A APPENDIX

A1
TREE PLANTING DETAILS, SUGGESTED TREE AND PLANT LIST, AND ALTERNATIVE TREE PLANTING DETAILS

Fairfax, VA

Washington, DC

TOP
Continuous Landscape Panels provide sufficient soil volumes for healthy tree growth
Image Credit: Fairfax County

BOTTOM
Sidewalks cantilevered over tree well provides uncompacted soil for tree roots to grow under hardscaping
Image Credit: Fairfax County

The Public Facilities Manual (PFM) provides tree planting design recommendations and a list of approved tree species for planting in public spaces.

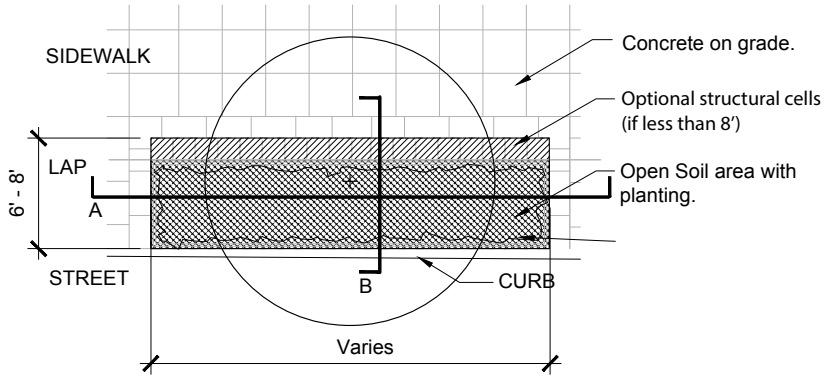
In the CRDs and CRAs, a unique palette of trees and other landscaping has been selected as an alternative to the guidance in the PFM. Tree and plant species were selected based on hardiness, low maintenance, drought tolerance, texture, and form to provide a diverse and resilient landscape palette that is sustainable in an urban environment. The list is not exhaustive; other tree types may be specified as long as the types align with the criteria as outlined in these Guidelines. The list indicate appropriate planting locations and their anticipated size at maturity for each tree and plant species.

The PFM has specific requirements for tree wells for Category III and IV street trees. However, this guidance may not always be feasible to implement in urban environments. In such instances, the following tree planting details may be substituted for those in the PFM, depending on available space, specific streetscape conditions, and desired character, if warranted by the site-specific conditions. Final determination of appropriate tree planting methods should be done in consultation with the County's Urban Forestry Management Division. The following graphics illustrate different methods for planting trees depending on site conditions.

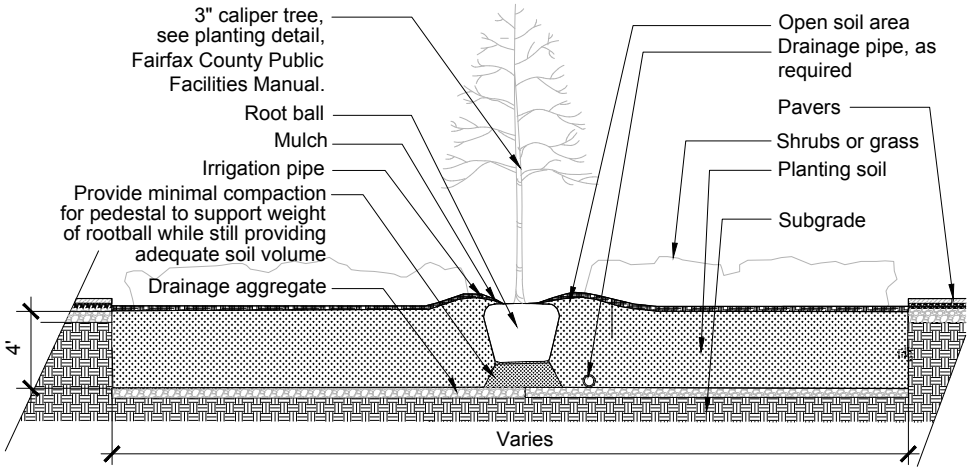
- *Graphic 18: Open Soil Tree Well Planting Detail*
- *Graphic 19: Covered Tree Well Planting Detail*
- *Graphic 20: Connected Tree Well Planting Detail with an Amenity Zone*
- *Graphic 21: Connected Tree Well Planting Detail without an Amenity Zone*
- *Graphic 22: Alternative Design Strategy 2: Structural Cell Supporting Sidewalk*
- *Graphic 23: Alternative Design Strategy 3: Cantilevered Sidewalk*

GRAPHIC 18: OPEN SOIL TREE WELL PLANTING DETAIL

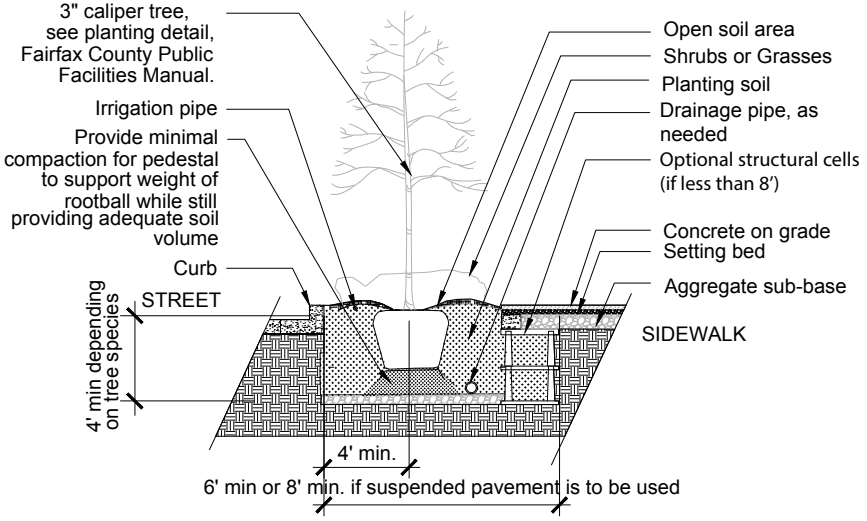
A1.1 TREE PLANTING DETAILS



Plan

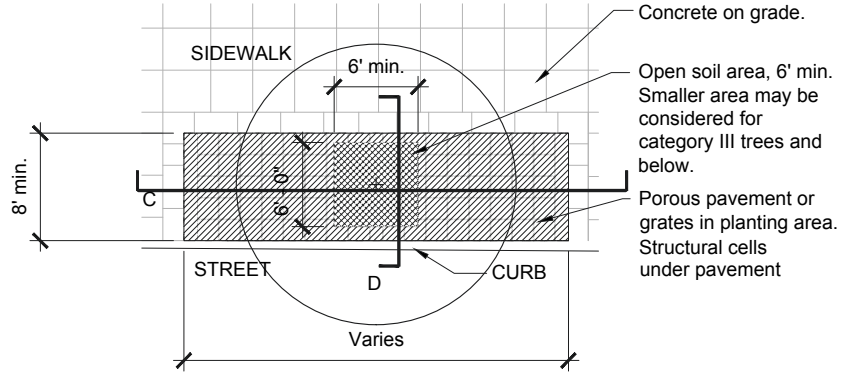


Section A

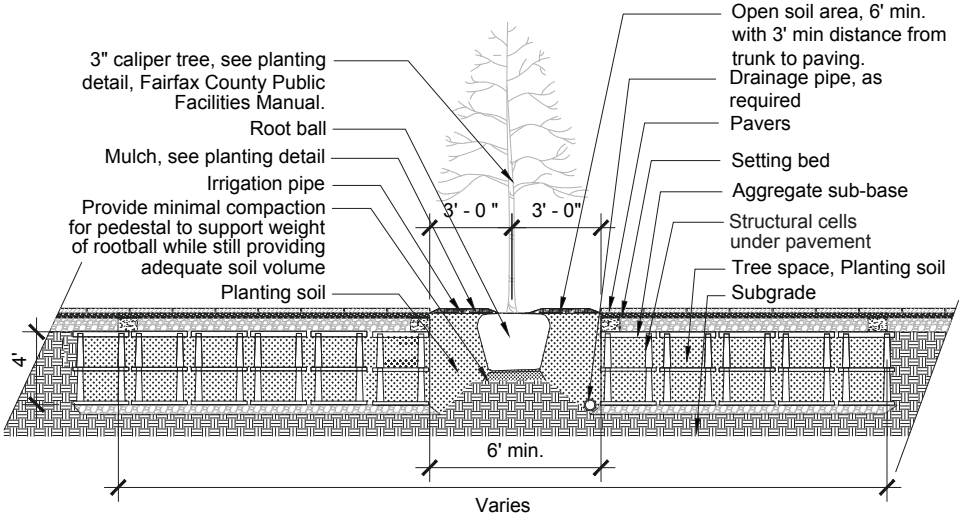


Section B

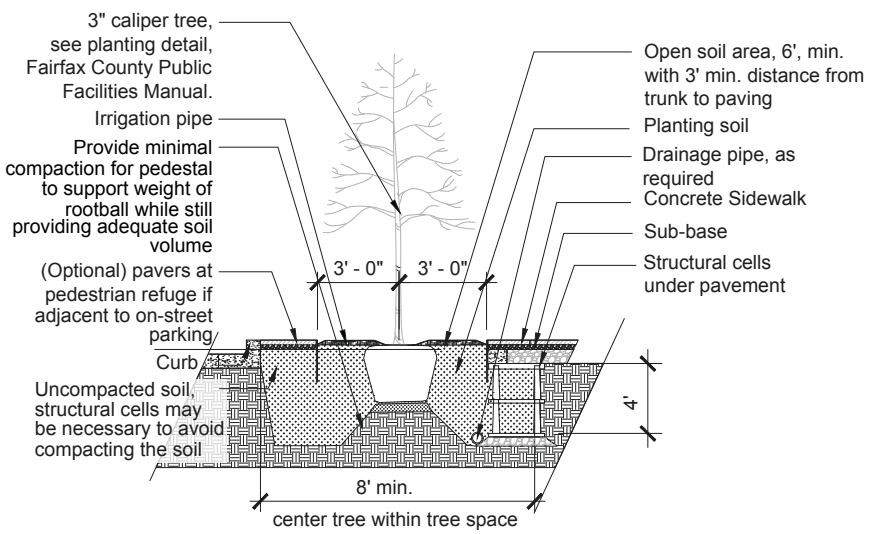
GRAPHIC 19: COVERED TREE WELL PLANTING DETAIL



Plan

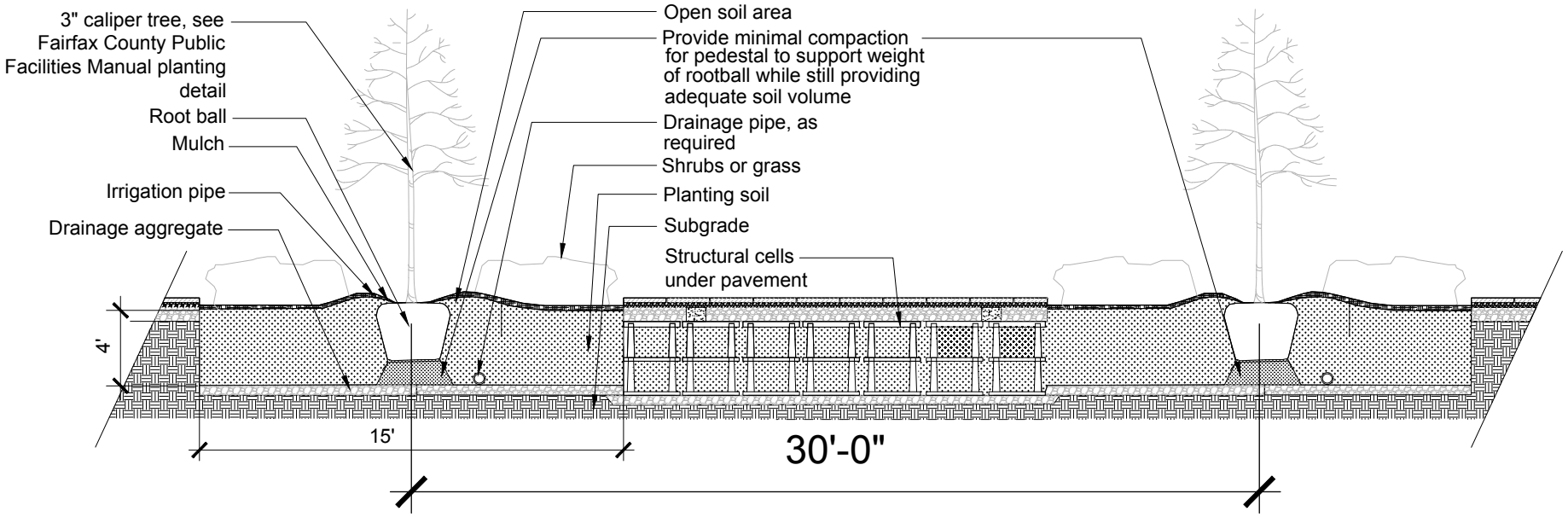


Section C

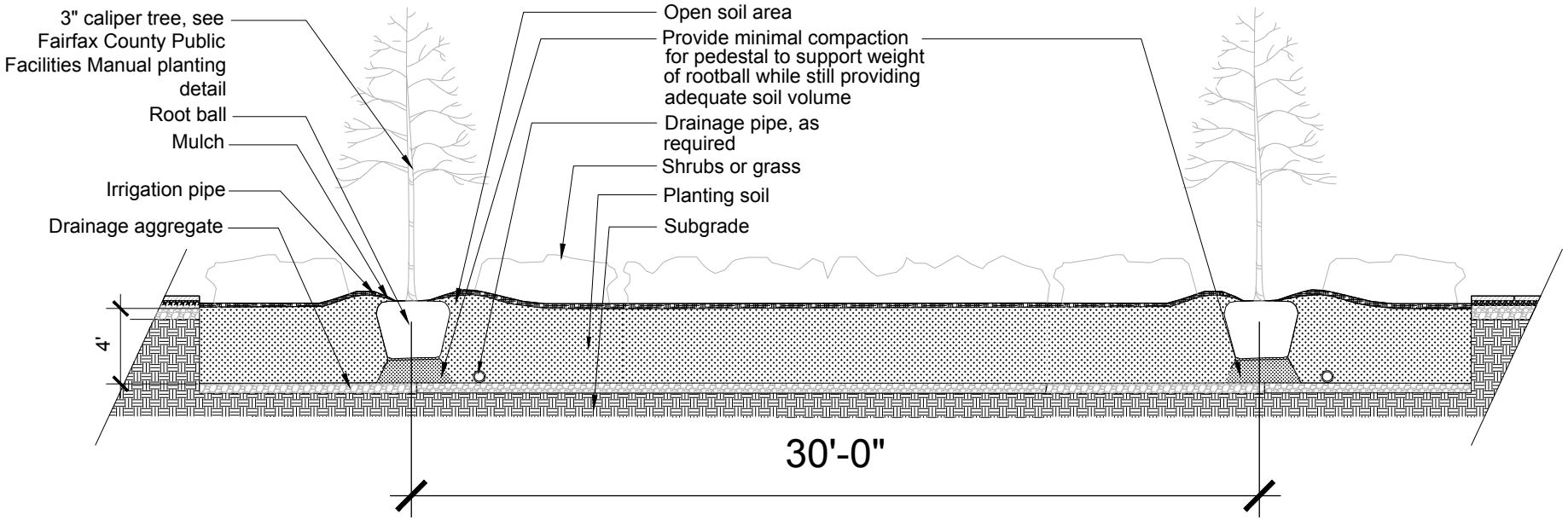


Section D

GRAPHIC 20: CONNECTED TREE WELL PLANTING DETAIL WITH AN AMENITY ZONE



GRAPHIC 21: CONNECTED TREE WELL PLANTING DETAIL WITHOUT AN AMENITY ZONE



A1.2 TREE AND PLANT LIST

CATEGORY I, II, III, AND IV TREES

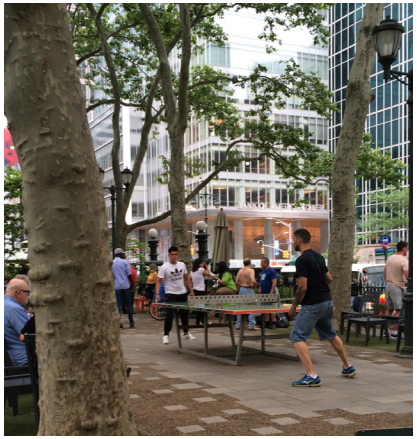
COMMON NAME	SCIENTIFIC NAME	NATIVE	PLAZA	STREET	PARK	LID	AVG. HGT/ SPREAD
Category IV							
London Plane Tree	Platanus acerifolia 'Bloodgood'			X		X	60'-100'/80'
Sycamore	Platanus occidentalis	X			X	X	75'-100'/75'-100'
Swamp White Oak	Quercus bicolor	X	X	X	X	X	50'-60'/50'-60'
Willow Oak	Quercus phellos	X		X	X		40'-60'/30'-40'
Northern Red Oak	Quercus rubra	X	X	X	X		75'/50'-60'
Valley Forge Elm	Ulmus americana 'Valley Forge'		X	X			50'-70'/40'-50'
Category III							
River Birch	Betula nigra	X	X		X	X	25'/15'
Hackberry	Celtis occidentalis	X		X		X	40'-60'/40'-60'
Thornless Honeylocust	Gleditsia triancanthos inermis	X	X	X		X	30'-70'/30'-70'
Black Gum	Nyssa sylvatica	X	X	X		X	30'-50'/20'-30'
Bald Cypress	Taxodium distichum	X		X	X	X	50'-100'/20'-35'
Silver Linden	Tilia tomentosa		X	X	X		50'-70'/30'-50'
Category II							
European Hornbeam	Carpinus betulus		X	X	X		30'-40'/20'-30'
American Hornbeam	Carpinus caroliniana	X		X		X	35'-50'/20'
Persian Parrotia	Parrotia persica		X	X	X	X	30'-40'/15'-30'
Eastern Hophornbeam	Ostrya virginana	X		X	X		25'-50'/20'35'
Category I							
Columnar Red Maple	Acer rubrum 'Columnaris'			X			60'/15'
Columnar European Hornbeam	Carpinus betulus 'Columnaris'			X			30'-50'/20'-30'
Princeton Sentry Gingko	Ginkgo biloba 'Princeton Sentry'		X	X			65'/25'

Valley Forge Elm

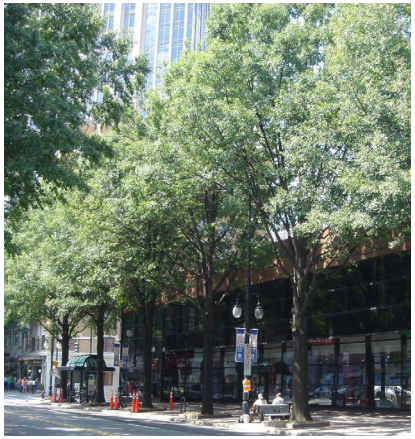
Silver Linden

Northern Red Oak

Columnar European Hornbeam



London Plane Tree



Willow Oak

Swamp White Oak

River Birch

CATEGORY II AND III FLOWERING TREES

COMMON NAME	SCIENTIFIC NAME	NATIVE	PLAZA	STREET	PARK	LID	AVG. HGT/SPREAD
Category III							
Yellowwood	Cladrastris kentukea		X		X		30’-50’/40’-55’
Category II							
Serviceberry	Amelanchier arborea	X	X	X		X	15’-30’/20’
Serviceberry	Amelanchier canadensis	X		X	X	X	20’/15’
Eastern Redbud	Cercis canadensis	X	X	X			20’-30’/25’-35’
Flowering Dogwood	Cornus florida ‘Appalachian Spring’ or ‘Cherokee Princess’	X	X		X		15’-30’/15’-30’
Carolina Silverbell	Halesia carolina	X	X		X		30’-40’/25’-35’
Sweetbay Magnolia	Magnolia virginiana	X	X	X	X	X	10’-35’/10’-35’
Sourwood	Oxydendrum arboreum	X	X		X	X	20’-50’/10’-25’
Sassafras	Sassafras albidum	X			X	X	20’-30’/10’-20’
Japanese Snowbell	Styrax japonicus		X	X	X		20’-30’/20’-30’
Persimmon	Diospyros virginiana	X			X	X	20’-30’/10’-30’

Flowering Dogwood

Carolina Silverbell

Serviceberry

Japanese Snowbell Flowers

Eastern Redbud

Sourwood

Yellowwood

SHRUBS

COMMON NAME	SCIENTIFIC NAME	NATIVE	PLAZA	STREET	PARK	LID	AVG. HGT/SPREAD
Red Chokeberry/Choke Cherry	Aronia arbutifolia	X	X	X	X	X	2'/4'
False Indigo-bush	Amorpha fruticosa	X	X		X	X	10'/10'
American Beautyberry	Callicarpa americana	X	X		X	X	3'/3'
Sweet Pepperbush	Clethra alnifolia	X	X		X	X	10'/10'
Midwinter Fire Red Twig Dogwood	Cornus sanguinea 'Midwinter Fire'			X	X	X	5'-6'/5'-6'
Red Twig Dogwood	Cornus sericea	X	X		X	X	3'-6'/10'-15'
Witch Hazel	Hamamelis virginiana	X			X	X	15'-20'/15'-20'
Oak Leaf Hydrangea	Hydrangea quercifolia			X	X		5'-6'/5'-6'
Inkberry Holly	Ilex glabra	X	X		X	X	3'-5'/3'-5'
Common Winterberry	Ilex verticillata	X	X	X	X	X	3'-12'/3'-12'
Virginia Sweetspire	Itea virginica	X	X	X	X	X	3'-6'/3'-6'
Northern Bayberry	Myrica pennsylvanica	X	X	X	X	X	5'-6'/5'-6'
Common Ninebark	Physocarpus opalifolius	X	X		X		5'-8'/4'-6'
Winged Sumac	Rhus coppalinum	X			X	X	7'-15'/5'-12'
Densiformis Spreading Yew	Taxus x media 'Densiformis'		X	X	X		4'/8'
Possumhaw Viburnum	Viburnum nudum	X	X	X	X	X	5'-12'/5'-12'
Blackhaw Viburnum	Viburnum prunifolium	X	X	X	X	X	12'-15'/6'-12'

Virginia Sweetspire

American Beautyberry

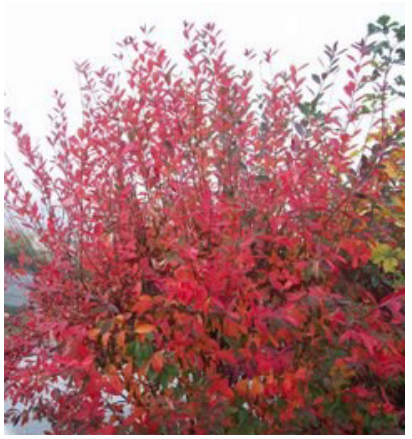
Densiformis Spreading Yew

Oak Leaf Hydrangea

Common Ninebark

Common Winterberry

Midwinter Fire Red Twig Dogwood



Red Chokeberry

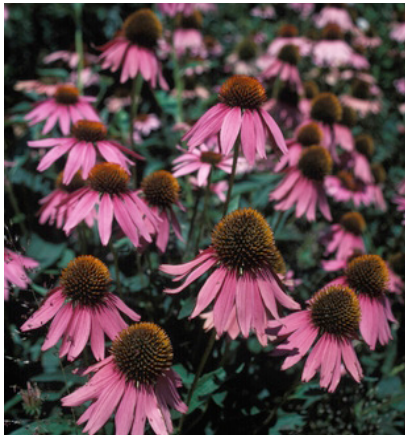
ORNAMENTAL GRASSES, PERENNIALS, AND GROUND COVERS

COMMON NAME	SCIENTIFIC NAME	NATIVE	PLAZA	STREET	PARK	LID	AVG. HGT/SPREAD
Blue Star	Amsonia tabernaemontana	X		X	X		18″/18″
Big Bluestem	Andropogon gerardii	X	X	X	X		5′-7′/2′-3′
Swamp Milkweed	Asclepias incarnata	X			X	X	1′-3′/2′-3′
Butterflyweed/Milkweed	Asclepias tuberosa	X		X	X	X	30″/24″
Wild Blue Indigo	Baptisia australis	X	X	X	X	X	3′-5′
Creek Sedge	Carex amphibola	X	X	X	X	X	12″/18″
Pennsylvania Sedge	Carex pennsylvanica	X			X	X	12″/18″
Tussock Sedge	Carex stricta	X			X	X	18″/12″
River Oats	Chasmanthium latifolium	X	X	X	X	X	30″/48″
Turtlehead	Chelone glabra	X		X	X	X	18″/12″
Tickseed	Coreopsis verticillata 'Moonbeam'	X		X	X		18″/18″
Purple Coneflower	Echinachea purpurea			X	X		24″/12″
Purple Lovegrass	Eragrostis spectabilis	X	X	X	X	X	1′/2′
White Wood Aster	Eurybia divaricata	X	X	X	X		12″-30″/18″-30″
Bloody Cranesbill	Geranium sanguineum			X	X		9″-18″/12″-18″
Alumroot	Heuchera americana	X	X		X		12″/18″
Virgina Ginger	Hexastylis virginica	X			X	X	6″-12″
Iris	Iris veriscolor			X	X	X	24″/12″
Blazingstar	Liatris spicata	X	X		X	X	24″/12″
Allegheny spurge	Pachysandra procumbens	X			X	X	12″/24″
Golden Ragwort	Packera aurea	X	X		X	X	12″/24″
Switchgrass	Panicum virgatum		X	X	X	X	36″/36″-72″
Creeping Phlox	Phlox stolonifera	X	X		X	X	6″-18″
Orange Coneflower	Rudbeckia fulgida var. fugida	X	X	X	X	X	24″/24″
May Night Meadow Sage	Salvia nemorosa 'May Night'			X	X		18″/18″
Little Bluestem	Schizachyrium scoparium	X	X	X	X	X	30″/24″
Woolgrass	Scirpus cyperinus	X	X	X	X	X	4′/2′
Autumn Joy Sedum	Sedum 'Autumn Joy'			X	X		18″/18″-24″
Goldenrod	Solidago spp.	X	X	X	X		2′-6′/3′-4′
Indian Grass	Sorghastrum nutans	X	X	X	X		36″-60″/12″-24″
New England Aster	Symphyotrichum novae-angliae	X	X	X	X		36″-72″/24″-36″

Turtlehead

Blue Star

Tussock Sedge



Purple Coneflower

Indian Grass

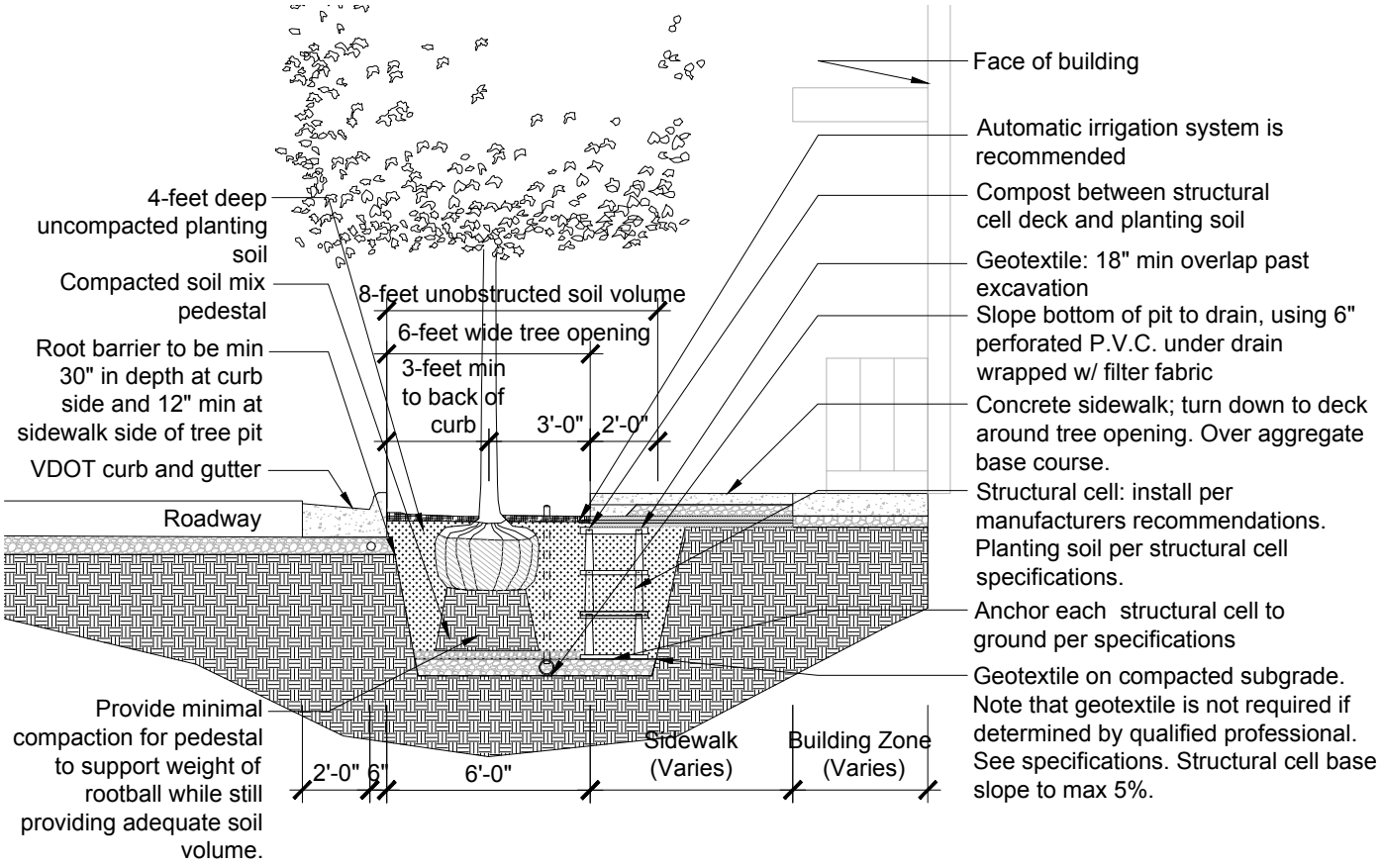
Butterflyweed

Autumn Joy Sedum

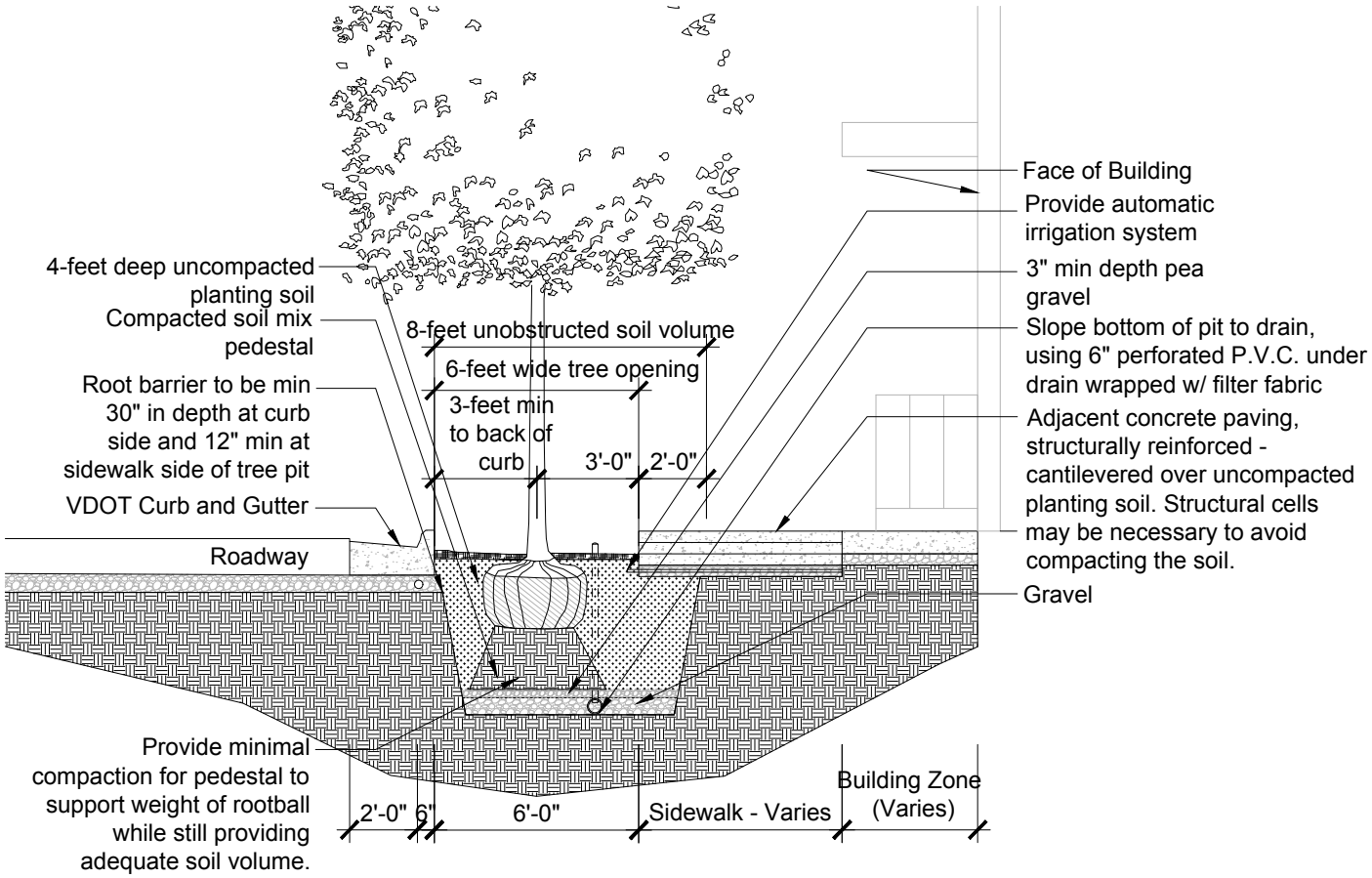
Switchgrass

A1.3 ALTERNATIVE TREE PLANTING DETAILS

GRAPHIC 22: ALTERNATIVE DESIGN STRATEGY 2: STRUCTURAL CELL SUPPORTING SIDEWALK



GRAPHIC 23: ALTERNATIVE DESIGN STRATEGY 3: CANTILEVERED SIDEWALK



A2 SUSTAINABLE DESIGN TOOLBOX

Modern development strategies no longer view stormwater management as stormwater disposal. Modeled after natural systems, Low Impact Development techniques (LIDs) are a preferred stormwater management approach. LIDs aim to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source. Instead of conveying and treating stormwater in large, land intensive facilities, LIDs address stormwater through smaller, more cost-effective landscape features known as Integrated Management Practices (IMPs). LID techniques can reduce runoff volumes entering local streams and may be easier to incorporate into developed areas than more traditional detention and retention ponds. Many components of the urban environment have the potential to integrate LID features. This includes not only open space, but also rooftops, streetscapes, parking lots, sidewalks, and medians.

Stormwater strategies should be developed at the project's conceptual design stage so that features can be integrated into the site to benefit the overall project. A three-tiered strategy should be employed for stormwater management. The first tier should focus on creating an efficient site design, minimizing the extent of impervious surface, and maximizing native vegetation to reduce stormwater runoff. Site features such as building structures, utility corridors, and parking should be sited to reduce the amount of impervious surface. The second tier should employ LIDs, and, finally, the third tier should address any remaining stormwater needs through more conventional retention and detention methods.

Individual LID tools that are most applicable to CRDs and CRAs are summarized in the following toolbox:

LEFT
10-foot wide vegetated bioswale within the streetscape uses low maintenance plantings and grasses to absorb rainwater
Image Credit: Fairfax County

RIGHT
Innovative green roof serves as a building amenity and screens roof equipment
Image Credit: GreenRoofGardener

BIO-RENTENTION FACILITY:
an excavated, shallow surface depression planted with specially selected native vegetation to treat and capture runoff. Bioretention facilities temporarily capture stormwater to be absorbed by plants and infiltrated into the groundwater. These facilities may include smaller facilities such as bioretnention planters or cells incorporated into a streetscape or within street medians and islands, or larger facilities such as rain gardens, where additional space is available on a site or in a streetscape. In addition to their stormwater management functions, bioretention facilities can be designed to serve as aesthetic features to enhance the site or streetscape.

Applications: Bioretention facilities should be located in well-drained soils and can be located adjacent to sidewalks, walkways and driveways within the Landscape Panel, in the Building Zone, in parking lots, or within other public spaces. Native vegetation that thrives in wet conditions should be planted to enhance the water absorption capabilities of the rain garden. Educational signage and other interpretive elements may be included to illustrate how bioretention facilities can reduce stormwater runoff and benefit the larger watershed.

Image Credit: Golden Triangle BID

Washington, DC

Environmental Protection Agency

Portland, OR

REFORESTATION:
refers to the replanting of a portion of the site with trees that will eventually create a significant canopy. Natural forests have multiple layers of canopy from low level ground cover to shrubs to large shade trees.

Applications: Reforestation can occur in both natural areas and developed areas, including riparian corridors, common greens and other park spaces. Reforestation and planting of trees near picnic areas, pavilions, spectator areas, playgrounds, benches, trails, and other built features will enhance the environment, provide shade, and create a sense of place.


Image Credit: ASLA

GREEN ROOF:
a roof of a building or structure (such as a parking deck) that is covered with non-invasive vegetation and a growing medium, planted over a waterproofing membrane. Green roofs absorb rainwater and prevent a portion of that water from running off roof surfaces and onto the ground. Green roofs provide additional environmental benefits, including insulation of the underlying building, wildlife and pollinator habitat, and lowering ambient air temperature. They can also provide an outdoor fresh-air experience, which may be beneficial in an urban environment.

Applications: Green roofs can be put on many types of buildings; however, they are relatively expensive due to structural requirements (related to the load placed on buildings), waterproofing, soil substrate, and plantings. Wood frame buildings pose additional challenges for installing green roofs due to the potential for water intrusion and additional loads on a wooden structure. Green roofs should be considered for sites where they provide multiple benefits, such as providing outdoor common space and increasing energy efficiency while also off-setting stormwater demands.


Image Credit: Fairfax County

VEGETATED SWALE:
a broad, shallow channel that is densely planted with a variety of trees, shrubs, and/or grasses. Vegetative swales may be utilized in lieu of pipes to convey stormwater naturally and are beneficial in accommodating infiltration, reducing runoff volume, incorporating native vegetation, and filtering pollutants.

Applications: Vegetated swales are an economical alternative to piping and may be constructed in the Landscape Panel, Building Zone, parking lot, plaza or park and, if designed in an aesthetically pleasing way, can be an open space amenity.

NATURALIZED INFILTRATION BASIN:
an earthen structure constructed either by impoundment of a natural depression or by excavation that provides temporary storage and infiltration of stormwater runoff.

Applications: Existing and new stormwater management basins can be naturalized with native plantings to aid infiltration and to provide wildlife habitat. Basins can be planted with native wildflowers and seasonal grasses that are both attractive and help restore ecosystem services.


Image Credit: Fairfax County

PERVIOUS PAVEMENT:
a permeable pavement underlain by a uniformly-graded stone bed which provides temporary storage for stormwater runoff and promotes infiltration. The pavement surface may consist of porous concrete or porous structural pavers. The use of pervious pavement manages stormwater beneath the surface, minimizes disruption of additional areas for the management of stormwater and reduces the costs associated with construction of a stand-alone stormwater management facility.

Applications: Pervious pavement can be used in parking areas, in plazas, or for recreational courts, trails and certain walkways, as well as within the Amenity Zones of streetscapes. Use of pervious pavement may not be practical in flood-prone areas where the water table is elevated, where sediment and leaf litter will quickly fill the porous voids, or where there are steep grade changes. For large parking lots, a mix of surface types that include turf parking with a gravel base, aggregate paving for traffic aisles, and pervious paving for parking stalls should be considered.


Image Credit: Fairfax County

A3 REFERENCE MATERIALS

FAIRFAX COUNTY REFERENCE MATERIALS

Arts Fairfax
https://artsfairfax.org/

Fairfax County Bicycle Master Plan
https://www.fairfaxcounty.gov/transportation/bike/master-plan

FCDOT Bicycle Parking Guidelines: Bicycle Parking Requirement for Urban Centers and Transit Station Areas
www.fairfaxcounty.gov/transportation/sites/transportation/files/assets/documents/pdf/bikeprogram/fcdot_bicycle_parking_guidelines_final2.pdf

Fairfax County's Comprehensive Plan
https://www.fairfaxcounty.gov/planning-zoning/fairfax-county-comprehensive-plan

Fairfax County's Comprehensive Plan - Policy Plan
https://www.fairfaxcounty.gov/planning-zoning/comprehensive-plan/policy-plan

Fairfax County Environmental Quailty Advisory Council
https://www.fairfaxcounty.gov/planning-zoning/environmental-quality-advisory-council

Fairfax County Office of Community Revitalization
www.fcrevit.org/

Fairfax County's Policy Plan Environment Element, Objective 13
https://www.fairfaxcounty.gov/planning-zoning/sites/planning-zoning/files/assets/compplan/policy/environment.pdf

Fairfax County Public Facilities Manual (PFM)
www.fairfaxcounty.gov/landdevelopment/public-facilities-manual

Fairfax County Sustainability Initiatives:
https://www.fairfaxcounty.gov/environment/sustainability-initiatives

Fairfax County Urban Parks Framework, Appendix 2 in the Comprehensive Plan, Policy Plan
https://www.fairfaxcounty.gov/planning-zoning/sites/planning-zoning/files/assets/compplan/policy/parksrec.pdf

Fairfax County's Zoning Ordinance
https://www.fairfaxcounty.gov/planning-zoning/zoning-ordinance

Fairfax County's Zoning Ordinance, Article 12 Signs
https://www.fairfaxcounty.gov/planning-zoning/sites/planning-zoning/files/assets/documents/zoning/zoning%20ordinance/art12.pdf

Fairfax County's Zoning Ordinance Article, 14 Part 9, Outdoor Lighting Standards
https://www.fairfaxcounty.gov/planning-zoning/sites/planning-zoning/files/assets/documents/zoning/zoning%20ordinance/art14.pdf

One Fairfax Policy
https://www.fairfaxcounty.gov/topics/one-fairfax

ADDITIONAL REFERENCE MATERIALS

American Bird Conservancy Bird Friendly Building Design
https://abcbirds.org/wp-content/uploads/2015/04/Bird-friendly_Building_Guide_WEB.pdf

Federal Highway Administration (FWHA) Separated Bike Lane Planning and Design Guide
https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/separated_bikelane_pdg/page00.cfm

International Dark-Sky Association
www.darksky.org/

National Association of City Transportation Officials (NATCO) Urban Bike Design Guidelines
https://nacto.org/publication/urban-bikeway-design-guide/

National Association of City Transportation Officials (NACTO) Urban Street Stormwater Guide
https://nacto.org/publication/urban-street-stormwater-guide/

Project for Public Spaces
https://www.pps.org/

US Green Building Council's Leadership in Energy and Environmental Design (LEED)
https://new.usgbc.org/leed

US Green Building Council's Sustainable Sites Initiative (SITES)
www.sustainablesites.org/

National Street Design Reference Materials

American Association of State Highway and Transportation Officials (AASHTO) "Policy on Geometric Design of Highways and Streets"
https://www.transportation.org/

Americans with Disabilities Act Accessibility Guidelines (ADAAG)
http://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/background/adaag

Design and Safety of Pedestrian Facilities: A Recommended Practice of the Institute of Transportation Engineers (ITE)
https://safety.fhwa.dot.gov/ped_bike/docs/designsafety.pdf

Manual on Uniform Traffic Control Devices (MUTCD)
https://mutcd.fhwa.dot.gov/

National Association of City Transportation Officials (NACTO) Urban Street Design Guide
https://nacto.org/publication/urban-street-design-guide/

Virginia Street Design Reference Materials

Virginia Department of Transportation's Drainage Manual
http://www.virginiadot.org/business/locdes/hydra-drainage-manual.asp

Virginia Department of Transportation's Road and Bridge Specifications
www.virginiadot.org/business/const/spec-default.asp

Virginia Department of Transportation's Road Design Manual
www.virginiadot.org/business/locdes/rdmanual-index.asp

Virginia Department of Transportation and Department of Rail and Public Transportation's Multimodal System Design Guidelines
http://www.drpt.virginia.gov/planning/multimodal-guidelines/

Virginia Trees and Plants Reference Materials

Earth Sanga
http://www.earthsangha.org/

Plant NOVA Natives
http://www.plantnovanatives.org/

Virginia Department of Transportation's Northern Virginia Planting Guidelines
www.virginiadot.org/about/NOVA_Planting_Guidelines.asp

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