninebark, *Physocarpus opulifolius*; Inkberry Holly, *Ilex glabra*; Winterberry Holly (male and female), *Ilex verticillata*; Sweet Betsy, *Calycanthus floridus*; Witherod, *Viburnum cassinoides*; space 6-feet on center; 3-gallon container; plant 60% of area.

A mix of the following plants (at least five species): Path Rush, *Juncus tenuis*; Horsetail, *Equisetum hyemale*; Swamp Milkweed, *Asclepias incarnate*; Horse Mint, *Monarda fistulosa*; Sundrops, *Oenothera fruticosa*; Blazing Star, *Liatris spicata*; Small's Beard Tongue, *Penstemon smallii*; Spiderwort, *Tradescantia virginiana*; White Wild Indigo, *Baptisia alba*; False Indigo, *Baptisia australis*; Blue-eyed Grass, *Sisyrinchium angustifolium*; space 2-foot on center; small pots to 1-quart container; plant 10% of area.



A mix of the following grasses: Switchgrass, *Panicum virgatum*; Big Bluestem, *Andropogon gerardii*; Eastern Gammagrass, *Tripsacum dactyloides*; space 18-inches on center; small pots; plant 20% of area.

A mix of the following plants (at least two species): Wax Myrtle, *Myrica cerifera*; Vernal Witch Hazel, *Hamamelis vernalis*; Deciduous Holly, *Ilex decidua*; Spicebush, *Lindera benzoin*; space 8-feet on center; 3-gallon container; plant 5% of area.

A mix of the following trees –Red Maple, *Acer rubrum*; Sycamore, *Platanus occidentalis*; Black Gum, *Nyssa sylvatica*; Willow Oak, *Quercus phellos*; spaced randomly along the lower interior slopes 30 or more feet apart; do not plant on the dam side or within 20 feet of any storm water structure, inlet/outlet device, or within 20 feet of the downhill toe of the dam; provide one tree for every 80 linear feet of permanent pool shoreline; at least 10-gallon container size plants or equivalent.

Upland Slopes, Embankment, Downhill & Surrounding Slopes (dry - seldom to no inundation):

This area rarely if ever floods. This zone is typically above the maximum 100-year water surface elevation. Plants should be able to sustain prolonged periods of drought. Select plants that are capable of adequately stabilizing the steeper slopes typical of this area. Trees and larger woody vegetation must be kept off the dam embankment (interior and exterior slopes).

The following plants should be planted:

A mix of the following trees (at least two species): Fringetree, *Chionanthus virginicus*; Blackhaw Viburnum, *Viburnum prunifolium*; Red Bud, *Cercis Canadensis*; Ironwood, *Carpinus caroliniana*; space at least 15 feet on center; do not plant on the dam side or within 10 feet of any storm water structure, inlet/outlet device, or within 10 feet of the downhill toe of the dam; at least 5-gallon container; plant 5% of the area.

A mix of the following grasses (plant at least five species): Switchgrass, *Panicum virgatum*; Big Bluestem, *Andropogon gerardii*; Eastern Gammagrass, *Tripsacum dactyloides*; Indian Grass, *Sorghastum nutans*; Little Bluestem, *Schizachyrium scoparium*; Sideoats Grama, *Boutelou curtipendula*; Pink Muhly Grass, *Muhlenbergia capalaris*; Mosquito Grass, *Boutelou gracilis*; Purple Love Grass, *Erogrostis spectabilis*; space 18-inches on center; small pots; plant 50% of area - use the lower growing Purple Love Grass and Mosquito Grass on top of dam and along service drives.

A mix of the following plants (at least two species): Nearly Wild Rose, *Rosa species "Nearly Wild"*; Petite-Pink Scotch Rose, *Rosa pimpinellifolia*; Beautyberry, *Callicarpa Americana*; American Elderberry, *Sambucus Canadensis*; Fragrant Sumac, *Rhus aromatica*; Winter Jasmine, *Jasminum nudiflorum*; Butterfly Bush, *Buddleia davidii*; space 6-feet on center; 3-gallon container; plant 20% of area

A mix of the following plants (at least three species): Butterfly Weed, *Asclepias tuberosa*; Purple Coneflower, *Echinacea purpurea*; Whirling Butterflies, *Gaura lindheimeri*; Creeping Phlox, *Phlox subulata*; Black-eyed Susan, *Rudbeckia hirta*; Homestead Purple Verbena, *Verbena canadensis "Homestead Purple"*; Cornflower, *Centaurea species*; Tickseed, *Coreopsis species*; space 2-foot on center; small pots to 1-quart container; plant 20% of area.



A mix of the following trees (at least three species): Eastern Red Cedar, *Juniperus virginiana*; Sourwood, *Oxydendrum arboretum*; Persimmon, *Diospyros virginiana*; Loblolly Pine, *Pinus taeda*; White Oak, *Quercus alba*; spaced randomly in family groupings along the upland and downhill slopes 30 or more feet apart; do not plant on the dam side or within 20 feet of any storm water structure, inlet/outlet device, or within 20 feet of the downhill toe of the dam; provide one tree for every 60 linear feet of permanent pool shoreline; at least 10-gallon container size plants or equivalent.

Mulch Standards

Benefits of Proper Mulching

- Helps maintain soil moisture. Evaporation is reduced, and the need for watering can be minimized.
- Helps control weeds. A 2-4 inch layer of mulch will reduce the germination and growth of weeds.
- Mulch serves as nature's insulating blanket. Mulch keeps soils warmer in the winter and cooler in the summer.
- Many types of mulch can improve soil aeration, structure (aggregation of soil particles), and drainage over time.
- Some mulch can improve soil fertility.
- A layer of mulch can inhibit certain plant diseases.
- Mulching around trees helps facilitate maintenance, and can reduce the likelihood of damage from "weed whackers" or the dreaded "lawnmower blight."

Applying a **2-4 inch layer of organic mulch** can mimic a more natural environment and improve plant health. The roots of most trees can extend out a significant distance from the tree trunk. In addition, most of the fine absorbing roots are located within inches of the soil surface. These roots, which are essential for taking up water and minerals, require oxygen to survive. A **thin layer of mulch, applied as broadly as practical**, can improve the soil structure, oxygen levels, temperature, and moisture availability where these roots grow.

Not Too Much!

As beneficial as mulch is, **too much can be harmful**. The generally recommended mulching depth is 2 to 4 inches. Unfortunately, North American landscapes are falling victim to a plague of over mulching. A new term, "mulch volcanoes," has emerged to describe mulch that has been piled up around the base of trees. Most organic mulches must be replenished, but the rate of decomposition varies. Some mulch, such as cypress mulch, remains intact for many years. Top dressing with new mulch annually (often for the sake of refreshing the color) creates a buildup to depths that can be unhealthy. Deep mulch can be effective in suppressing weeds and reducing maintenance, but it often causes additional problems.

Types of Mulch

Two major types of mulch are inorganic and organic. Inorganic mulches do not decompose and do not need to be replenished often. On the other hand, they do not improve soil structure, add organic materials, or provide nutrients. Organic mulches include wood chips, pine needles, hardwood and softwood bark, cocoa hulls, leaves, compost mixes, and a variety of other products usually derived from plants. Because the decomposition process improves soil quality and fertility, many arborists and other landscape professionals consider this a positive characteristic, despite the added maintenance. For the most part, the following **organic type mulches should be used:**

Hardwood mulch - Ground or shredded, and screened to a maximum particle size of four inches; well aged and composted at least six months; free of inert material.

Pine straw mulch - Preferably collected from long-leaf pines; clean and free of twigs, branches, pine cones, and inert material. Use should be limited to areas planted with acid-loving plants.

Pine bark mulch - Fine shredded and screened to a maximum particle size of two inches.

Leaf mulch - Well shredded. Use should be limited to natural areas.

In order to maintain a more natural appearance, use of artificially colored mulch is discouraged.



Mulch Standards

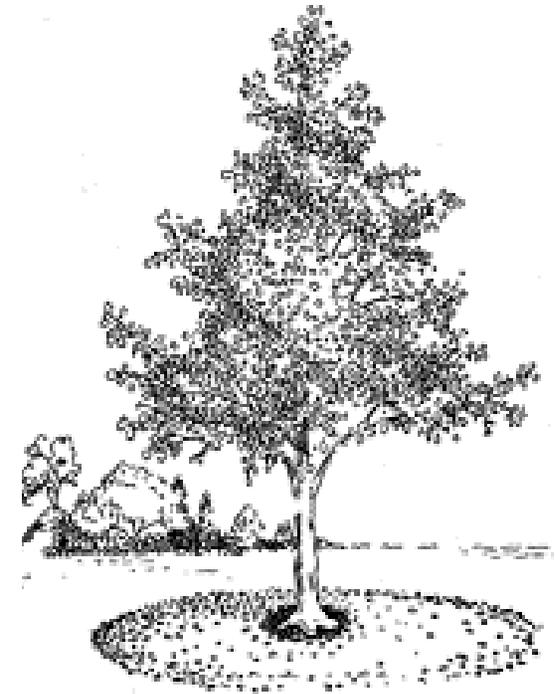
Problems Associated with Improper Mulching

- Deep mulch can lead to excess moisture in the root zone, which can stress the plant and cause root rot.
- Piling mulch against the trunk or stems of plants can stress stem tissues and may lead to insect and disease problems.
- Some mulch, especially those containing cut grass, can affect soil pH. Continued use of certain mulches over long periods can lead to micronutrient deficiencies or toxicities.
- Mulch piled high against the trunks of young trees may create habitats for rodents that chew the bark and can girdle the trees.
- Thick blankets of fine mulch can become matted, and may prevent the penetration of water and air. In addition, a thick layer of fine mulch can become like potting soil and may support weed growth.
- Anaerobic "sour" mulch may give off pungent odors, and the alcohols and organic acids that build up may be toxic to young plants.

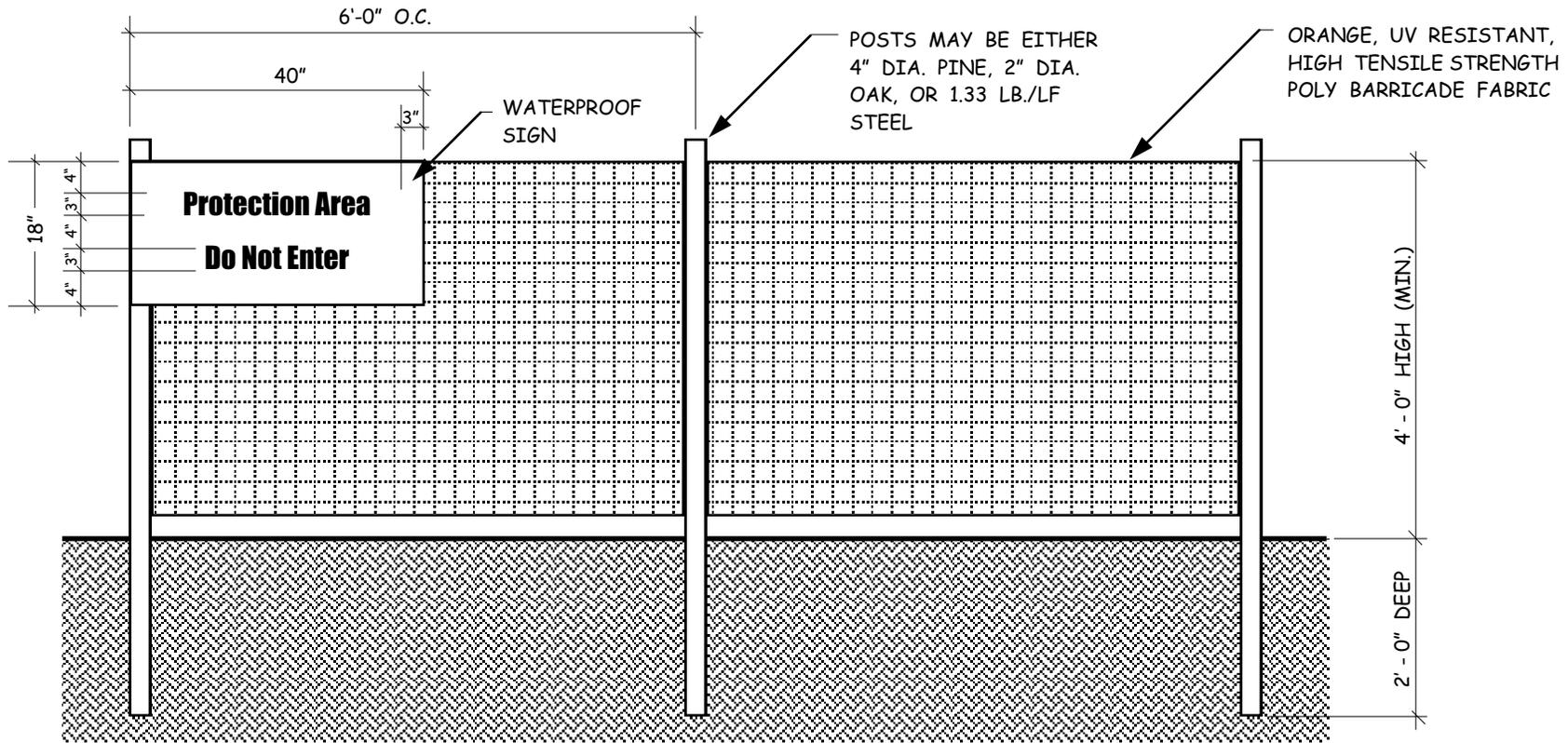
Proper Mulching

It is clear that the choice of mulch and the method of application can be important to the health of landscape plants. The following are some guidelines to use when applying mulch.

- **Inspect plants and soil in the area to be mulched.** Determine whether drainage is adequate. Determine whether there are plants that may be affected by the choice of mulch. Most commonly available mulches work well in most landscapes. Some plants may benefit from the use of slightly acidifying mulch such as pine bark.
- **If mulch is already present, check the depth.** Do not add mulch if there is a sufficient layer in place. Rake the old mulch to break up any matted layers and to refresh the appearance. Some landscape maintenance companies spray mulch with a water soluble vegetable-based dye to improve the appearance.
- **If mulch is piled against the stems or tree trunks, pull it back several inches** so that the base of the trunk and the root crown are exposed.
- **Organic mulches are usually preferred to inorganic materials** due to their soil-enhancing properties. If organic mulch is used, it should be well aerated, and preferably, composted. Avoid sour-smelling mulch.
- **Composted wood chips can make good mulch**, especially when they contain a blend of leaves, bark, and wood. Fresh wood chips may also be used around established trees and shrubs. Avoid using non-composted wood chips that have been piled deeply without exposure to oxygen.
- **For well-drained sites, apply a 2-4 inch layer.** If there are drainage problems, a thinner layer should be used. Avoid placing mulch against the tree trunks. For new installation and where it is possible to do around mature trees, place mulch out to the tree's drip line or beyond.



PROTECTION FENCE



NOTES

- WARNING SIGNS TO BE MADE OF DURABLE WATERPROOF MATERIAL.
- ALL LETTERS TO BE AT LEAST 3-INCHES HIGH, CLEARLY LEGIBLE AND SPACED AS INDICATED ABOVE.
- SIGNS TO BE PLACED 200- FEET ON CENTER, MAX.
- SIGNS TO BE PLACED AT EACH END OF LINEAR TREE PROTECTION AREA AND 200- FEET ON CENTER THEREAFTER.
- FOR TREE PROTECTION AREAS LESS THAN 200- FEET IN PERIMETER, PROVIDE NO LESS THAN ONE SIGN PER PROTECTION AREA AND/OR SIDE.
- ATTACH SIGNS SECURELY TO FENCE POSTS AND FABRIC.
- FABRIC MUST BE ATTACHED TO APPROVED POSTS ONLY. DO NOT ATTACH TO TREES.
- MAINTAIN TREE PROTECTION FENCE THROUGHOUT DURATION OF PROJECT - FENCING MUST REMAIN UPRIGHT AND SLACK FREE.
- ADDITIONAL SIGNS AND/OR PROTECTION MEASURES MAY BE REQUIRED BY THE PLANNING DEPARTMENT BASED UPON ACTUAL FIELD CONDITIONS.
- FAILING TO MAINTAIN TREE PROTECTION MEASURES MAY RESULT IN FINES AND/OR PERMIT REVOCATION.

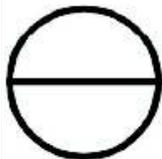
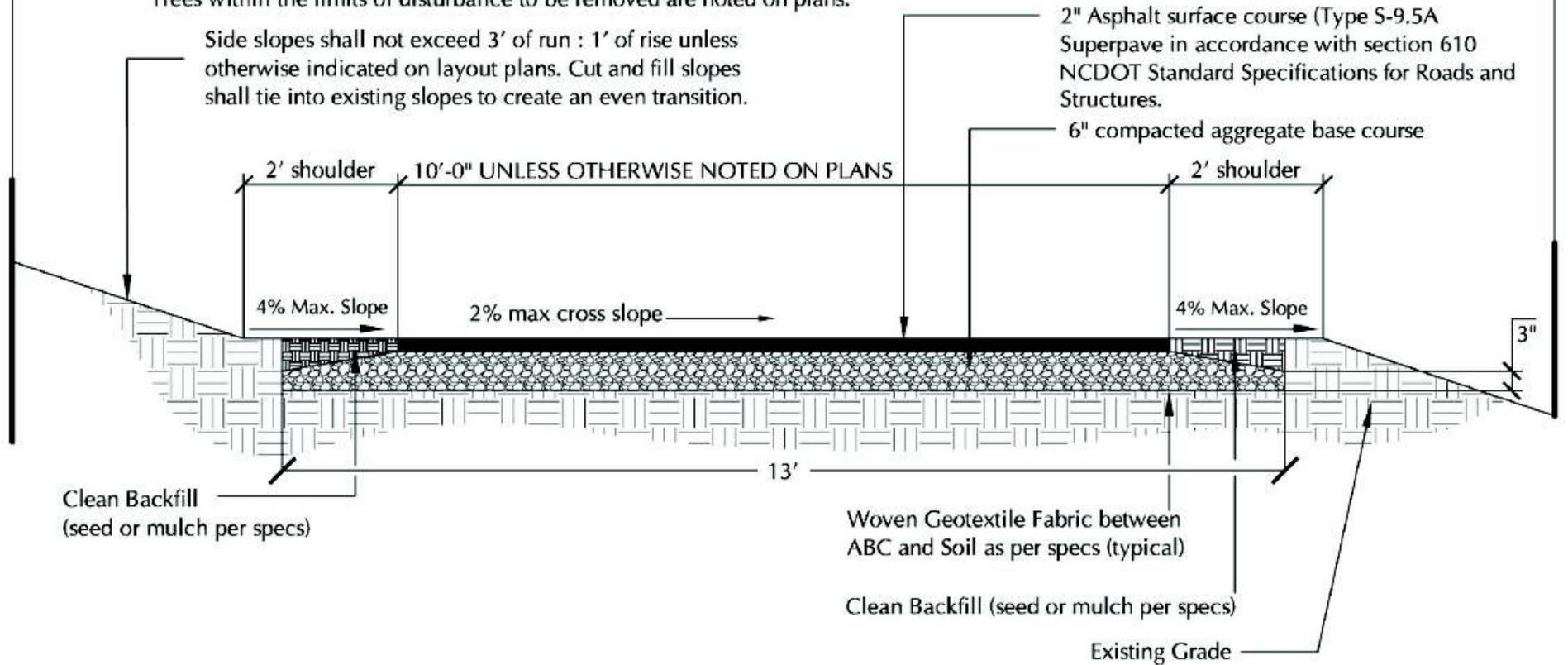
20' LIMITS OF DISTURBANCE
ON ALL TRAIL SURFACES

Notes:

1. Cross slope direction varies. See layout plans for direction of slope.
2. Contractor is responsible for re-establishing all slopes disturbed by construction.
3. Contractor shall not clear outside the 20' limit of disturbance.

Trees within the limits of disturbance to be removed are noted on plans.

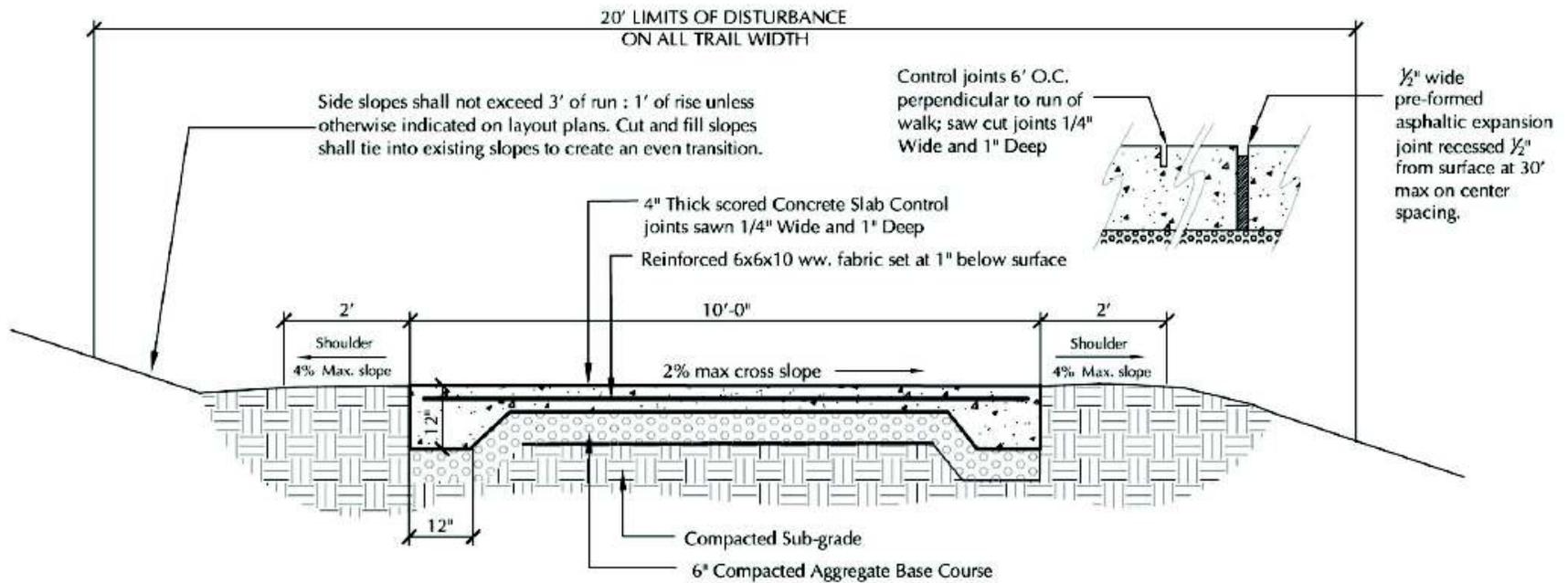
Side slopes shall not exceed 3' of run : 1' of rise unless otherwise indicated on layout plans. Cut and fill slopes shall tie into existing slopes to create an even transition.



TYPICAL ASPHALT GREENWAY

SECTION VIEW

SCALE: 1/2" = 1'- 0"

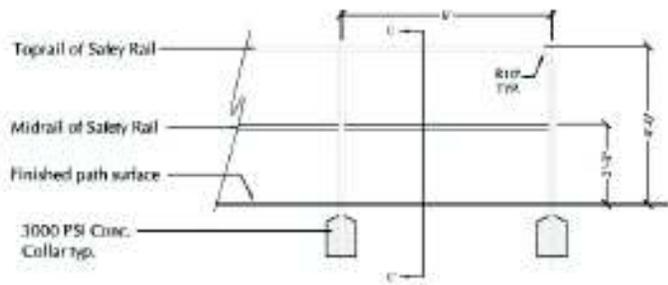


B
L12

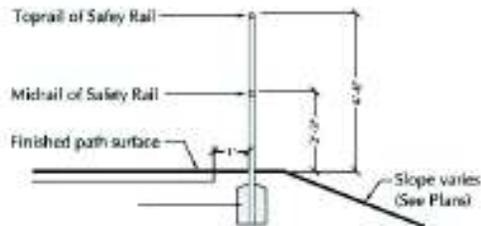
TYPICAL KEYED CONCRETE

SECTION VIEW

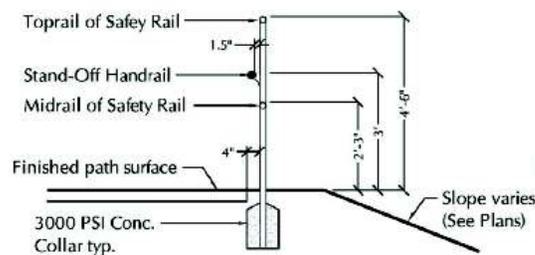
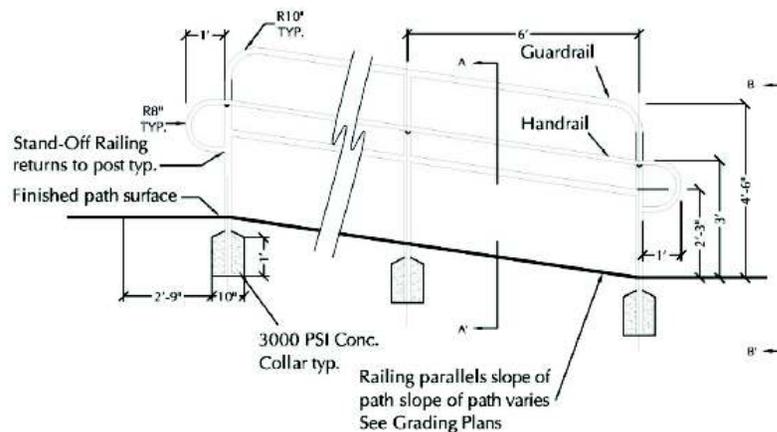
SCALE: 3/8" = 1' - 0"



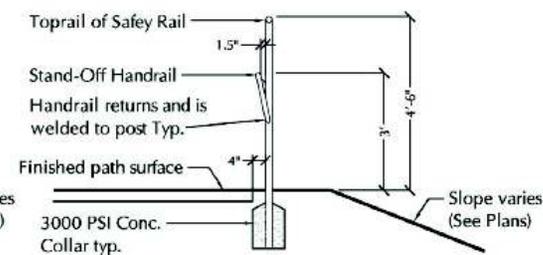
SAFETY RAIL
ELEVATION VIEW



SAFETY RAILING DETAIL
ELEVATION & SECTION VIEW



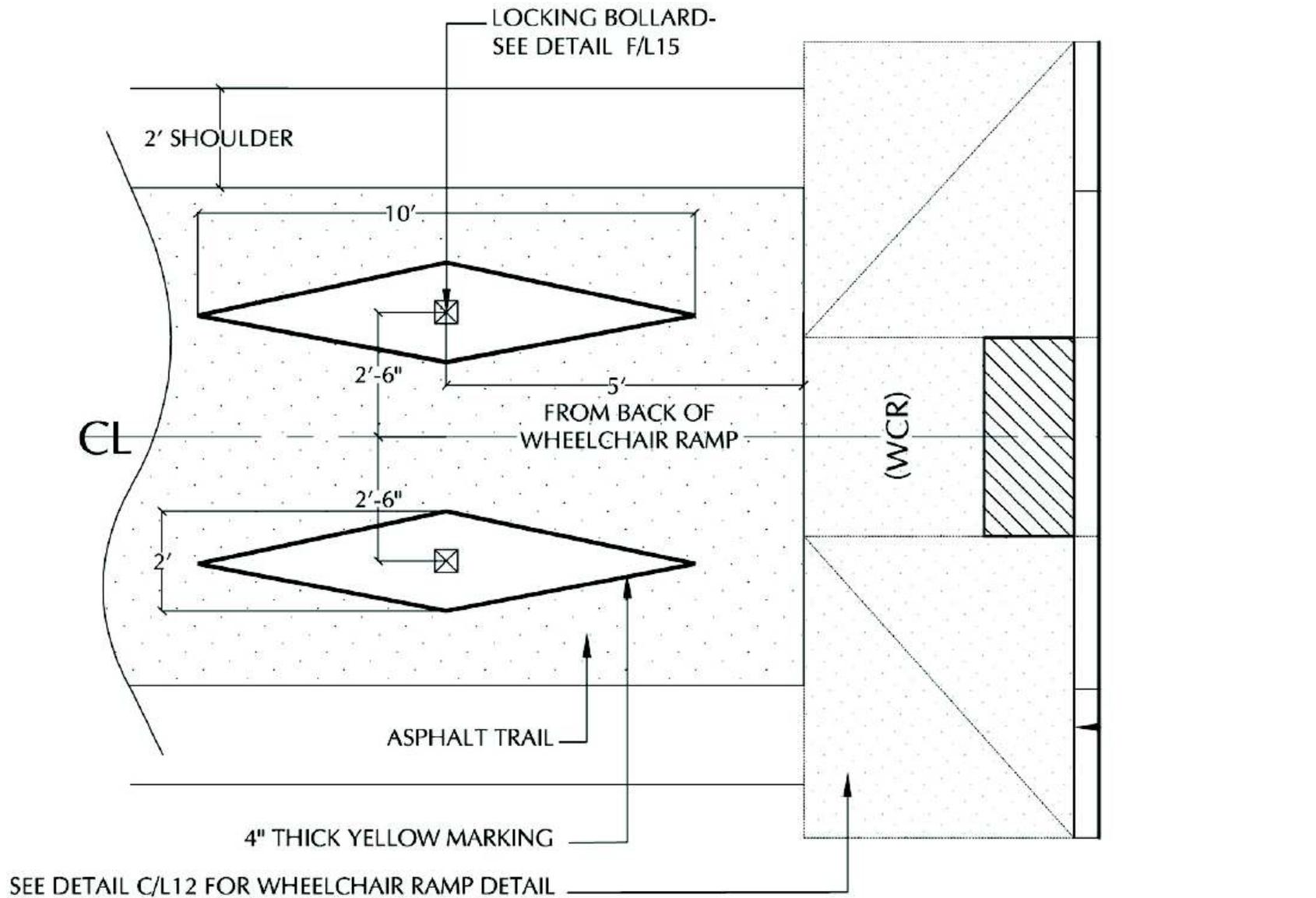
SECTION VIEW A-A'



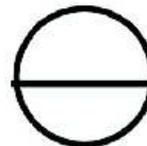
SECTION VIEW B-B'

SAFETY RAILING /HAND RAILING DETAIL
SECTION VIEW

SCALE: 1/4" = 1'- 0"



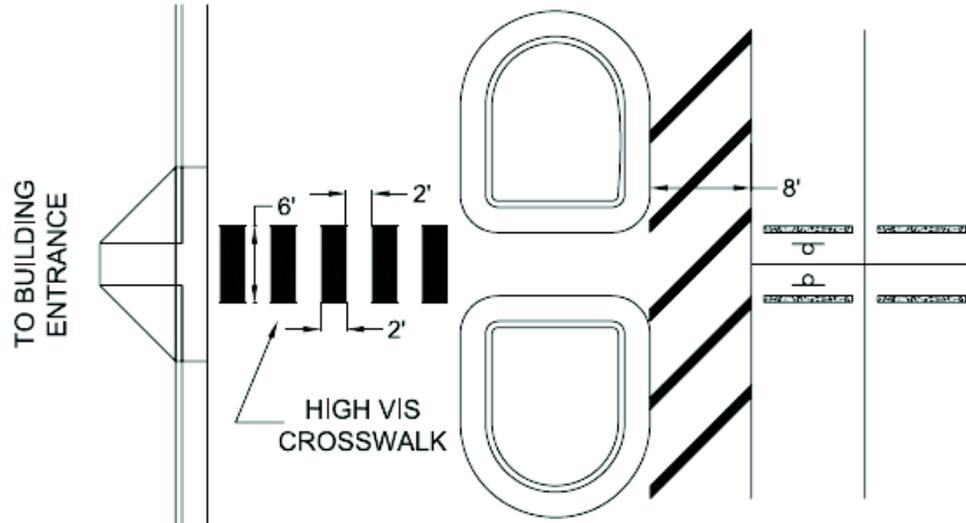
NOTE:
1. SEE PLAN FOR LOCATIONS BOLLARDS AND MARKING LOCATIONS

 **BOLLARD AND PAVEMENT MARKINGS**
ELEVATION VIEW

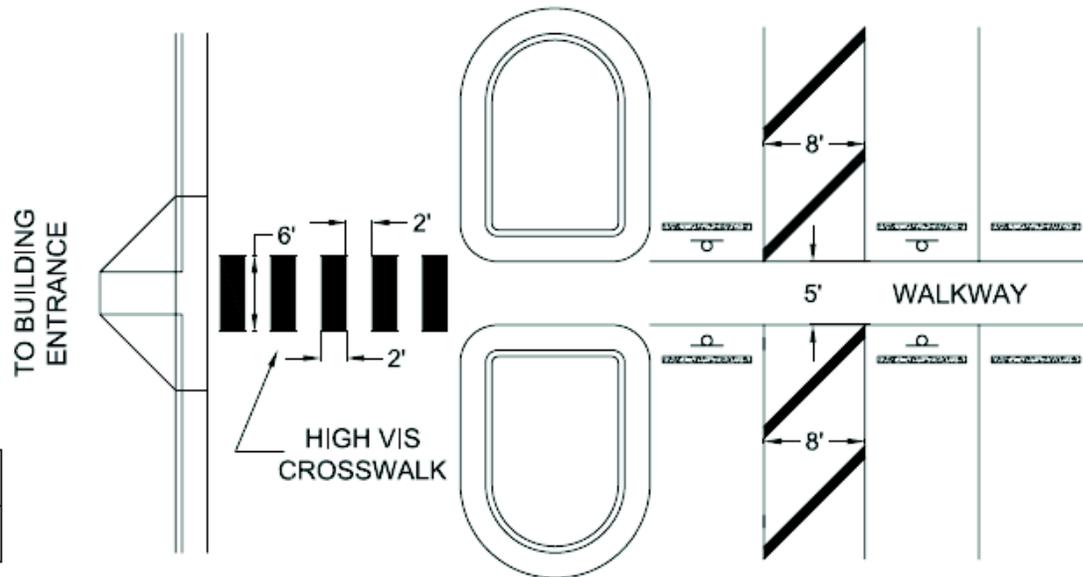
SCALE: 3/8" = 1'-0"

NOTE: ACCESSIBLE PARKING SPACES TO BE CONSTRUCTED PER THE NC ACCESSIBILITY CODE

OPTION 1



OPTION 2



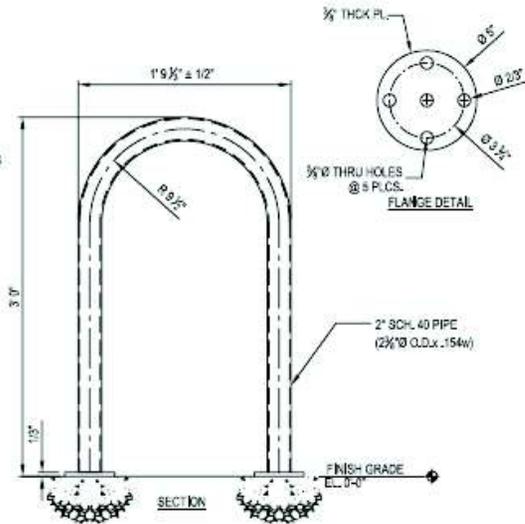
Symbol	Description
	R7-8 RESERVED PARKING SIGN

ACCESSIBLE PARKING SPACES



CREATIVE PIPE
 P.O. BOX 2458
 RANCHO MIRAGE, CA 92270-1087
 1 (800) 644-8467
 PHONE: (760) 340-5555
 FAX: (760) 340-5883
 www.creativepipe.com

- SELECT DESIRED OPTION
- CROSS BAR - CB
- SELECT DESIRED MOUNTING OPTION
- EMBEDDED - E
- SURFACE FLANGE - F (SHOWN)
- SELECT DESIRED FINISH
- HOT-DIPPED GALVANIZED - G
- POLYESTER POWDER COAT - P
- STAINLESS STEEL (W/ SATIN FINISH) - SS
- THERMOPLASTIC POWDER COAT - T
- SELECT DESIRED COLOR
- RED
- GREEN
- BLACK
- BLUE
- BRONZE
- SKY BLUE
- GREY
- YELLOW
- WHITE
- BEIGE
- TEAL
- CUSTOM



- NOTES:
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
 2. DO NOT SCALE DRAWINGS.
 3. CONTACT MANUFACTURER FOR CUSTOM COLORS.
 4. CONTRACTORS NOTE: FOR PRODUCT AND COMPANY INFORMATION, VISIT www.CADetail.com For REFERENCE NUMBER 474-022F.



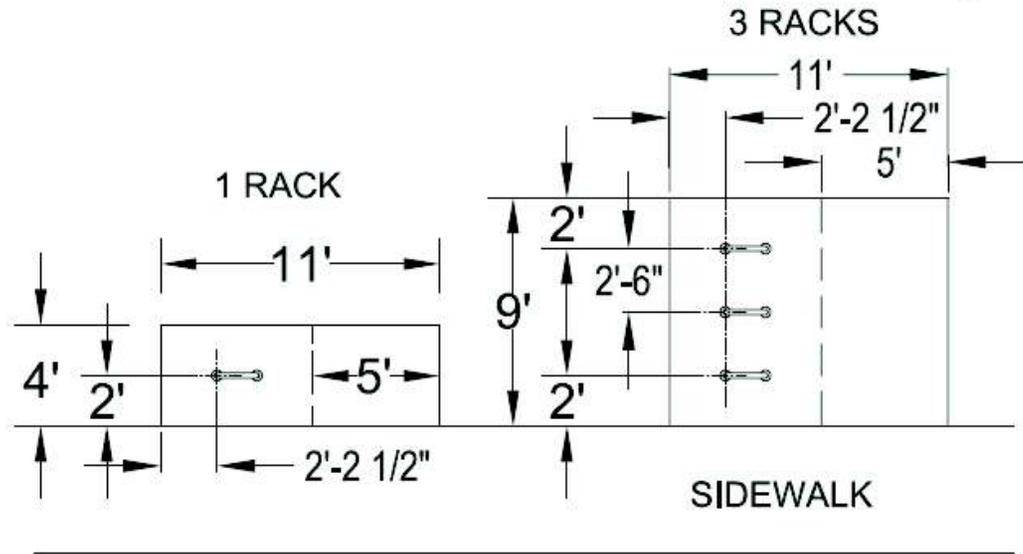
474-022F

PROTECTED BY COPYRIGHT - 01/02/05

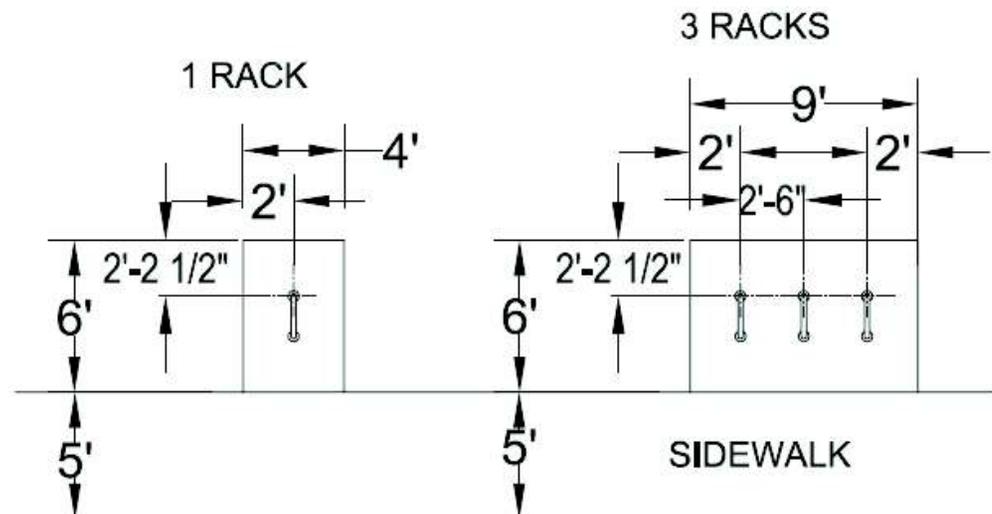
www.CADetail.com

- NOTES:
- Parking pad is 6" concrete slab. Size shown is 4'x6' min. pad for single rack and 2'-6" additional width per rack for racks to be spaced 2'-6" o.c. If more than one.
 - 5' wide unobstructed maneuvering area is required behind racks; requires 4'x11' min. pad when oriented parallel to a sidewalk as shown.
 - Other placements shall meet minimum size requirements.
 - Bicycle parking shall not encroach on accessible paths.
 - Designated placement within parking lots may also be acceptable.

OPTION 1: PARALLEL TO SIDEWALK (PREFERRED)



OPTION 2: PERPENDICULAR TO SIDEWALK



TOWN OF APEX

STANDARDS

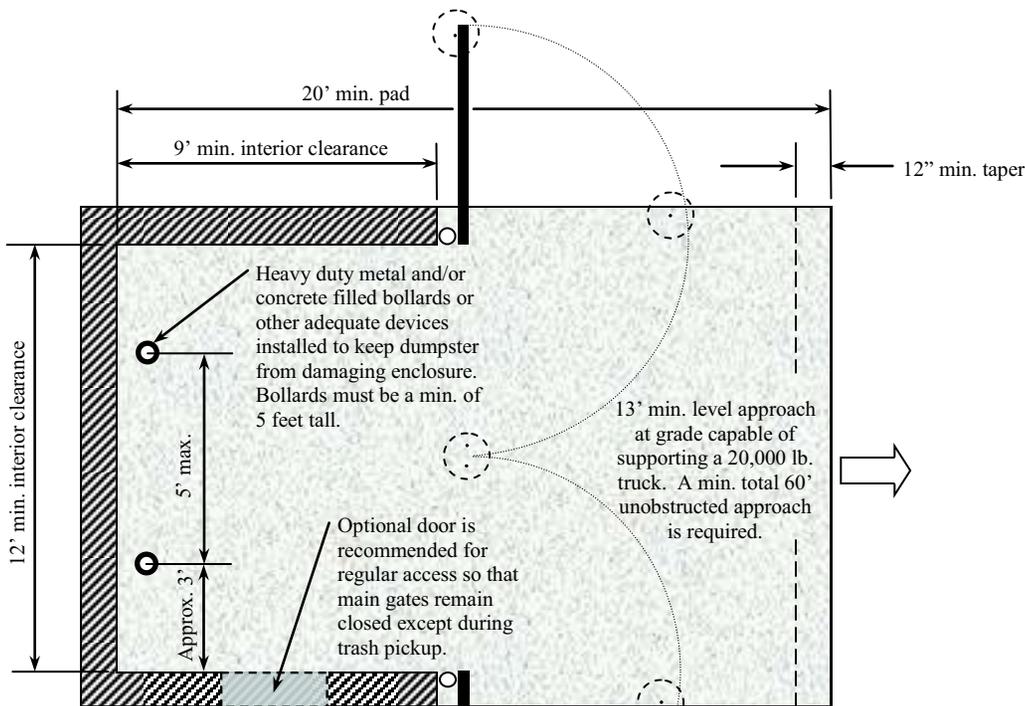
BICYCLE PARKING

STD. NO.

3.15

DUMPSTER PAD AND ENCLOSURE DETAILS

- Layout is for a single dumpster; enclosure needs to expand 12 feet for each additional dumpster. Compactors, recycling and trash roll-out cart areas must be screened in a similar way.
- Include enclosure design/location with any plan submittal.
- Enclosure must be 8 feet high or height of the dumpster (whichever is higher).
- Enclosure walls must be built of masonry materials and finished to match architecturally with principal building.
- Pad must be properly sloped and/or incorporate other appropriate drainage to ensure water does not collect/pond.
- Gates must be built of heavy duty commercial grade materials (metal framing/finishes, bolted /welded hinges, etc.).
- Gates finishes must blend with principal building by using opaque metal, wood composite, PVC composite, or approved equals (no wood framing, wood finishes or chain-link fencing or similar materials allowed).
- Gates must be designed to swing clear of enclosure walls.
- Other components and hardware (bollards, hinges, latches, stops, service doors, etc.) must be built of heavy duty commercial grade materials.
- Enclosures must be landscaped to blend with surrounding areas and buildings and visually soften the appearance.
- Gates must remain closed except during trash pickups; optional service doors are recommended.
- Gate stop latches & holes are required to hold gates in place whether closed or open.



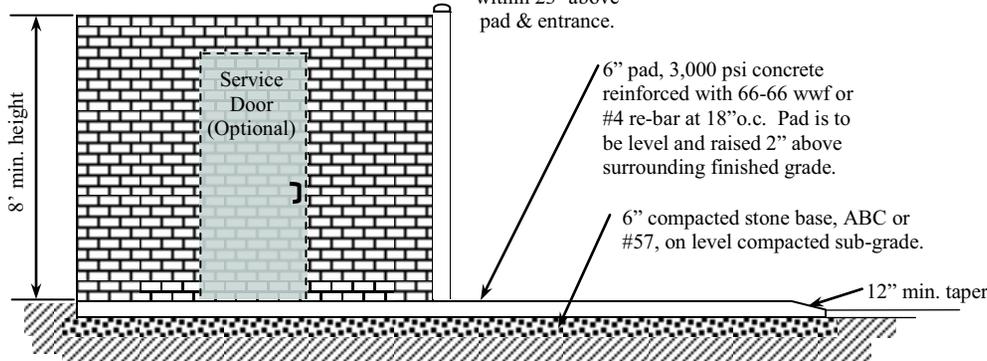
TYPICAL LAYOUT

If possible, limit parking w/i 6'+ of each side of enclosure.

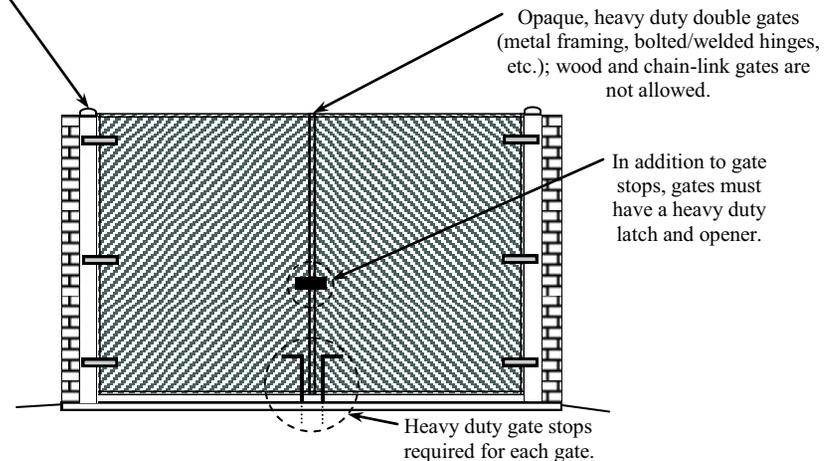
Typical - Gate stop holes, 3 per gate (closed, 90°, & at 180°).

Typical- Heavy duty metal gate posts (capped) with a minimum of 3 hinges per gate. Posts mounted outside & clear of enclosure so that min. interior clearances are maintained.

No obstructions within 23' above pad & entrance.



SIDE ELEVATION



FRONT ELEVATION

Small Town Character Residential Design Standards

These Residential Design Standards are only applicable in the in the Small Town Character Overlay District. The sketches represent examples of how the requirements of UDO Section 6.3.1 (H) maybe met. The sketches do not illustrate everyway the ordinance can be met, nor do they illustrate all required by the ordinance for new residential construction or major residential renovations in the Small Town Character Overlay District.



Architectural Features, UDO Sec. 6.3.1 (H)(2)(a)

Architectural Features

Residential structures shall have three (3) or more of the following features:

Wrap around porch (entire front façade and part of one or both side façades)

Predominant porch (over 75% of front façade)

Awnings

Columns

Porticos

Balconies

Broken roof lines

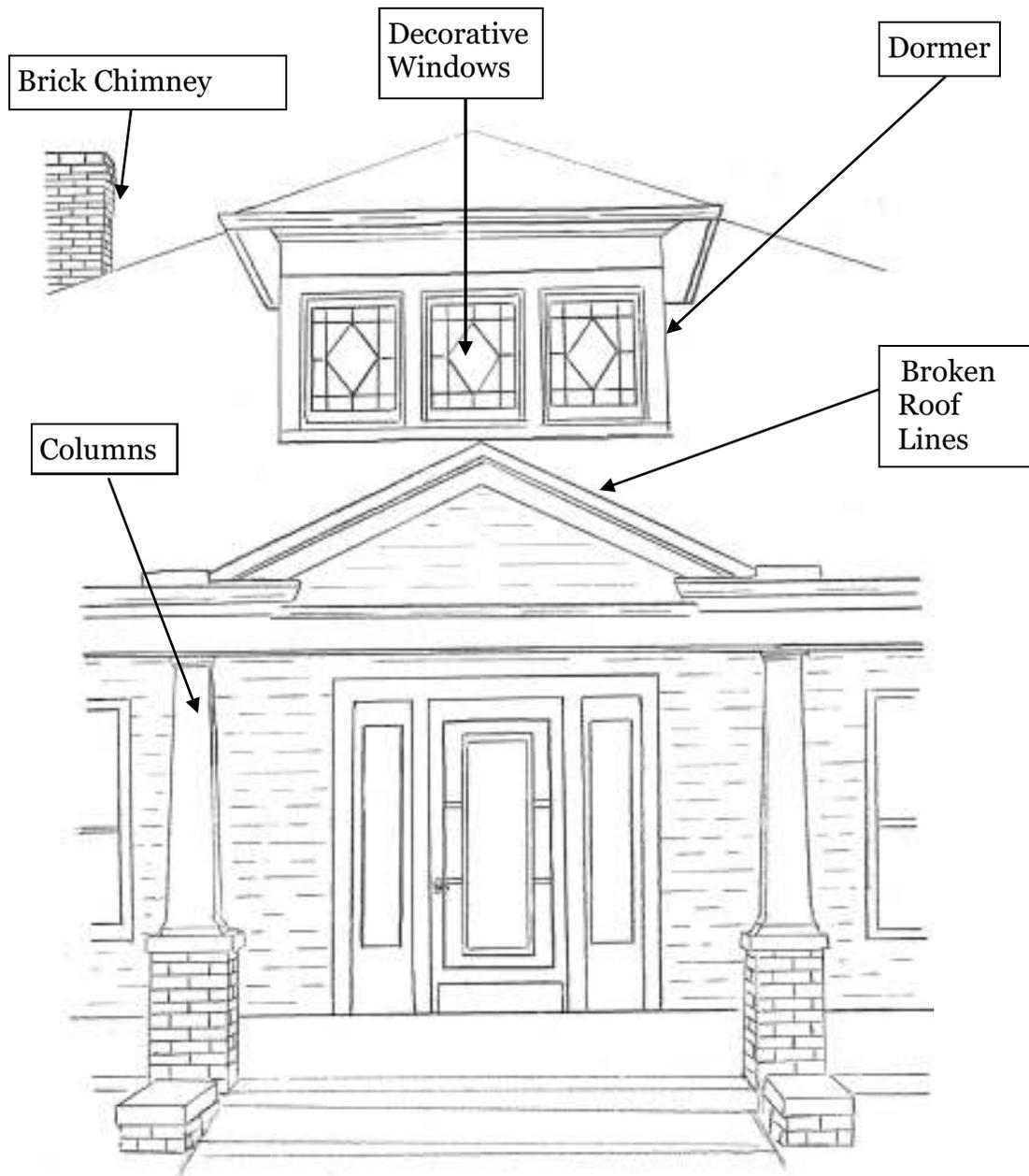
Dormers

Arched architectural features

Brick chimney

All brick façade

Other architectural features as approved by the Planning Director



Decorative Features, UDO Sec. 6.3.1 (H)(2)(b)

Decorative Features

Residential structures shall have four (4) or more of the following features:

Decorative shake

Decorative porch railing/
posts

Shutters

Decorative/functional air
vents on roof or foun-
dation

Trimmed Windows

Recessed windows

Decorative/period win-
dows

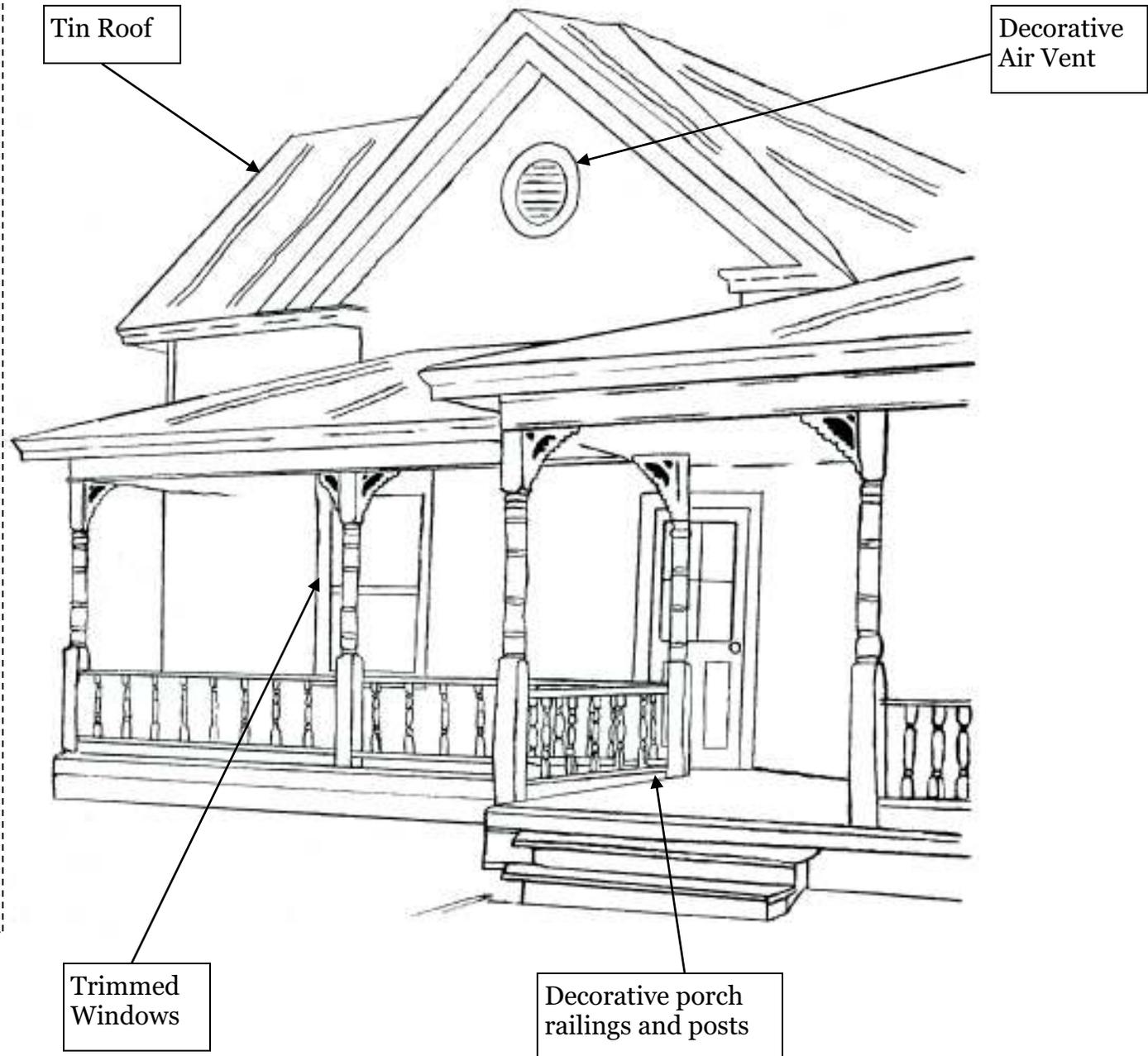
Decorative brick/stone

Decorative gables

Decorative cornices

Tin/metal roof

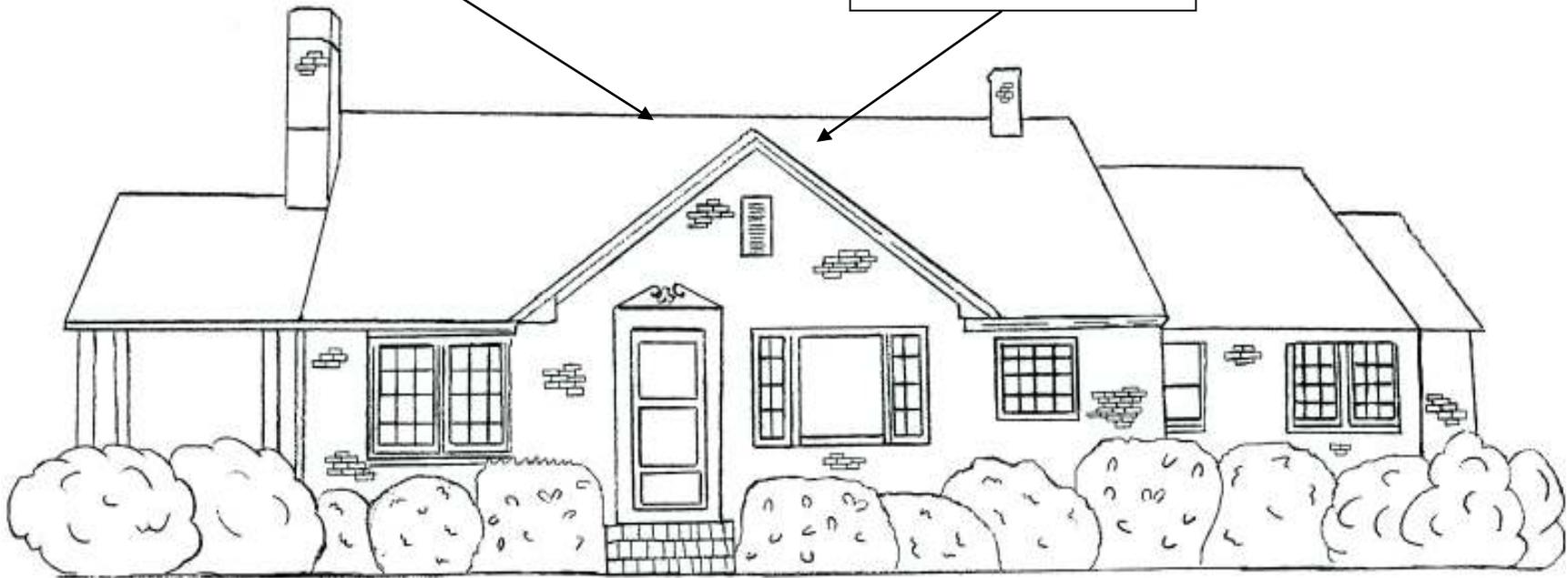
Other decorative features
as approved by the Plan-
ning Director



Residential Standards-Roofs, UDO Sec. 6.3.1 (H)(2)(c)

Varied Roof Lines

Roof shape is compatible
with rest of the structure



Roofs

Roof lines shall be varied to reduce the scale of structures and add visual interest.

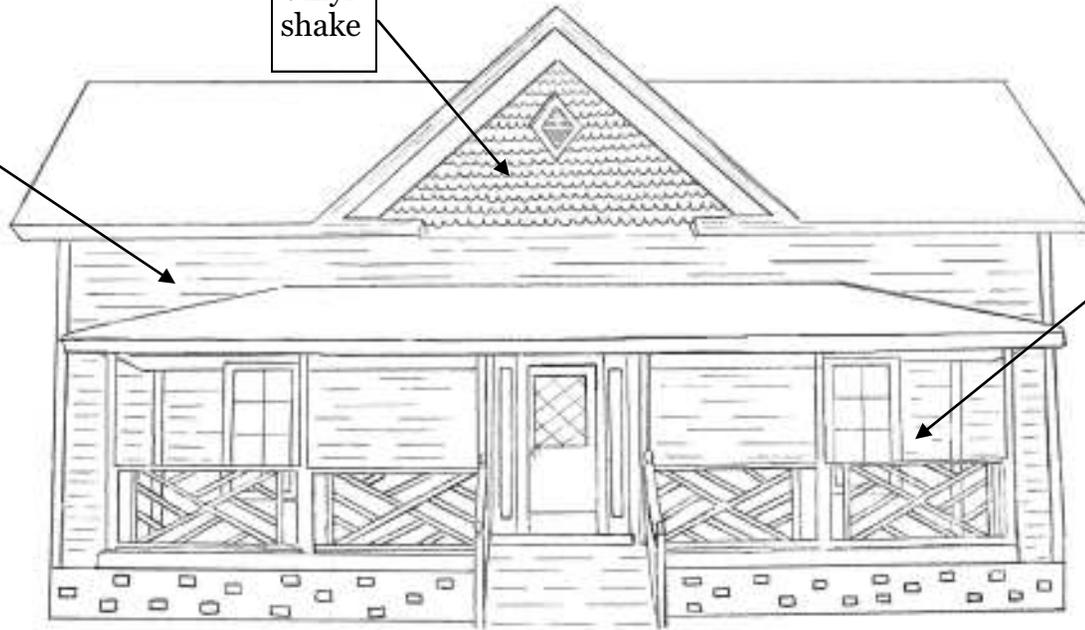
Roof shape (for example: flat, hip, mansard, or gable) and material shall be architecturally compatible with façade elements and the rest of the structure.

Residential Standards-Facades, UDO Sec. 6.3.1 (H)(2)(d)

Wood
Composite
siding

Vinyl
shake

Porch Area
at least 50%
of facade



Facades

The width of the façade shall not be any wider than 1.5 feet times the depth of the principal structure. The width to depth ratio shall be no more than 1.5 feet to 1 foot.

Recesses and projections:

The principal structure's front façade must incorporate recesses and projections along at least 50 (fifty) percent of the length of the façade. Windows, awnings, and porch area shall total at least 50 percent of the façade length abutting a public street.

Repeating design patterns:

Façades shall incorporate a repeating pattern of change in color, texture, and material modules.

Renovations:

Façade renovations shall incorporate original building details to the maximum extent practicable.

Materials:

The façade exterior siding shall be brick, stone, wood, wood composite, or fiber cement (or combination thereof). Vinyl shall only be used for exterior shake and trim elements and shall not be used as the siding material.

Roof cornices:

If roof cornices have been removed or damaged on an existing structure, renovations of that structure must include retaining, repairing, and replacing the roof cornices.

Residential Standards-Windows, UDO Sec. 6.3.1 (H)(2)(e)



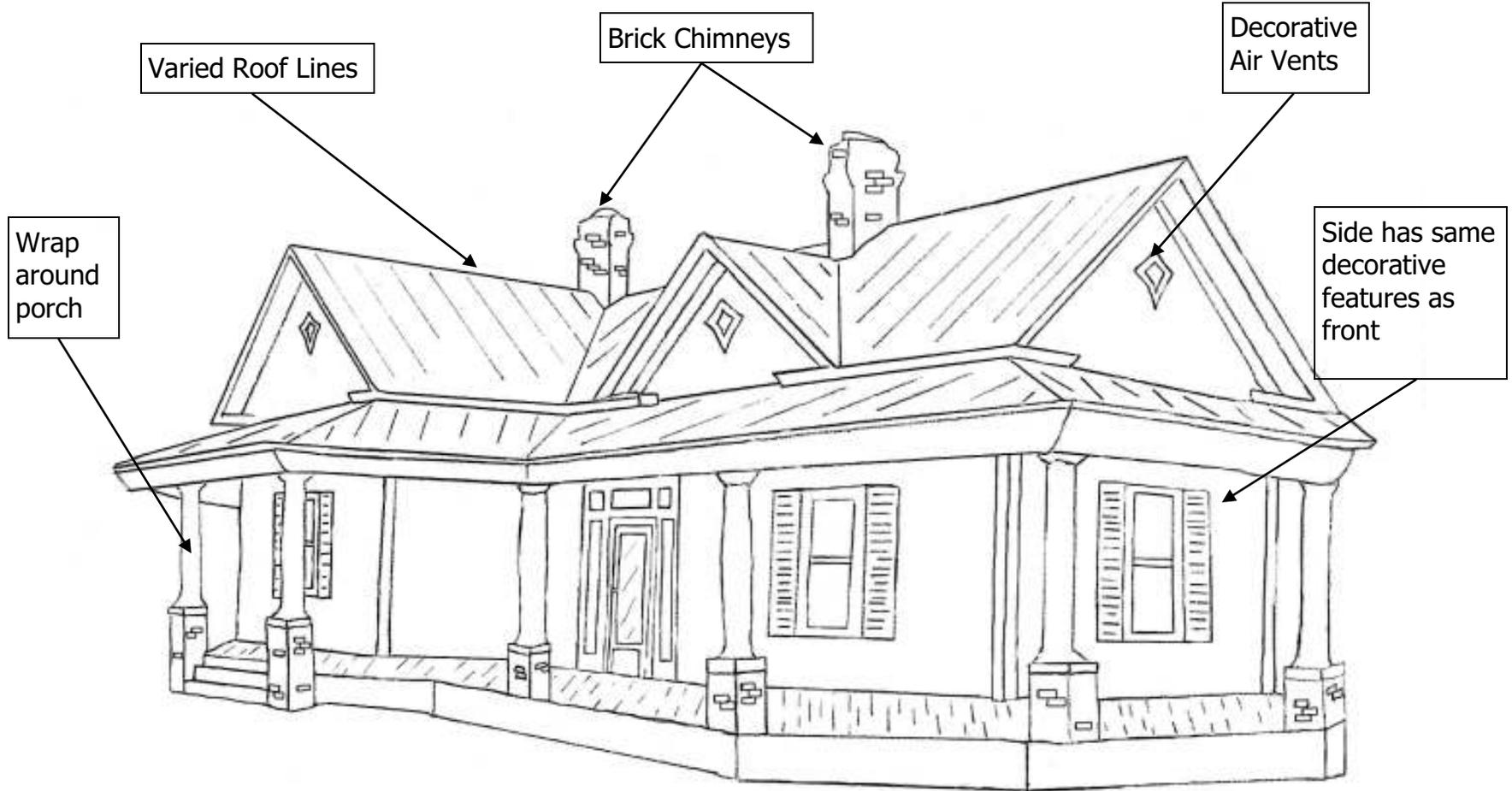
Windows

Replacement of windows on the façade of an existing structure shall be accomplished by using windows of the same trim size and character as the original.

Blank exterior walls are prohibited; windows shall be present on all sides of the home.

Shutters on windows shall be one half the width of the window to which they are affixed.

Residential Standards-Sides facing public street, UDO Sec. 6.3.1 (H)(2)(f)



Sides Facing Abutting Street

All sides of a principal structure that face an abutting public street shall have architectural and decorative features as described in Section 6.3.1(H)(1)(a) and (b).

Residential Standards-Entryways & Materials, UDO Sec. 6.3.1 (H)(2)(g)(h)



Entryways

Required features:

Doors shall have built-in windows; alternatively, a solid door is allowed provided side lights (side windows) are installed immediately adjacent to the solid door.

Variation:

Variations in color schemes and textures are encouraged in order to articulate entryways so as to give greater recognition to these features.

Materials

Predominant exterior building materials:

Predominant exterior building materials shall be high quality materials, including brick, wood, stone, fiber cement, and/or wood composite. Vinyl shall only be allowed in the form of shake and trim elements.

Foundations:

No slab on grade foundations are permitted. Foundations around the principal structure shall be fully enclosed. Front and side porches with open foundations shall have brick or stone piers and openings shall be fully screened with evergreen plantings.