

CIVIL ARTS OASIS



LARC 8150

Nadia Hartman
Jordan Livingston
Elizabeth Pruden
Michael Tyler

ACKNOWLEDGMENTS

CLEMSON UNIVERSITY FACILITIES

Livingston & Co. would like to take a moment to acknowledge Clemson University's Chief Facilities Officer, Todd Barnette, and Director of Landscape Services, Tommy Fallow for providing this opportunity for the Spring 2023 class of Planting Design to propose grading changes and planting plans to improve the water tower and storm water management of the site.

LARC DEPARTMENT

Livingston & Co would also like to acknowledge the efforts of Lara Browning and Paul Russell to maintain a relationship with University Facilities and provide graduate and undergraduate students with real-world projects and a competitive environment to stimulate creativity and drive.

AUTHORS



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Key Interest:
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Features

Affiliations: ASLA, Baking Club

Favorite Tree: European Beech



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Favorite Tree: Tulip Poplar



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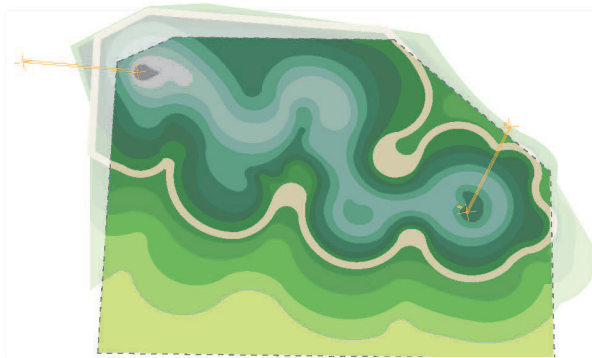
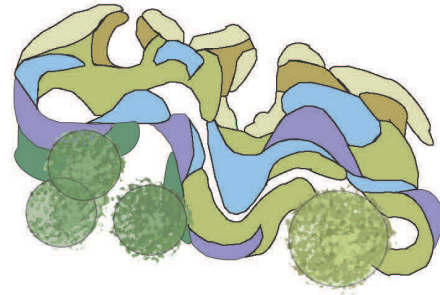
CIVIL ARTS OASIS: PROJECT INTRODUCTION AND PROCESS

INTRODUCTION:

Clemson University operates a water tower at 202 Hugo Drive, Seneca, SC 29678. According to SC DHEC Law, the water tower must be drained twice a day to prevent bacteria buildup within the pipes that supply Clemson University's West Campus with drinking water.

This draining of the water tower dumps approximately 12,500 gallons of water in the surrounding area that is then routed down the hillside towards Lake Hartwell. Because of South Carolina's heavy clay soil, the water receives little ground infiltration; also, because of poor existing grading, much of the water pools in front of Clemson ARTS facility.

We have been tasked to design a site in front of ARTS facility that addresses these issues and provides an opportunity for educating the public on proper storm water management.



PROCESS:

We conducted a site visit on March 27th, 2023 where we analyzed and photographed the site. We collected data on existing plants, erosion patterns, and received an existing grading plan. We then, conducted a site analysis and began drafting our design.

We, first, established our concept and began drafting a grading plan. Afterwards, we created a list of plants that are native and conducive to our proposed site. Finally, we created a preliminary planting design to present to Tommy Fallow.

Using his feedback, we drafted a final planting design and graphic planting plan. We have combined these illustrative documents into this booklet for your understanding. We hope you enjoy!

1

CIVIL ARTS OASIS: LID & GREEN INFRASTRUCTURE

LOW-IMPACT DESIGN(LID)

Refers to practices that manage storm water in such a way that imitates the natural processes and hydrology which result in ground infiltration or evapotranspiration.

GREEN INFRASTRUCTURE

Used by the EPA to refer to the management of wet weather flows that use these hydrological processes, as well as provide habitat, flood protection, cleaner air and cleaner water.

The purpose of this type of implementation is to protect water quality and associated aquatic habitat. It aims to preserve, restore and create green space using soils, vegetation, and rainwater harvest techniques.

THE PATH OF WATER

In a mature forest setting, the natural hydrology of the place is when precipitation falls, it disperses almost entirely along the forest floor. It then naturally infiltrates into the ground where it can then be soaked up by plant roots or evaporates.

In developed areas where forests and natural open spaces are cleared, and replaced by buildings, roads, parking areas and lawns, the hydrology of the place is that rainfall becomes storm water runoff, carrying pollutants to nearby waterways. In this landscape, much less water is able to infiltrate the ground and be soaked up by plants, and even less is able to evaporate back to the atmosphere.

BENEFITS AND IMPLEMENTATION

By employing principles such as preserving and recreating natural landscape features, LID minimizes imperviousness in order to create functional and appealing site drainage. In this way, *storm water is treated as a resource rather than a waste product.*

Through these practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed. Applied on a broad scale, LID can maintain or restore a watershed's hydrological and ecological functions as well as reduce flooding and protect developed property.

Many practices can be used to implement the principles of LID

- Bio-retention Facilities
- Rain Gardens
- Vegetated (Green) Rooftops
- Rain Barrels
- Permeable Pavements

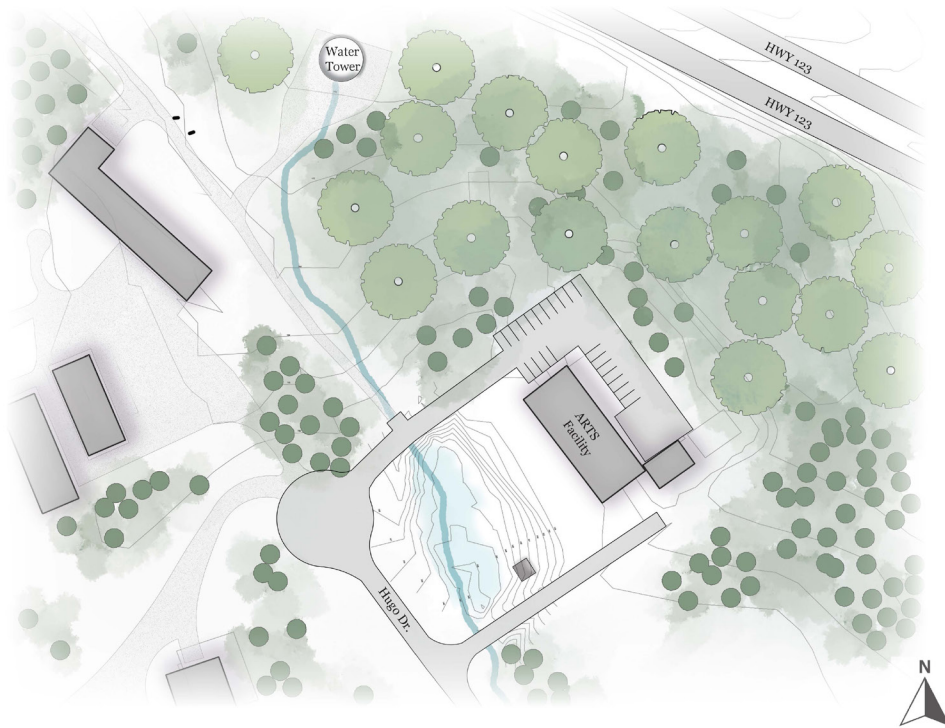
RESOURCES

EPA, Environmental Protection Agency, <https://www.epa.gov/nps/urban-runoff-low-impact-development>.

"Green Infrastructure and Low Impact Development." Department of Environmental Protection, <https://dep.wv.gov/WWE/Programs/nonptsources/Pages/LID.aspx>.

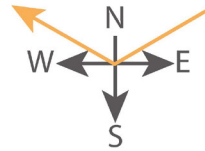
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CIVIL ARTS OASIS: SITE ANALYSIS

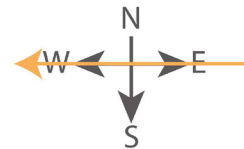


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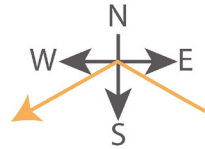
Sun Paths Summer Solstice



Equinox



Winter Solstice



CIVIL ARTS OASIS: CONCEPT

The project site, located near Clemson's Asphalt Rubber Technology Service (ARTS) office is currently a small, insufficiently graded drainage basin and an eyesore. The primary challenge on this site is frequent saturation and erosion risk, with some restrictions imposed by buried fiber cables and overhead power lines. Clemson Facilities has requested that the drainage be addressed with a design which can be toured to educate visitors about storm water management, as well as improve the beauty and enjoyment of the property for ARTS employees.

Our concept for this project is to create a place which addresses these needs while taking advantage of water's intrinsic value for providing a sense of tranquility and restoration. To achieve this we propose an artful grading abstracting flow and a selection of vegetation which thrives in persistently moist conditions.

Limited Native Plant Palette

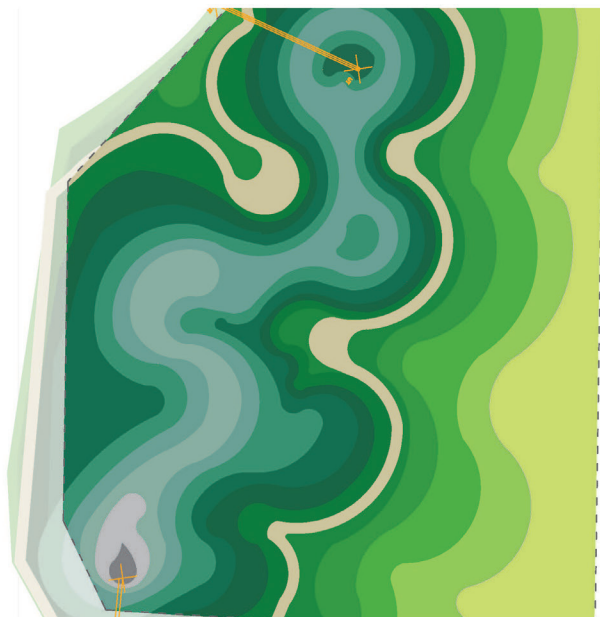
- Drinks up storm water
- Stabilizes slopes, prevents erosion
- Extremely Low-Maintenance
- Easy to explain function

All-Season Design

- Evergreens and interesting deciduous trees
- Popping fall contrast
- Series of blue and white blooms from spring to frost

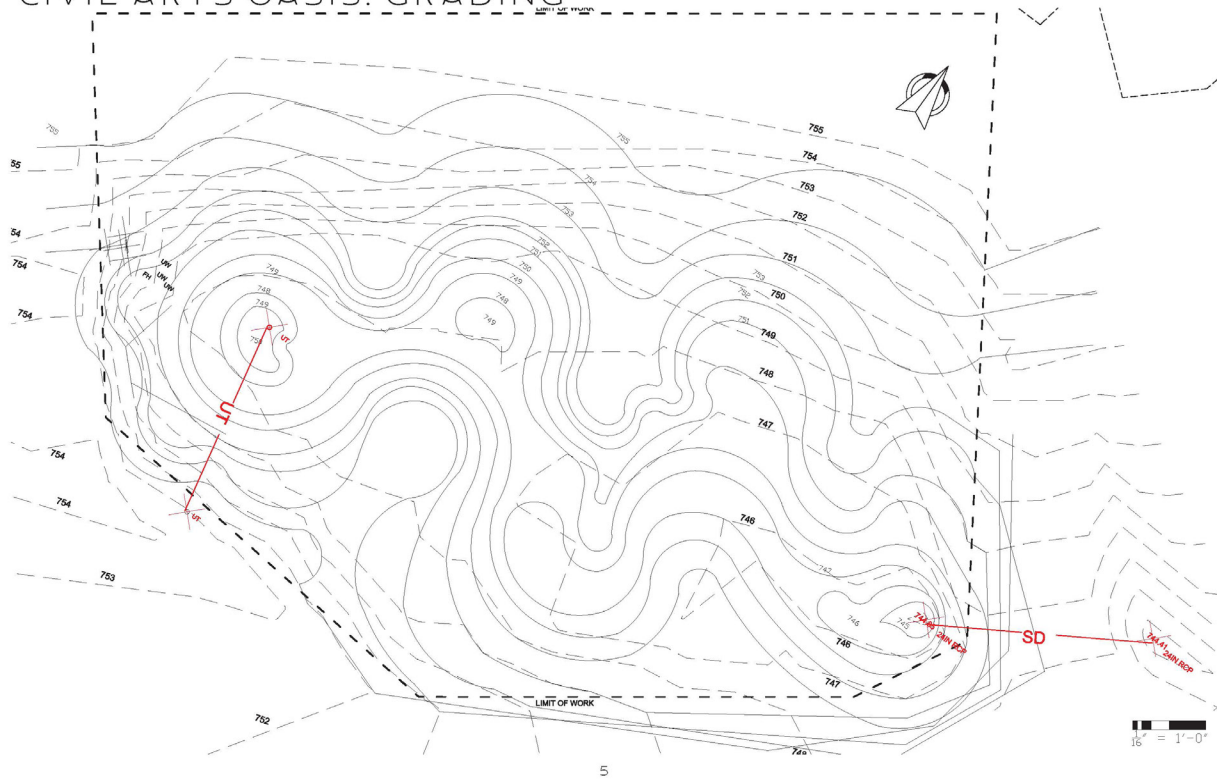
Employee Enjoyment

- Three level-graded areas for picnic tables or benches
- Walking loop

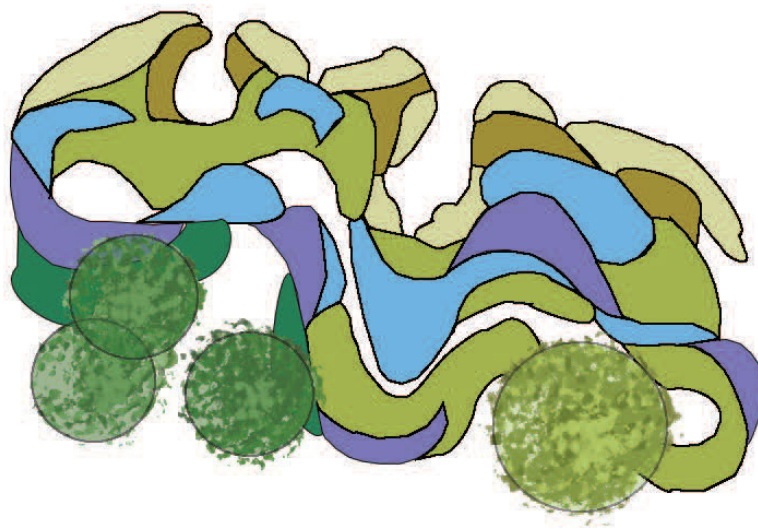


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CIVIL ARTS OASIS: GRADING



CIVIL ARTS OASIS: ILLUSTRATIVE MASTER PLAN



CIVIL ARTS OASIS: PLANT PALETTE

TREES & SHRUBS



GROUND COVER



7

CIVIL ARTS OASIS: SEASONAL DIAGRAM



NOTES

Does well in persistent moisture.

More upright than *Itea* and blooms later, flowers look similar.

Cherokee Princess resists anthracnose.
Alts: *Amelanchier canadensis* 'Trazam'

Inconspicuous flower. Provides winter cover for wildlife.

Abundant Gold fruit. Pollinate with Mr. Poppins.

Suckering stabilizes soil. Optional: prune immediately after flowering.

Dioecious. Female will produce red drupes if fertilized. Host to Spicebush Swallowtail.

Dioecious. Female will produce blue drupes if fertilized.

Fall leaves nearly pink, many have contrasting yellow venation.

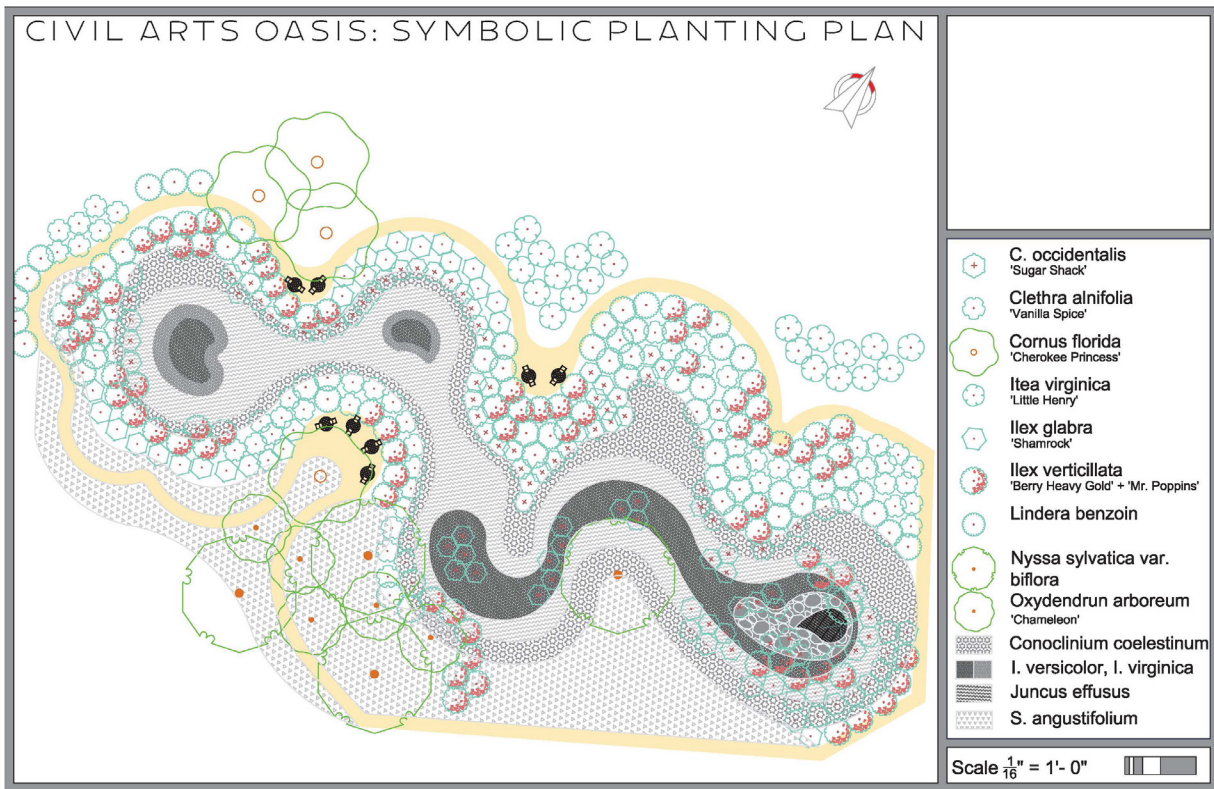
Spreads freely, blooms from late summer to frost. Popular with pollinators.

Planting both *versicolor* and *virginica* will create the appearance of a longer bloom season.

Dies back in winter, briefly takes a yellow hue in fall while transitioning to dormancy.

Flowers open during the day and close at night. Resembles grass when not in flower.

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CIVIL ARTS OASIS: PLANTING SCHEDULE

TREES	COMMON & BOTANICAL NAMES	CALIPER	SPACING	QUANTITY	NOTES
	<i>Cornus florida</i> 'Cherokee Princess'	2"	20'	4	Resists spot anthracnose.
	Cherokee Princess Dogwood				Alt. <i>Amelanchier canadensis</i> 'Trazam' has a single leader
	<i>Oxydendrum arboreum</i> 'Chameleon'	2"	12-24'	5	
	Chameleon Sourwood				
	<i>Nyssa sylvatica</i> var. <i>biflora</i>	2.5"	40'	4	
	Swamp Tupelo				
SHRUB	COMMON & BOTANICAL NAMES	CONTAINER	SPACING	QUANTITY	NOTES
	<i>Cephalanthus occidentalis</i> 'Sugar Shack'	3 Gal	3'	98	
	Sugar Shack Buttonbush				
	<i>Clethra alnifolia</i> 'Vanilla Spice'	3 Gal	6'	49	
	Vanilla Spice Summersweet				
	<i>Ilex glabra</i> 'Shamrock'	1 Gal	3'	42	
	Shamrock Inkberry				
	<i>Ilex verticillata</i> 'Roberta Case' and 'FarrowMrP'	1 Gal	5'	79	67 Female 'Roberta Case', 12 Male 'Mr Poppins'
	Berry Heavy Gold (F) and Mr. Poppins (M) Wintergreen				
	<i>Itea virginica</i> 'Little Henry'	2 Gal	5'	22	Transition ARTS lawn to Oasis
	Little Henry Sweetpire				
	<i>Lindera benzoin</i>	1 Gal	10'	60	
	Spicebush				
GROUND COVER	COMMON & BOTANICAL NAMES	CONTAINER	SPACING	QUANTITY	NOTES
	<i>Conoclinium coelestinum</i>	Tray	30"	450	Available as 50-plug trays or seed
	Blue Mistflower				
	<i>Iris versicolor</i>	Bare Root	24"	302	In <i>I. versicolor</i> areas, use blend of 75% versicolor, 25% virginica
	Blue Flag				
	<i>Iris virginica</i>	Bare Root	24"	141	In <i>I. virginica</i> areas, use blend of 75% virginica 25% versicolor
	Southern Blue Flag				
	<i>Sisyrinchium angustifolium</i>	Tray	12"	3850	Available as plugs or seed
	Blue-Eyed Grass				
	<i>Juncus effusus</i>	Tray	30"	400	Available as plugs
	Soft Rush				

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CIVIL ARTS OASIS: MANAGEMENT PLAN

PLANT DATA:

STRUCTURAL LAYER:

All the trees that we have selected are tolerant of poorly drained soils and native to the area. These trees are fairly slow growing and have irregular branch structures. All three are prone to diseases.

SEASONAL INTEREST LAYER:

All the shrubs that we have selected are tolerant of poorly drained soils and native to the area. These shrubs are all fairly aggressive; this is intentional to hinder success of invasive Chinese Privet seen on site.

GROUND COVER LAYER:

All the ground cover plants we have selected are very tolerant of wet feet. These plants will spread with thick root systems that will help break apart the dense clay soils.



Oxydendrum arboreum



Cornus florida

RECOMMENDATIONS:

STRUCTURAL LAYER:

The trees are meant to grow with irregular branch structures, so the trees should not be staked. We recommend planting the trees without mulch rings to minimize bark decay above the root crown.

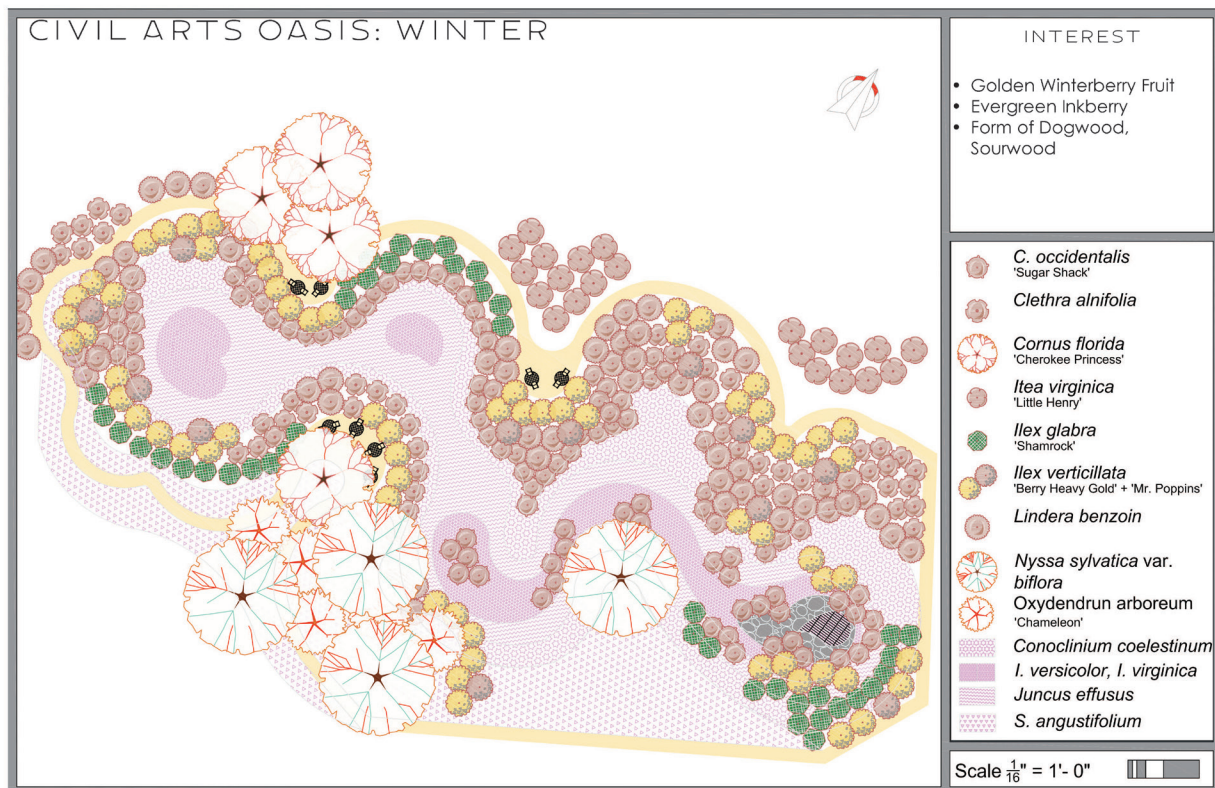
SEASONAL INTEREST LAYER:

The aggressiveness of the shrubs is by design. We recommend very minimal pruning of the shrubs to allow for dense growth to achieve the naturalistic aesthetic.

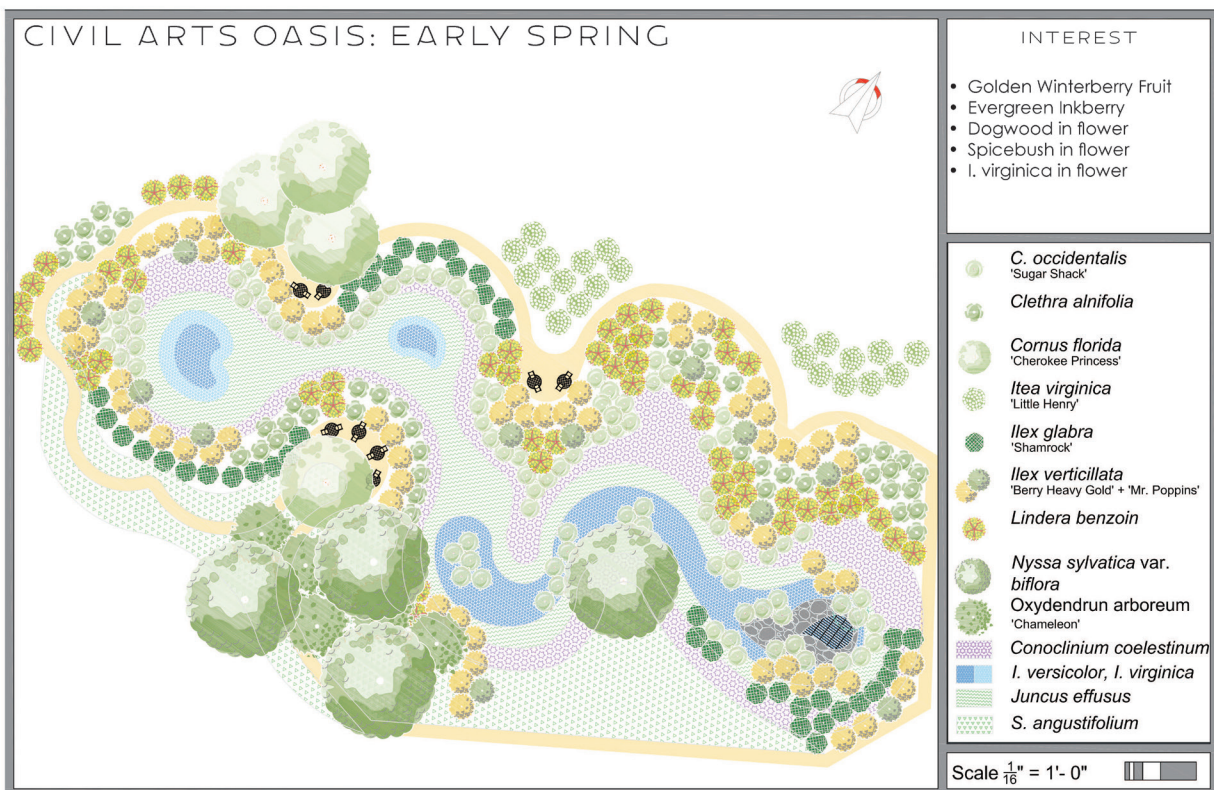
GROUND COVER LAYER:

The aggressiveness of the ground covers is, also, by design. We recommend letting the plants compete to achieve the density and massing that exists in nature.

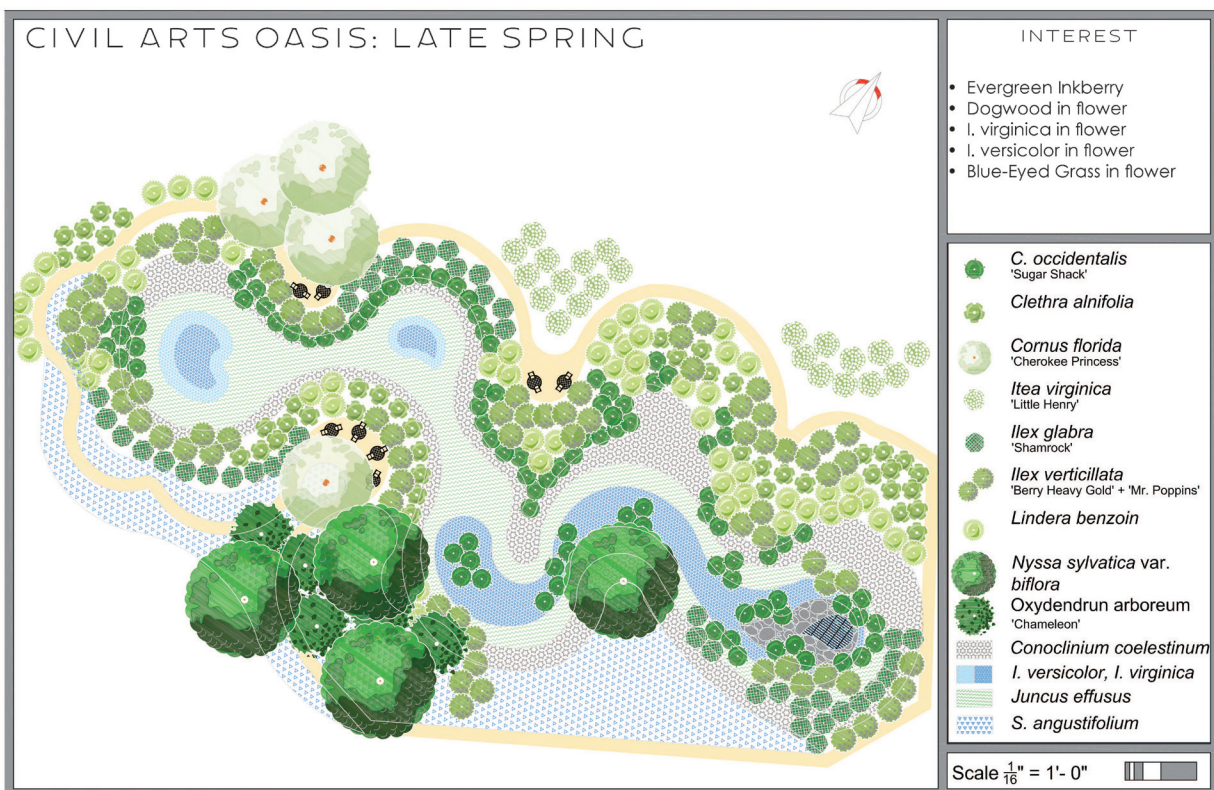
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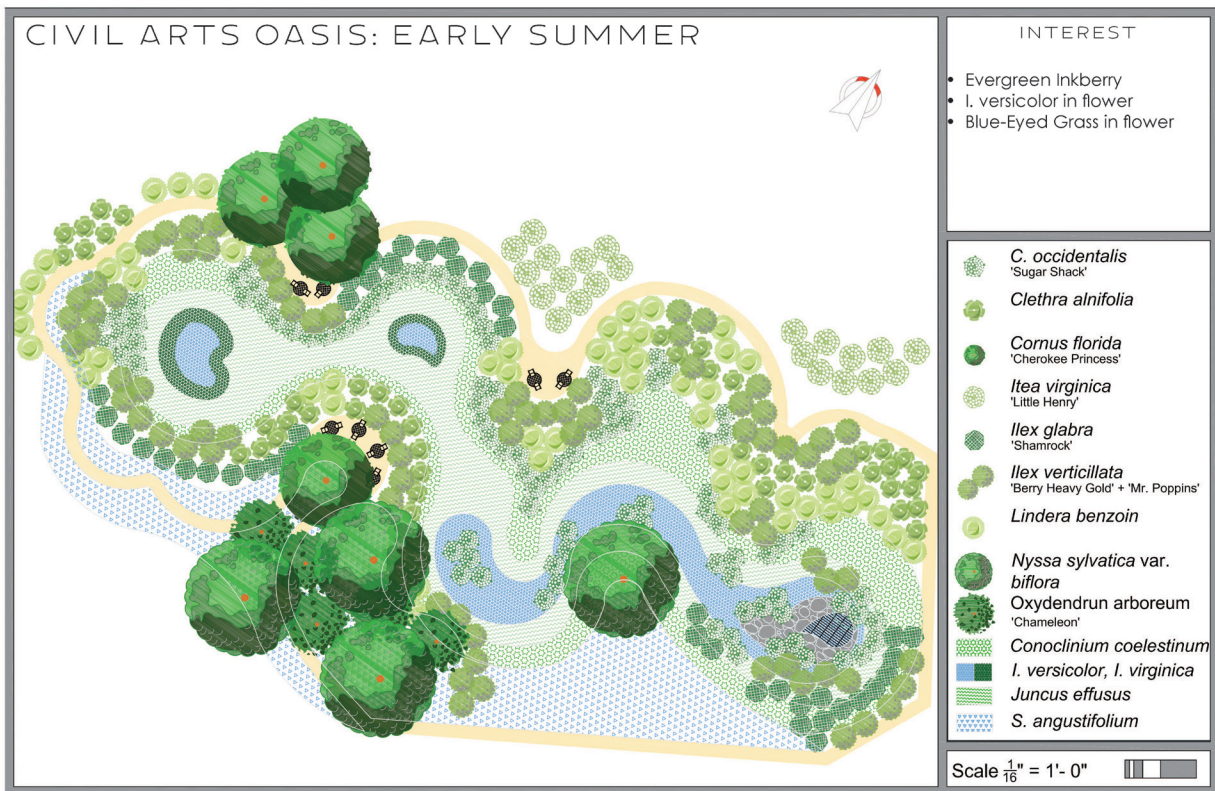
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13



14



15

CIVIL ARTS OASIS: CONCEPT

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Limited Native Plant Palette

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- Easy to explain function

All-Season Design

- Evergreens and interesting deciduous trees
- Popping fall contrast
- Series of blue and white blooms from spring to frost

Employee Enjoyment

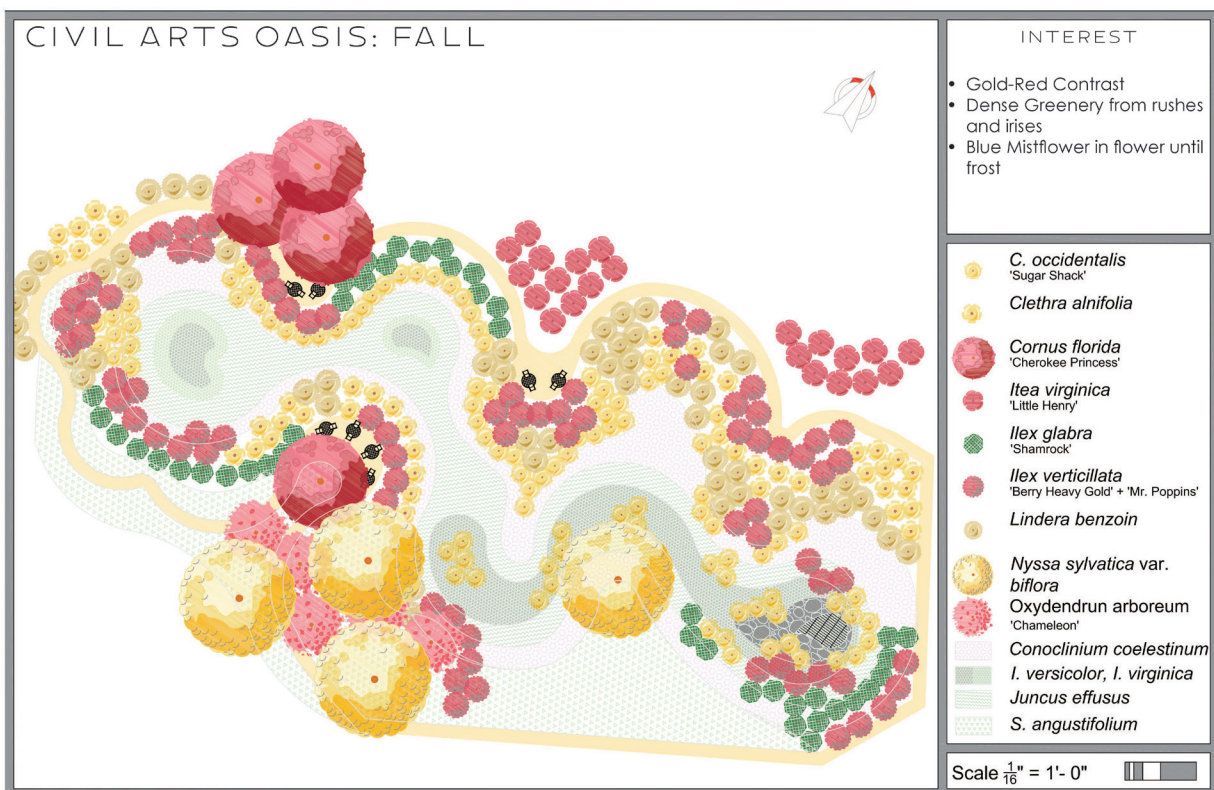
- Three level-graded areas for picnic tables or benches
- Walking loop



4



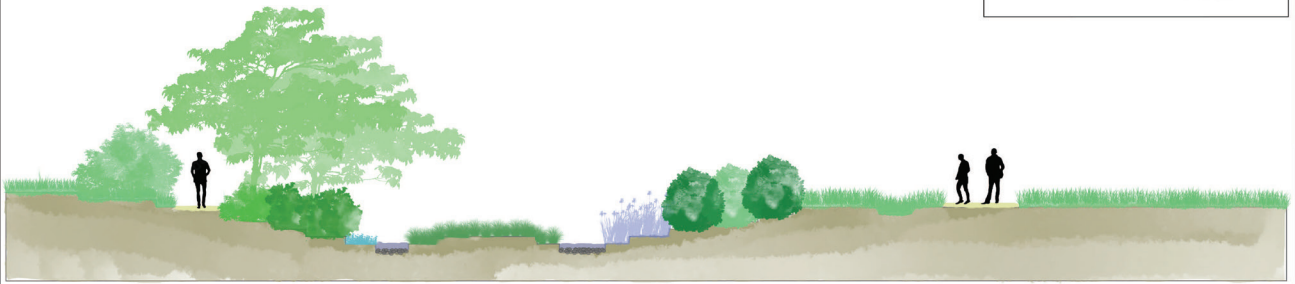
16



17

CIVIL ARTS OASIS: INTAKE SECTION

Inlet End Section : $\frac{3}{32} = 1'-0"$

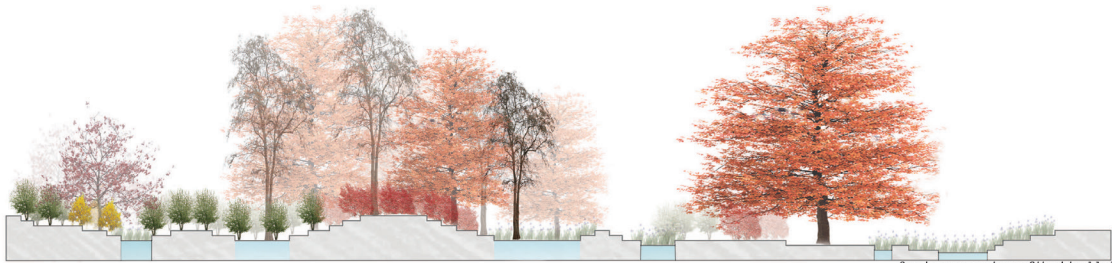


Scale accurate as fitted to 11x17 format

18

CIVIL ARTS OASIS: LENGTHWISE SECTION

Lengthwise Section from Inlet to Outlet : $\frac{1}{16} = 1'-0"$



Scale accurate as fitted to 11x17 format

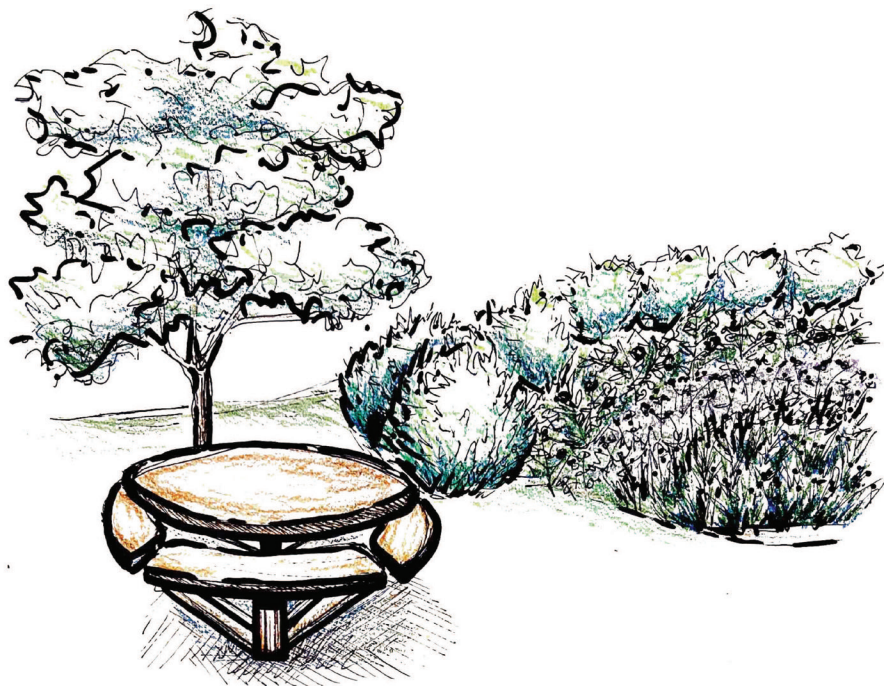
19

CIVIL ARTS OASIS: FALL WALK PERSPECTIVE



20

CIVIL ARTS OASIS: SUMMER PICNIC

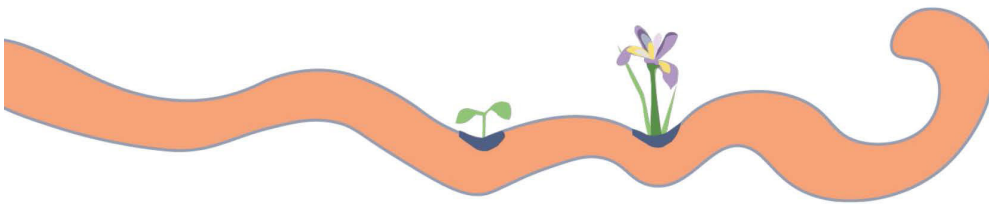


21

TIGER SWALES

A BIOSWALE PLANTING PLAN FOR ECOLOGICAL AND HUMAN WELLNESS BENEFITS

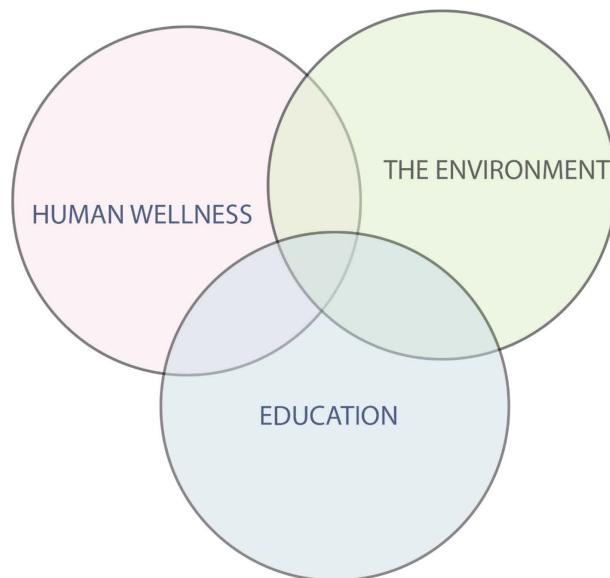
DESIGNED BY-
APRIL RIEHM, EMILY ALLEN, MARSHALL PERKINS & STANDRA JONES



CONCEPT

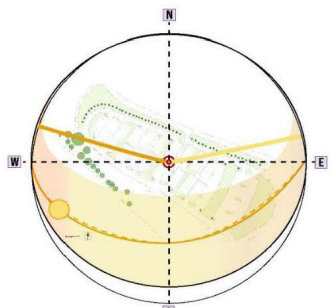
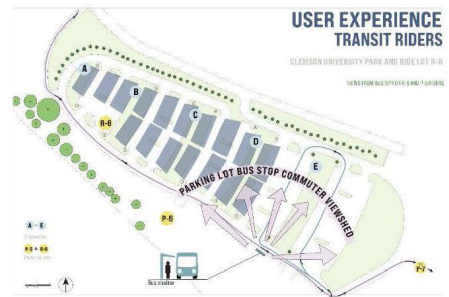
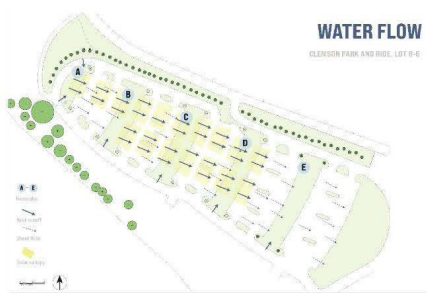
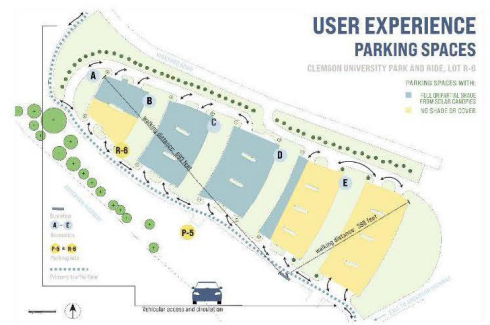
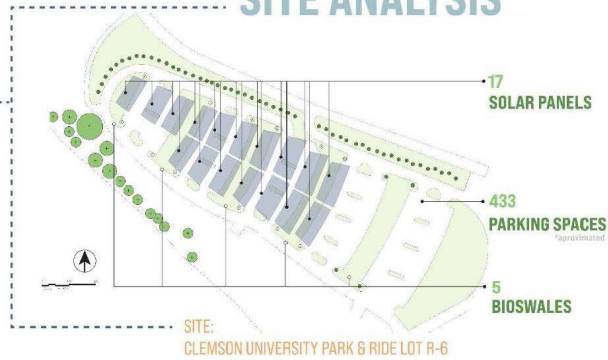
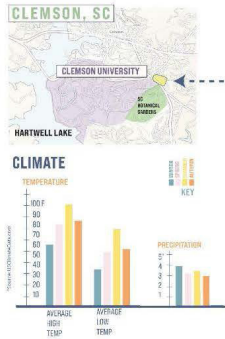
Our concept is based on these three interconnected pillars:

1. Ecology/habitat
2. Human wellness/comfort
3. Education



TIGER SWALES

SITE ANALYSIS



SUN / SHADE ANALYSIS

8am

12noon

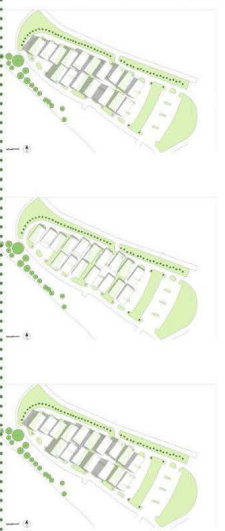
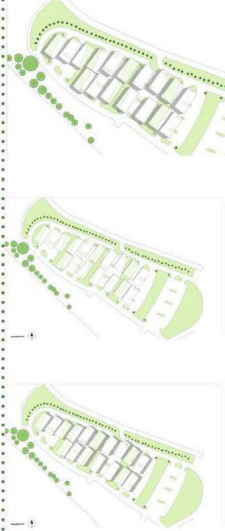
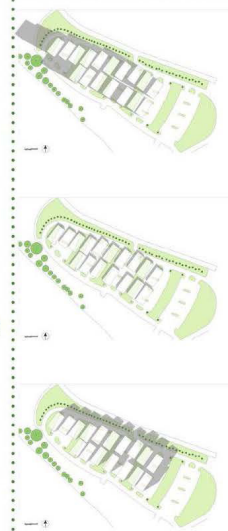
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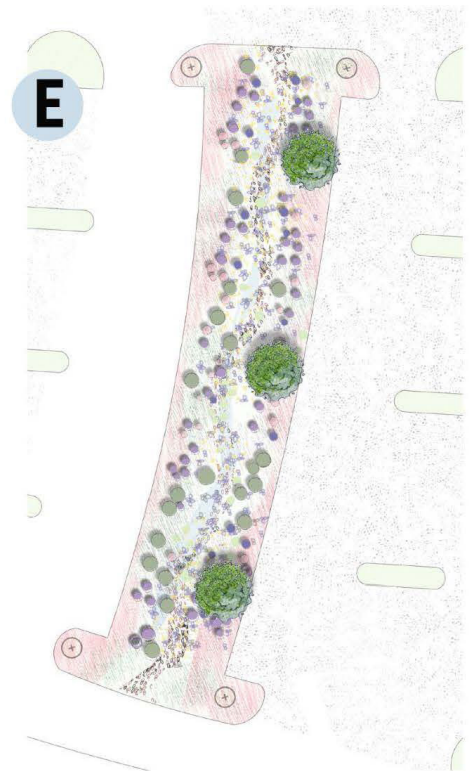
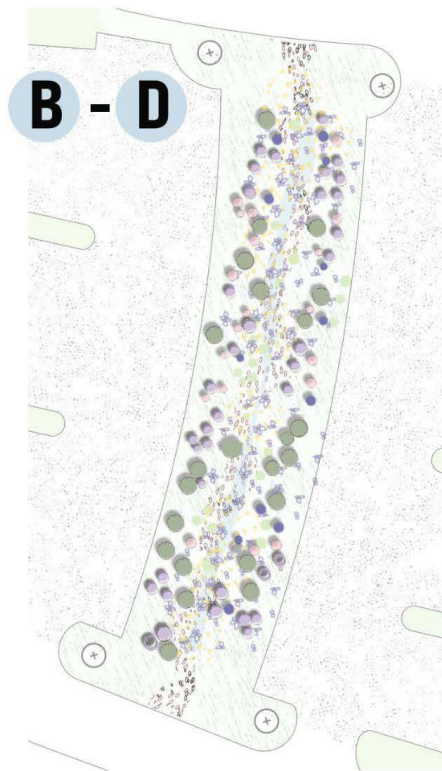
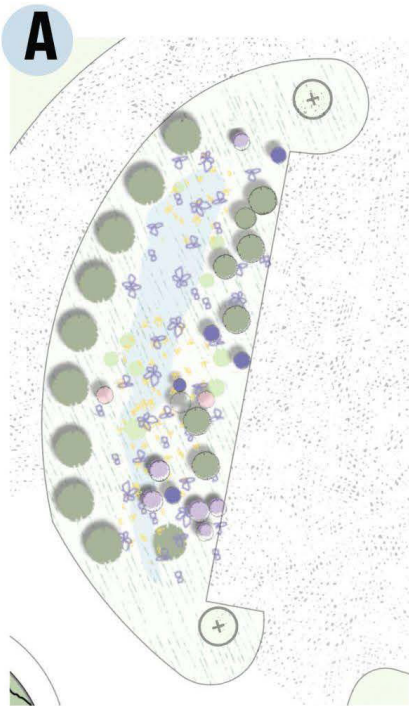
JANUARY

APRIL

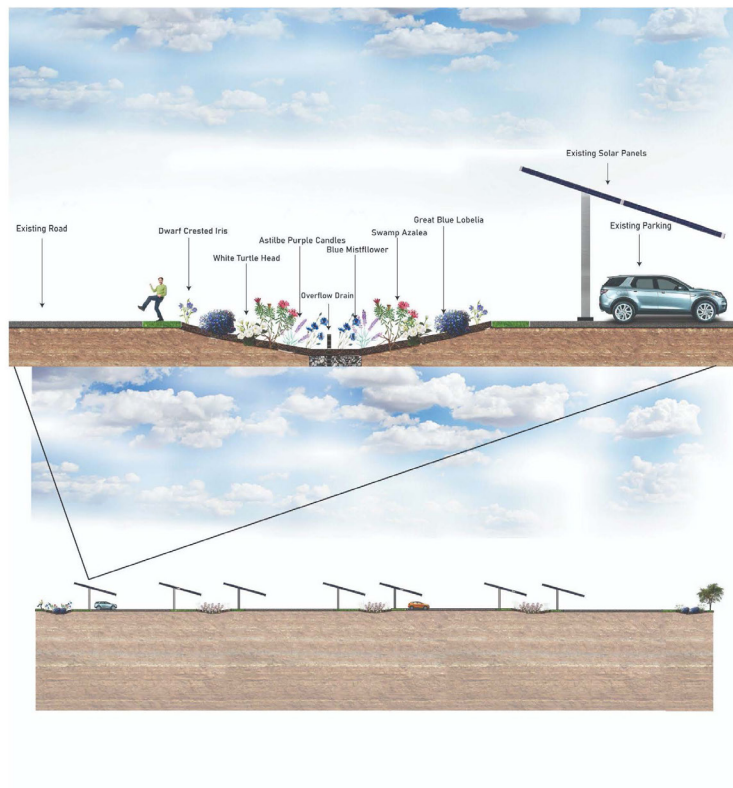
JULY

OCTOBER

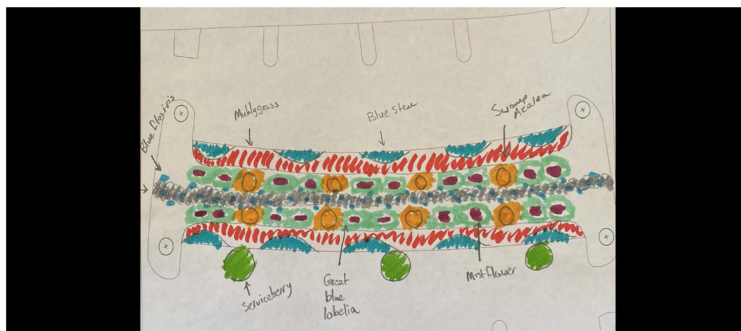
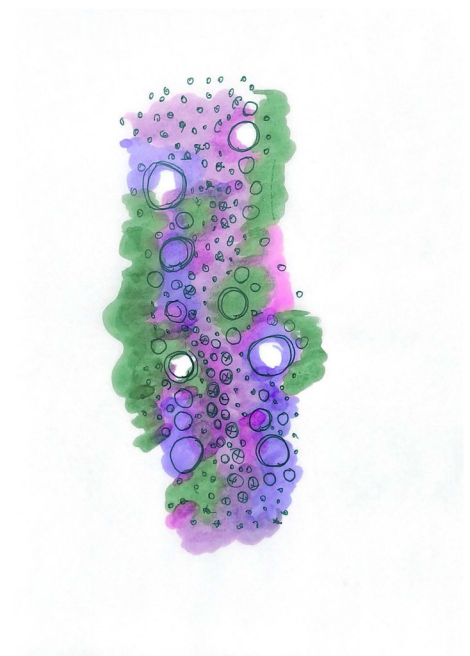
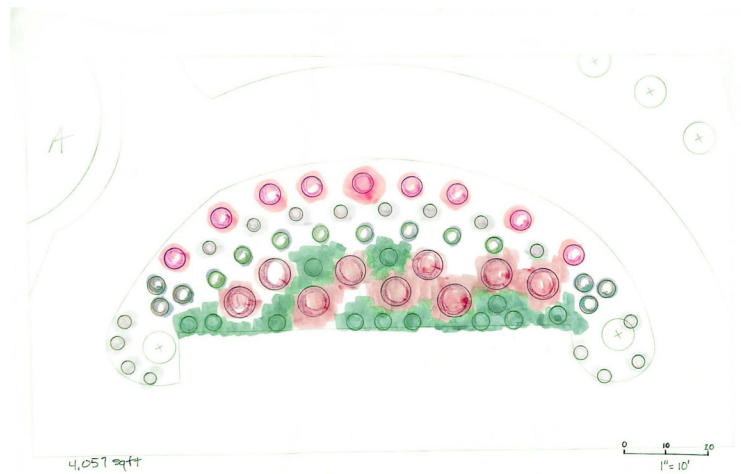




DESIGN



DESIGN



PERENNIALS



GRASSES & SEDGES



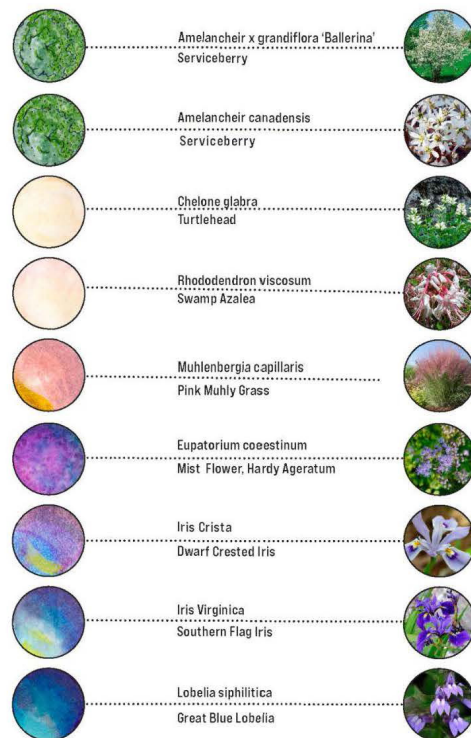
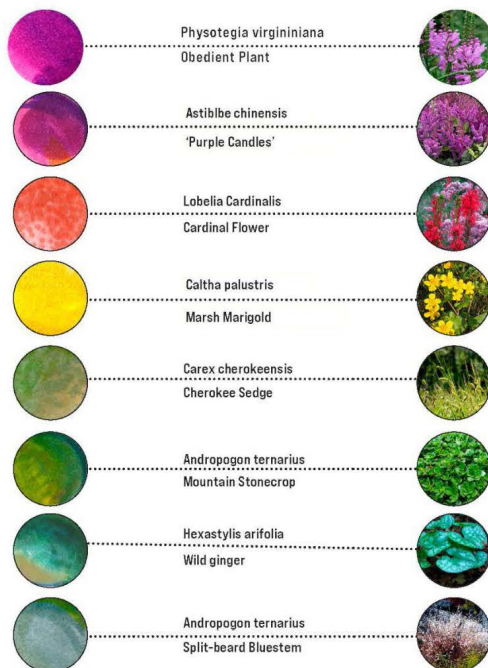
GROUND COVER



TREES



COLOR PALETTE

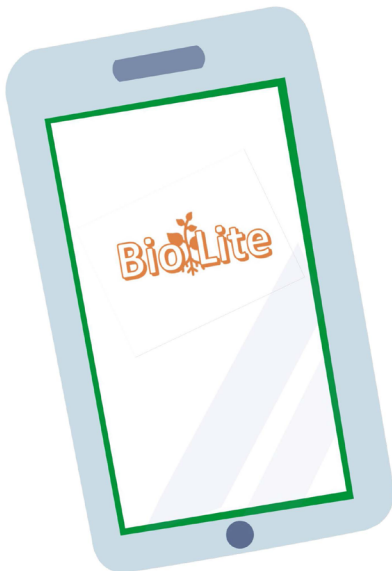




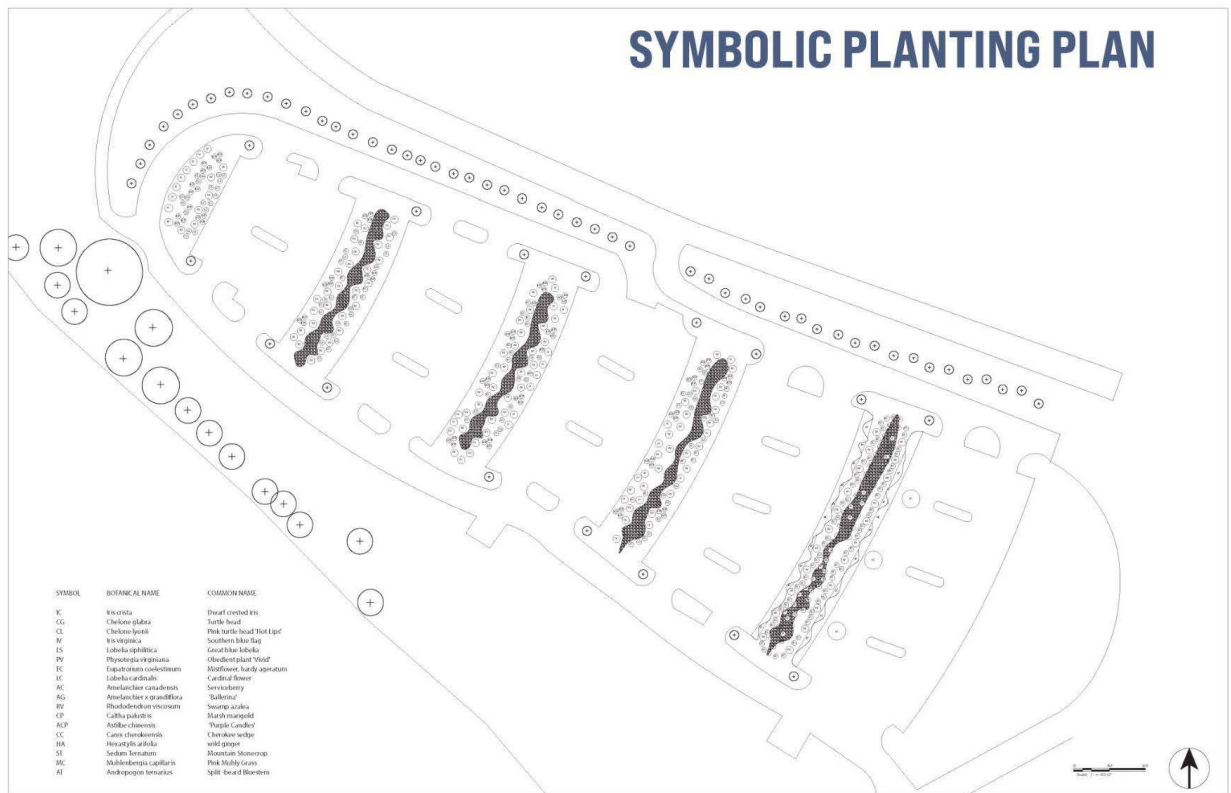
Maintenance Plan

- We selected these plants with ease of maintenance as a priority in mind.
- For this reason, native species and exceptionally tolerant cultivars comprise the plant palette which by nature are more acclimated to this region leading to increased biodiversity.

EDUCATION



- Signage for Plant Identification and QR Code signage for website link, public survey, and/or app download.
- 'Bio-Lite' App as a next step information on plant species, ecological functions, and growing conditions for Clemson students and staff as well as the general public.
- Clemson Cooperative could be involved in the app, with possibilities for Master Gardener consultation and feedback for homeowners and landscape professionals.
- This app would also ideally feature information on solar energy and Clemson's solar project.



CONCLUSION

Our design focuses on elaborating environmental innovation inspired by the solar panels generating electricity through solar energy. Similar to these solar panels, plants are also efficient transmuters of solar energy.

Spring time showcases pigmented floral blooms that provide nectar and pollen serving as food sources for pollinators, native butterflies, and hummingbirds. Winter time brings about attractive deep colored stems and evergreen foliage that serve the ecosystem as habitat that continues to play a key role in regional and national ecosystems. Charming fall colors enhance this planting for human enjoyment and promote student and faculty wellbeing.

Bioretention plantings can be highly capable of filtering water runoff to prevent pollution from vehicles and fertilizer. Dependable rhizomes work to solidify the soil and facilitate water movement within the soil top layers preventing flood and erosion.

R-6 Bio Bloom

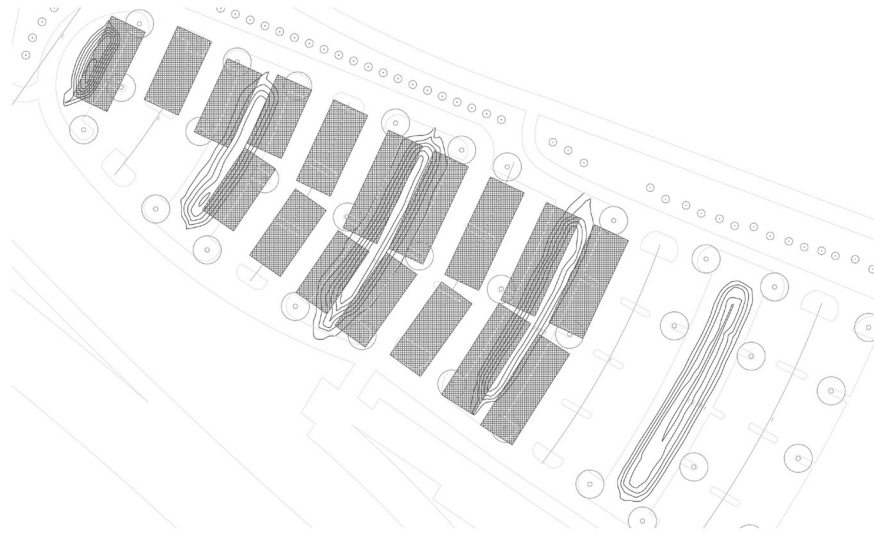
LARC 8150 Planting Design

Virginia Baird, Meredith Bendl, Wenxin Chen, Alex Leonard, and Annie Steele

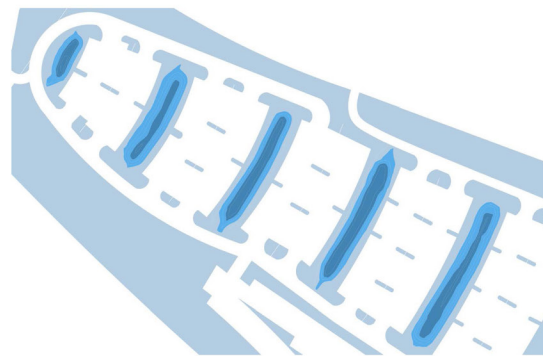
Concept

Aiming to enhance several **low-maintenance** bioretention areas in the parking lot, we focused on topography, sunlight, and moisture to create **sustainable plantings** at the site. These plantings will add color, dimension, ecological benefits, and educational opportunities to the current commuter parking lot.

Site Analysis



Solar and Moisture Diagrams

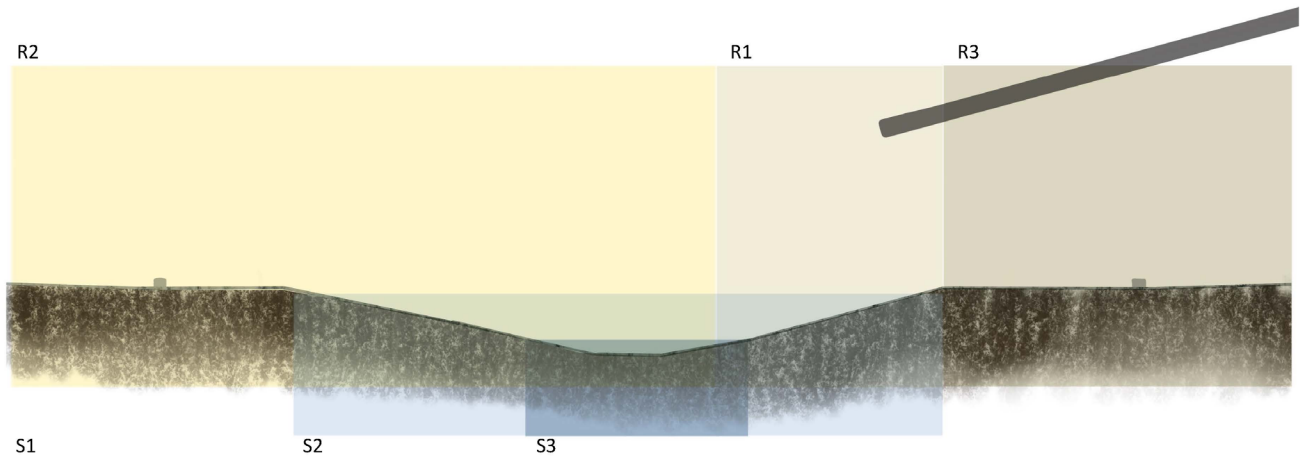


Planting Partitions

R1: Median Sun Exposure
R2: Most Sun Exposure
R3: Least Sun Exposure

S1: Least Saturation
S2: Median Saturation
S3: Most Saturation

Planting Partitions



Plant Palette

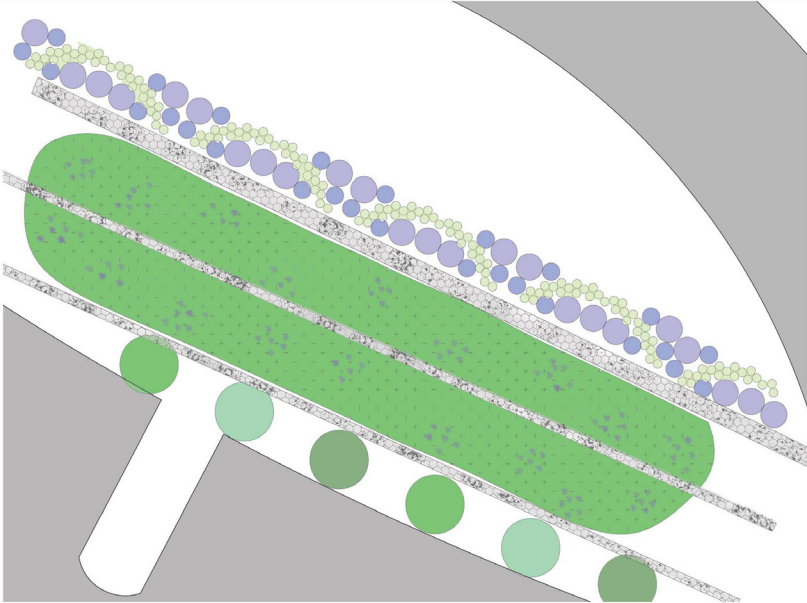
	Latin Name	Common Name	Sun	Soil	Size
Trees	<i>Ilex</i> 'HL10-90'	Christmas Jewel Holly	R1-R2	S1-S2	6-10' tall, 6-8' wide
Grasses	<i>Carex cherokeensis</i> Schwein	Cherokee Sedge	R2	S2	10-12" 1.5-2'
	<i>Chasmanthium latifolium</i>	River or Inland Sea Oats	R2	S3	2-3'
	<i>Schoenoplectus tabernaemontani</i>	Softstem Bulrush	R2-R3	S3	4-8' tall 3-6' wide
Large Shrubs	<i>Callicarpa americana</i>	American Beautyberry	R1-R3	S2	3-5' tall
	<i>Hydrangea quercifolia</i>	Oakleaf Hydranga	R3	S2	4-5' tall 4-6' wide
Median Shrubs	<i>Itea virginica</i>	Virginia Sweetpire	R1-R2	S2	4-8' tall 3-6' wide
	<i>Ilex verticillate</i>	Winterberry 'Little Goblin® Red'	R1-R2	S2-S3	4-4'
	<i>Clethra sinifolia</i>	Clethra 'Summersweet'	R2	S2-S3	5-7" tall, 6-8' wide
Perennials	<i>Iris versicolor</i>	Larger Blue Flag	R2	S3	2-3' tall
	<i>Baptisia australis</i>	Baptisia	R2	S2	1-4' tall
	<i>Physostegia virginiana</i> 'Vivid'	Obedient Plant	R2	S2	2' tall 12-18" wide
	<i>Symphyotrichum novae-angliae</i>	New England Aster	R2	S2	3-6' tall 2-3' wide

Seasonal Diagram

	Label	Botanical/Latin Name	Common Name	Spring	Summer	Fall	Winter
 Christmas Jewel Holly	Grasses	<i>Ilex 'HLIO-90'</i>	Christmas Jewel Holly				
		<i>Carex cherokeensis</i> Schwein	Cherokee Sedge				
 River or Inland Sea Oats	Trees	<i>Chasmanthium latifolium</i>	River or Inland Sea Oats				
		<i>Schoenoplectus tabernaemontani</i>	Softstem Bulrush				
 American Beautyberry	Large Shrubs	<i>Callicarpa americana</i>	American Beautyberry				
		<i>Hydrangea quercifolia</i>	Oakleaf Hydranga				
 Virginia Sweetspire	Median Shrubs	<i>Itea virginica</i>	Virginia Sweetspire				
		<i>Ilex verticillate</i>	Winterberry 'Little Goblin Red'				
 Clethra 'Summersweet'	Perennials	<i>Clethra sinifolia</i>	Clethra 'Summersweet'				
		<i>Iris versicolor</i>	Larger Blue Flag				
 Baptisia		<i>Baptisia australis</i>	Baptisia				
		<i>Physostegia virginiana 'Vivid'</i>	Obedient Plant				
 New England Aster		<i>Symphotrichum novae-angliae</i>	New England Aster				

Illustrative Plan

A



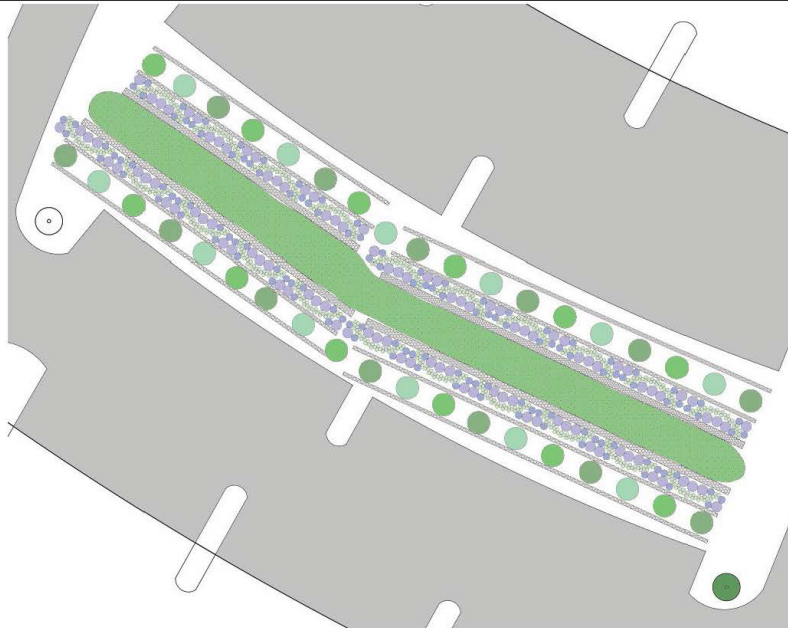
Illustrative Plan

B



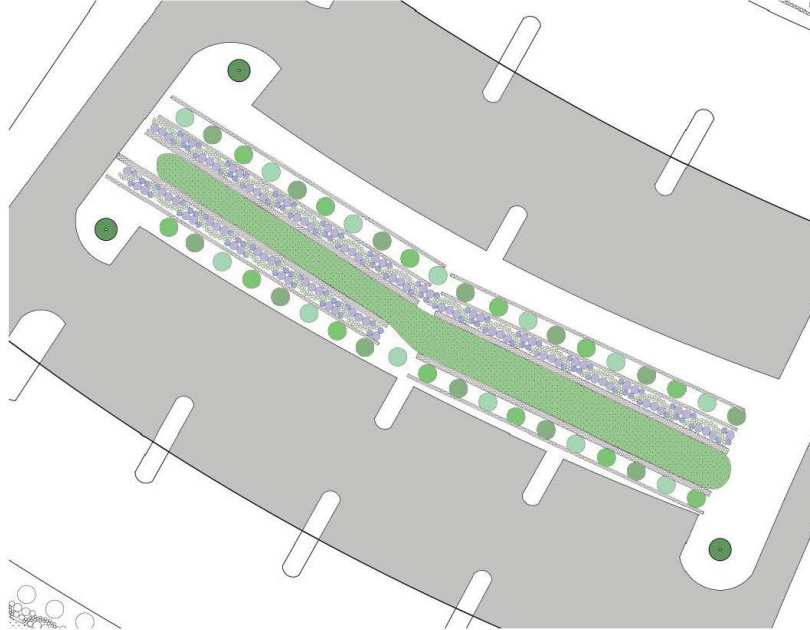
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C



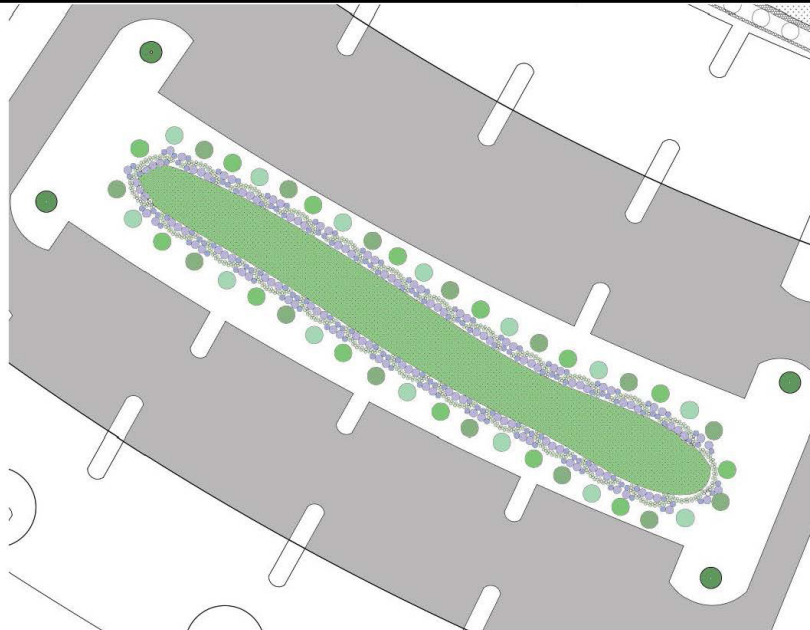
Illustrative Plan

D



Illustrative Plan

E



Section



Questions?