

Located two-and-a-half miles south of the US Capitol building, the project area consists of a 112 acre stretch of land adjacent to a major regional highway. Much of the site lies within an interstitial wildlife corridor surrounded by dense urbanization.

SITE COMPONENTS

ACCESS ROAD ECOTONES

PEDESTRIAN & BICYCLE INFRASTRUCTURE	
shared use path	
with poil-oil test dieds	
ECOLOGICAL INFRASTRUCTURE	
shepherd parkway [existing wooded area]	
canopy street trees — with understory, shrub, & perennial plantings	
native, pollinator-supporting meadow with grided understory & canopy tree plantings	
PLANTING ZONES	
revegetation zones	
interchange meadow zones —	
'edge' linear ecological community zones —	
'transition' linear ecological community zones	
'enclosed' linear ecological community zones	
STORMWATER INFRASTRUCTURE	999999
interstate bioswale	
dry detention basin	
drainage ditch	
	1
undated highway on/off ramps	
interstate 295	
SITE SECTION	N

The primary project components include multiple layers of infrastructure and vegetation organized around a series of realigned roadways. LID facilities, bioswales, and dry detention basins are integrated throughout the site to comprehensively manage stormwater runoff.

PHASE I - ANALYSIS

ANALYSIS CRITERIA

ACCESS ROAD ECOTONES

CONDITIONAL CRITERIA

STRUCTURAL CRITERIA







The spatial character of Shepherd Parkway is more enclosed and visually dense, and is typified by a dense forest canopy, understory trees, and forbs. The quality of space with respect to infrastructural elements varies throughout the site, but is generally dominated by site walls up to 25 feet in height and by adjacent four lane highways. West of the site is the Potomac River floodplain, which is flat and open. East of the site, the topography slopes upward to the riparian terrace and uplands, which is again the enclosed forest

spatial condition. Responding to these structural conditions, the designers found it appropriate to create a gradient across the Access Road Ecotone, from the most open and to the most enclosed conditions. The structural criteria

the team extracted from this gradient are: Open, Edge, Transition and Enclosed.

Open, in this case, is akin to a meadow-type environment with no trees. Edge is envisioned as a wooded meadow, Transition as a dense shrubland, or scrubland, with trees, and Enclosed as a forested environment with canopy and understory layers. With these four elements, the team aimed to structure the varied but connected changes in the sensory experience across the site for pedestrians, cyclists, and motorists. By being consistent in the design response among the structural criteria and in the transitions between them, the end user experience will be both legible and sensitive to context.

Soil types vere also considered. Well-draining soil types are prescribed for bioretention facilities in the District, but native on-site soils were found to be clay-based. Therefore, depending on topography, some areas will be well drained, while others will naturally pond if at low elevations. Some landscaped areas of the site are located adjacent to roads, which will be winterized with salt application. Therefore those plantings needed to be salt-tolerant, while others, such as in the cloverleaf, would be protected from salt-spray. Planned maintenance for this site will certainly be minimal, provided by DDOT. Therefore, high maintenance plantings will be completely unacceptable. Even plants that require attention at widely spaced but regular intervals will be problematic. With this in mind, the team created the following conditional criteria for areas across the site: Wet; Medium-Wet; Dry; Well Drained; Ponding; Elevated; Depressed; Sunny; Part-Shade; Shady; Hot; Cool; Salt-Tolerant; Not Salt-Tolerant; Low Maintenance; Medium Maintenance: Pollution-Tolerant:

> Not Pollution-Tolerant. With the conditional criteria, the team aimed to hold their design to rigorous standards, providing the project with the best chance of long-term survival. Understanding these conditions across the site and through time was seen as the key to the durability of the Access Road Ecotone.







The community types documented by DCR within an approximate 40 mile radius of the city were recorded with their associated plant species along with notes regarding soil type, drainage, exposure, and other physiological conditions in the team's database. In all, sixteen major plant communities were recorded. They include: Coastal Plain / Piedmont Bottomland Forest Types; Bald Cypress - Tupelo Swamps; Piedmont Prairies; Loblolly Pine Savannas; Oak-Hickory Woodlands and Savannas; Pine / Scrub Oak Sandhills; Sand / Gravel / Mud Bars and Shores; Rocky Bars and Shores; Piedmont / Coastal Plain Oak-Beech / Heath Forests; Basic Mesic Forests; Piedmont / Mountain Floodplain Forests; Piedmont / Mountain Swamp Forests; Mesic Mixed Hardwood Forest; Oak / Heath Forests; Acidic Oak - Hickory Forests; Eastern Hemlock - Hardwood Forest, In addition, a recent 2013 survey of plants in the adjacent Shepherd Parkway, conducted by the Maryland Native Plant Society, was included in the database. Essentially, it functions as a baseline of existing flora. In total, the 17 ecological criteria were identified, from which to draw design ideas. The intention was to retain the relationships of plants to plants and of plants to physiological conditions to which they are known to exist and thrive locally. This was to preserve the synergism between plants, and to encourage their success in appropriate soil, light, and inundation levels.







Planting selections were based on three key factors: ecological, conditional, and structural criteria. The design team's site analysis included the evaluation of three primary criteria - ecological, conditional, and structural (or form-based). Ultimately, the intersection of these three criteria became the basis for pant selection and substantially informed the resulting design.

PHASE I - ANALYSIS ECOLOGICAL CRITERIA

ACCESS ROAD ECOTONES



LOCAL TOPOGRAPHIC MAP

The process of ecological analysis included documenting local plant communities in the larger physiogeographic region. The team explored regional and local topographic similarities, using both sets of criteria to select a representative sample of native plant communities that would support native pollinator populations.

REGIONAL PHYSIOGEOGRAPHIC MAP

PHASE I - ANALYSIS CONDITIONAL CRITERIA

ACCESS ROAD ECOTONES

HYDROLOGY STUDY



The design team performed a series of analytical site studies focusing on key site conditions: solar availability, site hydrology, and retaining wall geometry. These studies revealed a range of localized microclimates which formed the basis for the planting strategy.

PHASE I - ANALYSIS STRUCTURAL CRITERIA

ACCESS ROAD ECOTONES

SHARED USE PATH



grass + perennial layer only. ex: grassland, prairie, marsh EDGE canopy/understory trees. grass + perennial layer. ex: savanna, swamp





Divided by roadway infrastructure, a series of interstitial planted areas work together to create ecological and experiential connections throughout the site. Spaces designated as 'Open', 'Edge', 'Transition', and 'Enclosed' each have a unique and legible planting character, providing a rich and dynamic experience for users traversing the site.

PHASE II - OVERLAY PLANTING ZONES

ACCESS ROAD ECOTONES

SHARED USE PATH PLANTING ZONES



HIGHWAY & INTERCHANGE PLANTING ZONES

HIGHWAY & INTERCHANGE SEED MIXES



Conditional and structural criteria were evaluated in order o create a series of distinct planting zones. Each of the nineteen zones is compatible with specific microclimatic conditions and designed to exhibit a recognizable spatial character associated with a local plant community.

PHASE III - ASSESS + DESIGN

ACCESS ROAD ECOTONES

HIGHWAY & INTERCHANGE PLANTING ZONES



FURTHEST FROM SHARED USE PATH	CLOSEST TO SHARED USE PATH	STORMWATER MANAGEMENT FACILITIES

A TYPES			B TYPES	C TYPES			
	STRUCTURAL CRITERIA: > OPEN		STRUCTURAL CRITERIA: > EDGE		STRUCTURAL CRITERIA: > EDGE		STRUCTURAL CRITERIA: > OPEN/EDGE
Δ1	CONDITIONAL CRITERIA: > open. dry. sunny. long stretches.	B1	CONDITIONAL CRITERIA: > sloped. dispersed understory tree cover >> part sun/shade. PM sun.	C1	CONDITIONAL CRITERIA: > drainage basins. inundation + drought. canopy tree cover >> part shade.	СЗ	CONDITIONAL CRITERIA: > drainage ditches. inundation + drought. 'meadow' side.
	ECOLOGICAL CRITERIA: > piedmont prairie		ECOLOGICAL CRITERIA: > oak-hickory savanna		ECOLOGICAL CRITERIA: > piedmont bottomland forest & sand/gravel/mud shores		ECOLOGICAL CRITERIA: > sand/gravel/mud shores
	OTHER DESIGN CRITERA: > biggest pollinator workhorse >> highest diversity of forb species > warm color blooms dominant w/ cool color blooms 'dotting' the meadow		OTHER DESIGN CRITERA: > lower % grasses than A1, high diversity of forb species > warm color blooms dominant w/ cool color blooms 'dotting' the meadow		OTHER DESIGN CRITERA: > high % grasses + grass-like species, medium diversity of forb species > mixed warm + cool color blooms		OTHER DESIGN CRITERA: > warm color blooms dominant
	STRUCTURAL CRITERIA: > OPEN		STRUCTURAL CRITERIA: > EDGE		STRUCTURAL CRITERIA: > OPEN		STRUCTURAL CRITERIA: > OPEN/EDGE
Δ2	CONDITIONAL CRITERIA: > open. dry. sunny. long stretches in cleared + grubbed areas.	B2	CONDITIONAL CRITERIA: > sloped. dispersed understory tree cover $>>$ part sun/shade. AM sun.	C2	CONDITIONAL CRITERIA: > interstate bioswales. inundation + drought. open. part sun/shade.	C4	CONDITIONAL CRITERIA: > drainage ditches. inundation + drought. 'woodland' side.
	ECOLOGICAL CRITERIA: > piedmont prairie		ECOLOGICAL CRITERIA: > oak-hickory savanna		ECOLOGICAL CRITERIA: > sand/gravel/mud shares		ECOLOGICAL CRITERIA: > sand/gravel/mud shores
	OTHER DESIGN CRITERA: > simplified + cheaper version of A1, more grasses fewer forb species > warm color blooms dominant w/ cool color blooms 'dotting' the meadow		OTHER DESIGN CRITERA: > lower % grasses than A1, high diversity of forb species > cool color blooms dominant w/ warm color blooms 'dotting' the meadow		OTHER DESIGN CRITERA: > high % grasses + grass-like species, high diversity of forb species > mixed warm + cool color blooms		OTHER DESIGN CRITERA: > cool color blooms dominant
			STRUCTURAL CRITERIA: > EDGE				
		B3	CONDITIONAL CRITERIA: $>$ sloped. dispersed understory tree cover $\;>>\;$ part sun/shade. late AM-PM sun.				
			ECOLOGICAL CRITERIA: > acidic oak-hickory forest				
			OTHER DESIGN CRITERA: > higher % woodland grasses than B1-2, medium diversity of farb species > cool color blooms dominant w/ warm color blooms 'dotting' the meadow				

A series of seed mix zones were developed for several large open areas located within the interchange. 'A' type seed mixes are optimized for drier areas whereas 'C' types are optimized for the unique combination of wet and dry conditions associated with stormwater management facilities.

PHASE III - ASSESS + DESIGN

ACCESS ROAD ECOTONES

SHARED USE PATH PLANTING ZONES



CLOSEST TO NEIGHBORHOOD ROADS & SIDEWALKS OPEN/EDGE

TRANSITION

FURTHEST FROM NEIGHBORHOOD ROADS & SIDEWALKS ENCLOSED

	E TYPES		T TYPES	W TYPES				
E1	STRUCTURAL CRITERIA: > OPEN CONDITIONAL CRITERIA: > sunny. wet. depressed. ECOLOGICAL CRITERIA: > rocky bars & shores	TI	STRUCTURAL CRITERIA: > TRANSITION CONDITIONAL CRITERIA: > sunny. dry. elevated. ECOLOGICAL CRITERIA: > pine/scrub oak sandhills	W1	STRUCTURAL CRITERIA: > ENCLOSED CONDITIONAL CRITERIA: > shady. dry. depressed. ECOLOGICAL CRITERIA: > acidic oak-hickory forests	W4	STRUCTURAL CRITERIA: > ENCLOSED CONDITIONAL CRITERIA: > partsun. vet. depressed. ECOLOGICAL CRITERIA: > shepherd parkway (local)	
E2	STRUCTURAL CRITERIA: > EDGE CONDITIONAL CRITERIA: > sunny. dry. elevoted. ECOLOGICAL CRITERIA: > oak-hickory woods & savannas	T2	STRUCTURAL CRITERIA: > TRANSITION CONDITIONAL CRITERIA- > shady. wet. depressed. ECOLOGICAL CRITERIA: > piedmont/mountain swamp forests	W2	STRUCTURAL CRITERIA: > ENCLOSED CONDITIONAL CRITERIA: > shady. dny. depressed. ECOLOGICAL CRITERIA: > ook-heath forests	W5	STRUCTURAL CRITERIA: > ENCLOSED CONDITIONAL CRITERIA: > part-sun. dry. ECOLOGICAL CRITERIA: > oak-hickory woods & savannas	
		тз	STRUCTURAL CRITERIA: > TRANSITION CONDITIONAL CRITERIA: > sunny. wet. depressed. ECOLOGICAL CRITERIA: > rocky bars & shores	W3	STRUCTURAL CRITERIA: > ENCLOSED CONDITIONAL CRITERIA: > part-sun. wet. depressed. ECOLOGICAL CRITERIA: > coastal plain/piedmont bottomland forest			

The second series of planting zones were developed for the four-foot bioretention facility that runs adjacent to the shared-use path. These areas will be directly experienced by pedestrians and cyclists. Accordingly, they are planted with nursery stock and will be maintained seasonally.

PHASE IV - PLANT SELECTION HIGHWAY & INTERCHANGE PLANTING ZONES

SEED MIX A1 - PIEDMONT PRAIRIE REFERENCE





rium - Little Bluestem - 20% Elvmus virginicus - Virginia Wildrve - 10% Panicum virgatum - Switchgrass - 08% Andropogon virginicus - Broomsedge - 07%

SEED MIX A2 - PIEDMONT PRAIRIE REFERENCE



Schizachyrium scoparium - Little Bluestem - 25% Panicum virgatum - Switchgrass - 15% Andropogon virginicus - Broomsedge - **15%** Elymus virginicus - Virginia Wildrye - **10%** Tridens flavus - Purpletop - 05%

TREE SPECIES - W/IN INTERCHANGE PLANTING ZONES



Platanus occidentalis - American Sycamor

Amelanchier x grandiflora - Serviceberry

FORBS - 55% Solidago juncea - Early Goldenrod - 07% olidaao nemoralis - Grav Goldenrod - 05% Solidago speciosa - Showy Goldenrod - 05% Pycnanthemum tenuifolium - Slender Mountainmint - 05% Other species (11) - 33%



FORBS - 30% Rudbeckia triloba - Brown-eyed Susan - **05%** Pycnanthemum tenuifolium - Slender Mountainmint - **05%** Coreopsis lanceolata - Lanceleaf Coreopsis - **05%** Echinacea purpurea - Purple Coneflower - **02%** Other species (8) - 13%

Cercis canadensis - Eastern Redbud

SEED MIX B1 - OAK-HICKORY SAVANNA REFERENCE



ium - Little Bluestern - 15% zachvrium s Elvmus virginicus - Virginia Wildrve - 10% Panicum virgatum - Switchgrass - 08% Agrostis perennans - Autumn Bentgrass - 07%

Rudbeckia triloba - Brov award Susran - 08% Solidago caesia - Bluestem Goldenrod - 07% Solidago juncea - Early Goldenrod - 07% Eurybia divaricata - White Wood Aster - 05% Other species (10) - 33%

SEED MIX B2 - OAK-HICKORY SAVANNA REFERENCE



Baptisia australis - Blue False Indigo - **08%**

Echinacea purpurea - Purple Coneflower - 07% Monarda fistulosa - Wild Bergamot - **06%** Penstemon digitalis - Tall White Beardtounge - **05%** Other species (10) - 34%

SEED MIX B3 - ACIDIC OAK-HICKORY FOREST REFERENCE



ACCESS ROAD ECOTONES

SEED MIX C1 - PIEDMONT BOTTOMLAND FOREST REFERENCE



GRASSES - 55% Chasmanthium latifolium - River Oats - 15%

Panicum riaidulum - Redtop Panicarass - 12% Elymus virginicus - Virginia Wildrye - **08%** Elymus riparius - Riverbank Wildrye - **07%** Other species (3) - 13%

FORBS - 45% inum - Mietflower - 08% Eupatorium c Asclepias incarnata - Swamp Milkweed- 08% Lobelia spicata - Pale Spiked Cardinal Flower - 05% Lobelia siphilitica - Blue Cardinal Flower - 05%

Other species (6) - 19%

SEED MIX C2 - PIEDMONT BOTTOMLAND FOREST REFERENCE



GRASSES - 55% Chasmanthium latifolium - River Oats - 12% Panicum rigidulum - Redtop Panicgrass - 12% Elymus virginicus - Virginia Wildrye - **08%** Elymus riparius - Riverbank Wildrye - **07%** Other species (4) - 15%

FORBS - 45% Eupatorium coelestinum - Mistflower - 08% Asclepias incarnata - Swamp Milkweed- 08% Helenium autumnale - Common Sneeseweed - 05% Lobelia cardinalis - Cardinal Flower - 05% Other species (9) - 19%

SEED MIX C3+4 - SAND/GRAVEL/MUD SHORES REFERENCE



Elymus virginicus - Virginia Wildrye - 08% Panicum rigidulum - Redtop Panicgrass - 07% Other species (5) - 32%

Helenium autumnale - Common Sneeseweed - 07% Lobelia cardinalis - Cardinal Flower - $\boldsymbol{07\%}$ Other species (8-12) - 21-22%

Open meadow zones within the project area constitute the most significant contribution to local pollinator habitat. These zones, principally experienced by vehicular users at high speed, are designed to highlight color and texture based on effective combinations of plant species, including when they are flowering.



PHASE IV - PLANT SELECTION HIGHWAY & INTERCHANGE PLANTING ZONES - SEED MIX A1

ACCESS ROAD ECOTONES





Elymus virginicus Virginia Wildrye 10%



Panicum virgatum Switchgrass 08%



Andropogon virginicus Broomsedge 07%

Schizachyrium scoparium Little Bluestem 20%

FORBS - 55%



Solidago juncea Early Goldenrod 07%



Solidago nemoralis Gray Goldenrod 05%



Solidago speciosa Showy Goldenrod 05%



Slender Mountainmint 05%



Coreopsis lanceolata Lanceleaf Coreopsis 05%

Chamaecrista fasciculata Partridge Pea 05%





Rudbeckia hirta Black-eyed Susan 03%



Asclepias syriaca Common Milkweed 04%



04%

Symphyotrichum novae-angliae Heleiopsis helianthoides New England Aster Oxeye Sunflower 03%

Asclepias tuberosa Butterfly Milkweed



Echinacea purpurea Purple Coneflower 03%



02%

Aquilegia canaden-



sis Red Columbine 0.5%

Liatris spicata Blazing Star 0.5%

Seed Mix A1 contains principal species found in the Piedmont Prairie plant community. Dominated by grasses, the planting mix includes a diverse array of native forbs. Species selections emphasize extended bloom time and favor plants that provide nesting opportunities for native pollinators.

03%



PHASE IV - PLANT SELECTION

SHARED USE PATH PLANTING ZONES - E2 & T3

ACCESS ROAD ECOTONES

E2 species

CANOPY LAYER Quercus falcata - Southern Red Oak —

T3. TRANSITION ZONE

GRASS + PERENNIAL LAYER Eupatorium hyssopifolium - Hyssopleaf Thoroughwort -Rudbeckia hirta 'Indian Summer' - Black Eyed Susan Sorghastrum nutans - Indian Grass -Schizachyrium scopacium - Little Bluestem -Solidago sphacelata 'Golden Fleece' - Goldenrod -

T3 species

EZ. EDGEZONE

CANOPY LAYER — Betula Nigra 'Dura Heat' - River Birch

SHRUB LAYER

Itea virginica 'Henry's Garnet' - Virginia Sweetspire Hydrangea quercifolia 'Pee Wee' - Oakleaf Hydrangea Clethra alnifolia 'Compacta' - Summersweet

Shared-use path planting zones are experienced serially by users and, because plant selections are based on a variety of site conditions, help to clearly articulate transitions between microclimates along the shared use trail.

PHASE IV - PLANT SELECTION

SHARED USE PATH PLANTING ZONES - W4 & W5

ACCESS ROAD ECOTONES

W5 species

CANOPY LAYER Quercus falcata - Southern Red Oak -

UNDERSTORY LAYER Chionanthus virginiana - Fringe Tree —

WS. ENCLOSED ZONE

SHRUB, GRASS + PERENNIAL LAYER Helianthu's divaricatus - Woodland Sunflower – Echinacea purgurea - Purple Coneflower – Schizachyrium scoparium - Little Bluestem – Rhus aromatica 'Gro-Low - Erggrant Sumac

W4 species

Wa. ENCLOSED ZONE

CANOPY LAYER Diospyros virginiana - Common Persimmon

UNDERSTORY LAYER Cercis canadensis 'Oaklahoma' - Eastern Redbud

SHRUB, GRASS + PERENNIAL LAYER Polygonatum biflorum var. communtatum - Large Soloman's Seal Asclepias incarnata - Swamp Milkweed Panicum virgatum 'Shenandoah' - Switchgrass

'Enclosed' zones are located furthest from intersecting roadways and are experienced by users fully immersed within the landscape. These planting zones include communities of five to eight recognizable plant species that will be maintained seasonally.

PHASE IV - PLANT SELECTION SHARED USE PATH PLANTING ZONES

E2

ACCESS ROAD ECOTONES



UNDERSTORY LAYER

E1

SHRUB, GRASS + PERENNIAL LAYER

structural criteria: OPEN conditional criteria: HOT, SUNNY, WET ecological criteria: ROCKY BARS & SHORES

structural criteria: EDGE conditional criteria: HOT, SUNNY, DRY ecological criteria: OAK HICKORY WOODS/SAVANNAS T1 structural criteria: TRANSITION

structural criteria: TRANSITION conditional criteria: HOT, SUNNY, DRY ecological criteria: PINE/SCRUB OAK SANDHILLS structural criteria: TRANSITION conditional criteria: COOL, SHADY, WET ecological criteria: PIEDMONT/MTN. SWAMP FORESTS

T2

structural criteria: TRANSITION conditional criteria: HOT, SUNNY, WET ecological criteria: ROCKY BARS & SHORES

ΤЗ





structural criteria: ENCLOSED conditional criteria: SHADY, DRY ecological criteria: ACIDIC OAK HICKORY FORESTS

structural criteria: ENCLOSED conditional criteria: SHADY, DRY ecological criteria: OAK HEATH FORESTS



structural criteria: ENCLOSED conditional criteria: HOT, PART-SUN, WET ecological criteria: COASTAL PLAIN/PIEDMONT BOTTOMLAND FOREST



ecological criteria: SHEPHERD PARKWAY [LOCAL]



structural criteria: ENCLOSED conditional criteria: HOT, PART-SUN, DRY ecological criteria: OAK HICKORY WOODS/SAVANNAS

SEASONAL CHARACTERISTICS - trees, shrubs, & vines



Together, the shared-use planting zones include a wide selection of native plants, organized into nineteen groups appropriate for use in urban and semi-urban conditions. These plant lists have been published for use by landscape architects in the Mid-Atlantic region.

ECOLOGICAL COMMUNITY RELATIONSHIPS

ACCESS ROAD ECOTONES



SEASONAL CHARACTERISTICS - forbs, grasses, sedges & rushes

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Parthenocissus quinquefolia- Virginia Creeper Decumaria barbara Campsis radicans- Trumpet Creeper											_	
Ageratina altissima- White Snakeroot Agrostis perennans- Autumn Bentgrass Andropogon virginicus- Broomsedge												
Antennaria Plantaginifolia Baptisia australis- Blue Wild Indigo Asclepias tuberosa- Butterfly Weed												
Asclepias syriaca- Common Milkweed Asclepias incarnata- Swamp Milkweed Aquilegia canadensis- Wild Columbine												
Carex lurida- Sallow Sedge Carex lurida- Sallow Sedge Carex lupulina Chamaecrista fasciculata- Partridge Pea												
asmanthium latifolium- River Oats, Spanglegrass Desmodium canadense Coreopsis verticillata- Threadleaf Coreopsis												
Coreopsis lanceolato- Longstalk Coreopsis Chrysogonum virginianum- Green and Gold Chelone glabra- White Turtlehead Eupatorium perfoliatum- Common Boneset												
Eupatoriadelphus fistulosus- Joe-Pye Weed Elymus virginicus- Virginia Wild Rye												

The Access Road Ecotones project will function as a long-term testing ground for the effectiveness of this specific design methodology and the plant mixes developed herein. It will also serve as a resource for further research into pollinator habitat and the use of plant community based design.