



HABIT

TO

HABITAT





# HABIT TO HABITAT

TRANSFORMING  
LAWNS TO DIVERSITY  
IN WELLESLEY



a project of

LANDSCAPE | INTERACTIONS





SUBMIT YOUR OBSERVATIONS  
TO BEECOLOGY



PROJECT TEAM

Evan Abramson, M.Sc.  
*Principal, Landscape Interactions*

Casey Armanetti  
*Associate Landscape Designer, Landscape Interactions*

SCIENTIFIC CONSULTANT

Dr. Robert Gegear, Ph.D.  
*Associate Professor, UMass-Dartmouth*  
*Founder and Director, New England Beecology Project*

BOTANIST

Robert Eastman

IN PARTNERSHIP WITH

Wellesley Natural Resources Commission

THANK YOU

To our partners and collaborators in the Town of Wellesley, without whom this project would not be possible: Bea Bezmalinovic, Natural Resources Commission Chair; Brandon Schmitt, Director; Lisa Moore, Education and Outreach Coordinator; Cricket Vlass, Park & Tree Superintendent; Mark Patenaude, Mike Balboni, Suzy Jordan and Wally Caban, Wellesley Department of Public Works. We are also grateful to entomologist Michael Veit for his review and comments on the target bee species list.

This project has been funded through Community Preservation Act (CPA) funds provisioned by the Community Preservation Committee of Wellesley and the Wellesley Natural Resources Commission capital budget appropriated at Town Meeting.

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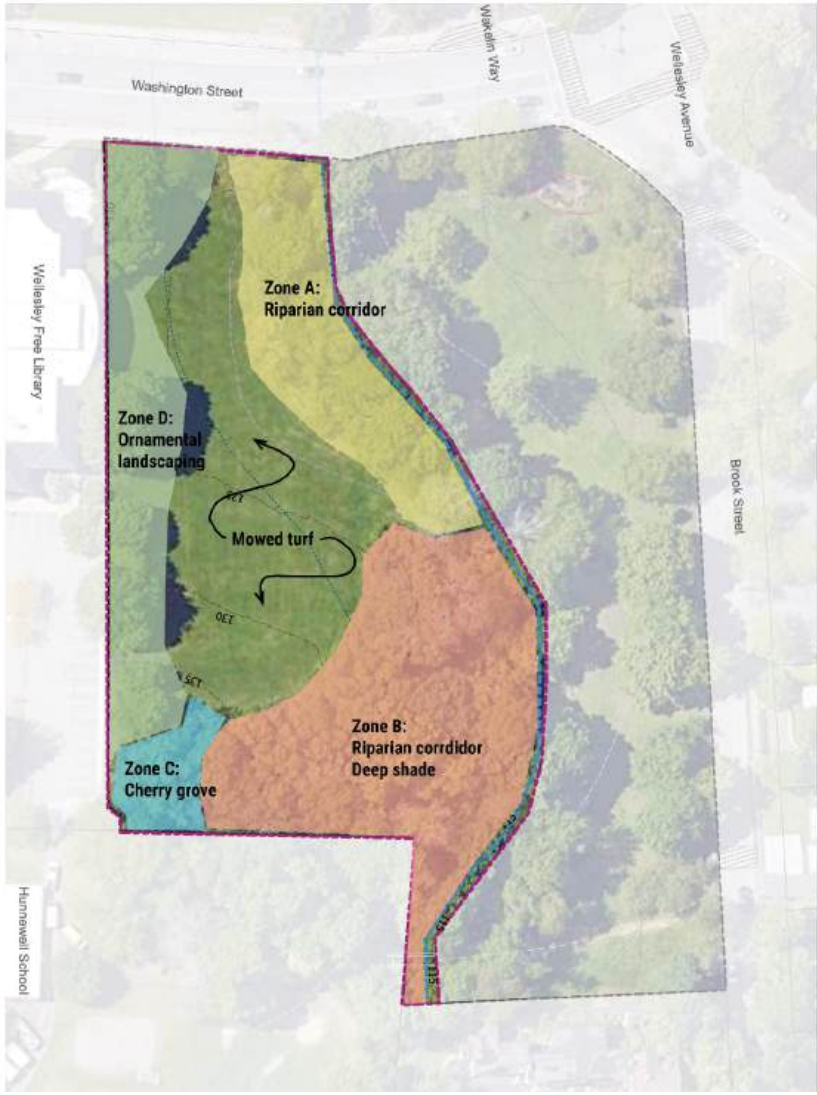
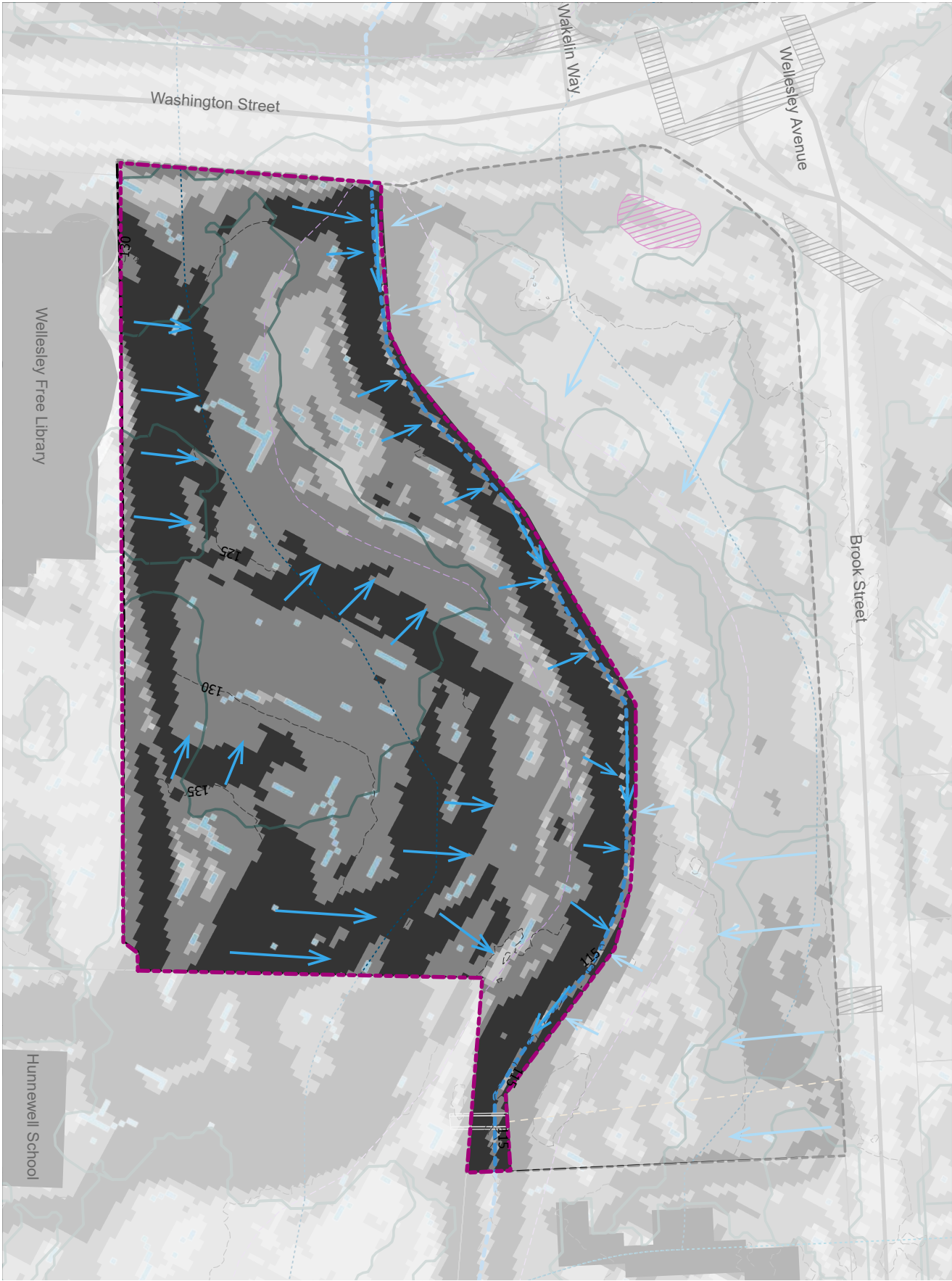
*Existing conditions of Simons Park at the commencement of the project in July 2022. The site consisted primarily of non-native grasses and white clover (*Trifolium repens*) surrounded by ornamental and native trees.*

## In 2022

Simons Park was a large, open lawn measuring just over 2 acres, comprised almost entirely of non-native turf grasses and white clover. A highly visible public park adjacent to the Wellesley Free Library main branch on Washington Street, the site is bordered by an intermittent stream and narrow riparian forest to the east, ornamental trees and perennial plantings to the west, and a forested path leading to the Hunnewell Elementary School to the south. Students transect the park regularly on their way to and from school, and library patrons gaze out upon the site from large picture windows in the reading room. It's common to find playgroups gathered on shaded edges of the park on hot days as well as people sunning themselves, eating lunch or walking their dog.

The Wellesley Natural Resources Commission (NRC), as part of their Grow Green Wellesley Initiative, identified Simons Park as an opportunity to showcase ecological landscaping methods, improve biodiversity, reduce water consumption and resource inputs, and support pollinators. After a public procurement process, Landscape Interactions was selected by the NRC to create a landscape design and management plan for the property, with the objective of transforming the site into a functionally diverse, resource-rich habitat specifically targeting at-risk native bees and butterflies. Surveys of the site over a three year period would demonstrate the before-and-after impacts of the design on pollinator species diversity. The results would be published and shared widely, to inspire landowners across town and the wider region to view their own properties as integral components of a network of ecosystems to expand local biodiversity, ecological health and climate resilience.





Ecological site analyses that informed the design process for Simons Park included (left to right): topography and drainage, solar exposure across the growing season, soils (not pictured) and existing vegetation.





*Eastern willow miner bee (Andrena bisalicis) gathering pollen from a native willow flower. This specialist bee gathers pollen from plant species in the Salix (willow) genus, and is in decline across much of the Northeast United States compared to historical observations (Bartomeus et al. 2013). Photograph by Tom Wood.*

## Why Pollinators?

Native pollinators are vital to creating and maintaining the habitats and ecosystems that most animals rely on for food and shelter — including humans. What happens (or doesn't happen) at the pollination scale has repercussions all the way through the food web. Over 80% of the flowering plants on Earth depend upon insect-mediated pollination; bees alone pollinate one-third of the food grown in the United States, and nearly half the crops grown in Massachusetts. In a global study of more than 40 crops in 600 fields across every populated continent, scientists found that wild pollinators were twice as effective as honeybees in producing seeds and fruit (Garibaldi et al. 2013). In the United States, wild bee pollination services were estimated to be worth \$3.07 billion in 2006 (Losey & Vaughan 2006). This estimate is a conservative approximation of wild bee pollination's contemporary value, considering the increase in pollinator-dependent crop plants over the past decade (Russo et al. 2013; Mathiasson & Rehan 2020).

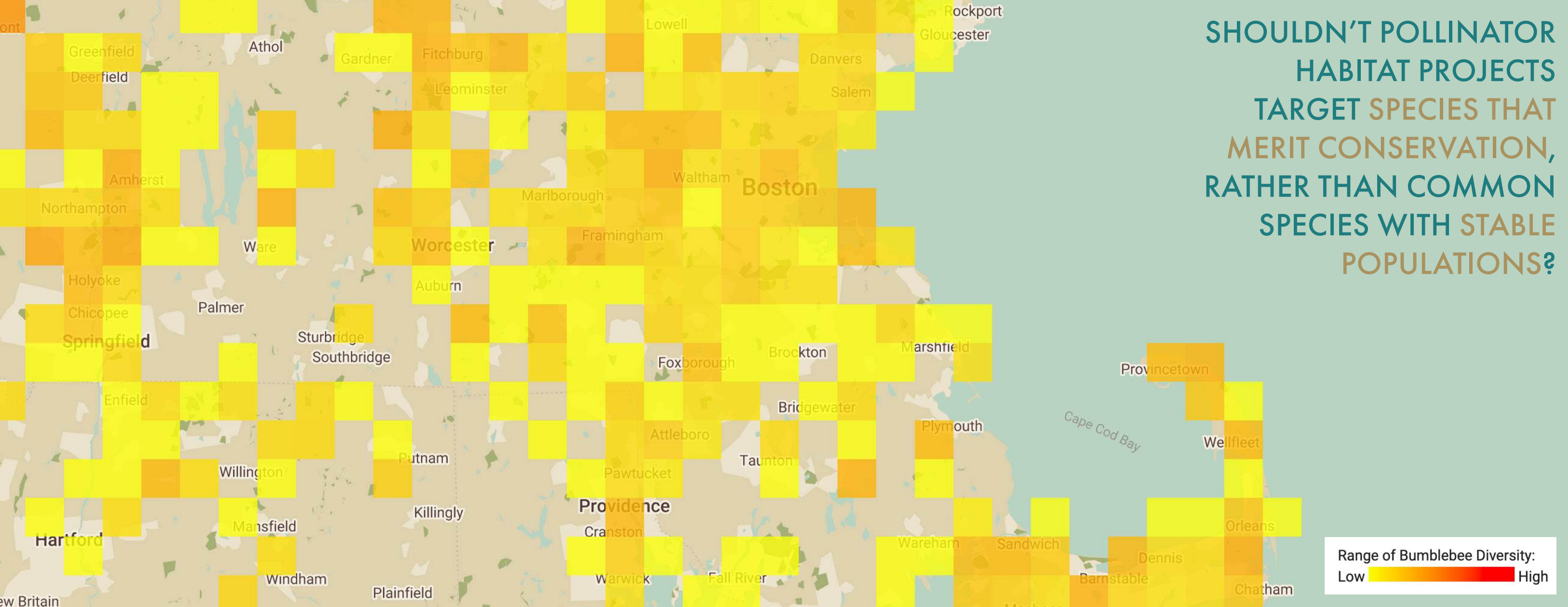
As **keystone species**, wild pollinators provide food, shelter and nest sites to wildlife at other trophic levels through their interactions with native flowering plants. Protecting a diversity of native pollination systems is therefore critical for maintaining healthy and diverse ecosystems. Pollination systems include bees, butterflies and moths, birds, beetles and flies, and represent over 80% of plant species worldwide.

Just like humans, pollinators need nutrient-dense food, shelter, and successful reproduction to thrive. But not all species require the same thing. A delicate balance exists between native plants and their pollinators, relationships that evolved over millions of years. Some plants have a small guild of species which coevolved with them to ensure their pollination. Similarly, approximately 15% of northeastern native bee species are considered pollen specialists (Fowler 2016). For many specialists, once their “partner” is missing from the landscape, they cannot reproduce – and thus risk becoming extirpated, endangered (and eventually, extinct).

A major misconception about pollinator decline is that all species are declining at the same rate. In fact, many species are actually *increasing* in abundance and geographic distribution as a direct result of human disturbance. “Seeing lots of bees” does not necessarily mean that your landscape is pollinator-friendly. Unfortunately, most efforts to restore pollination systems to date have resulted in increasing the numbers of a few common bee, butterfly and moth species, rather than on the range of wild pollinator species needed for ecosystem health and resiliency.



SHOULDN'T POLLINATOR  
HABITAT PROJECTS  
TARGET SPECIES THAT  
MERIT CONSERVATION,  
RATHER THAN COMMON  
SPECIES WITH STABLE  
POPULATIONS?



Portion of map depicting 10,115 observations of bumblebees in New England based on range of species diversity, 1864-2022. Courtesy the Beecology Project.

## Science Informs Design

Pollinators have experienced dramatic declines in recent decades, particularly since the year 2000. In comparing historical to contemporary records for the Northeast, over 100 native bee species are found to be declining across the region (Bartomeus et al. 2013; Mathiasson & Rehan 2019) including three bumblebee species in Massachusetts, with two more bumblebee species already extirpated from the state (Gegear 2018). The consensus among scientists is that these declines are being driven primarily by a combination of land development, pesticide use and climate change.

While the subject of pollinator decline is understood by many to be highly significant, few pollinator habitat projects target the range of species at risk in a given geographic area. This is ironic since it is due to the decline of so many species that we are aware of the pollinator crisis in the first place. **Shouldn't pollinator habitat projects target species that merit conservation, rather than common species with stable populations?**


The plants featured in this design were selected specifically to support native bees and butterflies at the greatest risk of local extinction in the Wellesley, Massachusetts area. This list of target pollinator species and the plants they utilize was developed by Dr. Robert Gegear as part of his ongoing research into bee/butterfly-flower interactions, through

his lab at UMass-Dartmouth as well as the Beecology Project that he directs. Dr. Gegear compiled the list based on peer-reviewed papers, government websites and public databases, as well as over 25,000 observations of bee/butterfly-flower interactions across Massachusetts, collected through various research-related activities.

For non-Bombus bees, Bartomeus et al. 2013 and Mathiasson & Rehan 2019 were compared by Dr. Gegear with museum records and public databases in order to determine which declining species have historical or contemporary presence in the Wellesley area. That list was also reviewed by entomologist Michael Veit. The list of at-risk butterfly species was compiled by Dr. Gegear based on Sharon Stichter's invaluable Butterflies of Massachusetts website, Massachusetts Butterfly Club and NABA (North American Butterfly Association) counts, as well as Michielini et al. 2020.

Using the **Beecology app** that Dr. Gegear has created, anyone can contribute observations of bumblebee and butterfly interactions with flowering plants at Simons Park to help us track the impact of the project on our target species. Get started at <https://beecology.wpi.edu/website/participate#apps>. On **iNaturalist**, join the Habit to Habitat project automatically by uploading your observations at Simons Park.





# NOT A SINGLE BEE OR BUTTERFLY WAS OBSERVED DURING THREE SURVEY PERIODS

## Baseline Survey Results

*The design site was surveyed three times before any landscape modifications took place. Surveys were conducted by Robert Gegear, Ph.D., Professor of Biology at UMass-Dartmouth and Founder of the Beecology Project.*

Surveys of all bee and butterfly interactions with flowering plants took place on August 5 and 25, 2022 as well as May 15, 2023. The entire lawn area was surveyed as well as the forest edge, and areas adjacent to the library and parking lot. Weather conditions were favorable (sunny, temperature above 70° F) during all surveys.

On August 5, 2022 all grass was dry due to severe drought conditions, and no flowers were in bloom. On August 25 after a few periods of rain, the site was surveyed again, but again no flowers were in bloom. On May 15, 2023 the site appeared to have been recently mowed. The only thing in bloom was lilac (*Syringa vulgaris*), which had no flower visitors. **The site therefore lacks the floral resources needed to support any bee or butterfly species throughout its life cycle.**

*To demonstrate the impact of the design on pollinator species diversity, the site will be surveyed again by Dr. Gegear for two more seasons after plants have established. Follow up surveys are expected to commence in May 2025.*

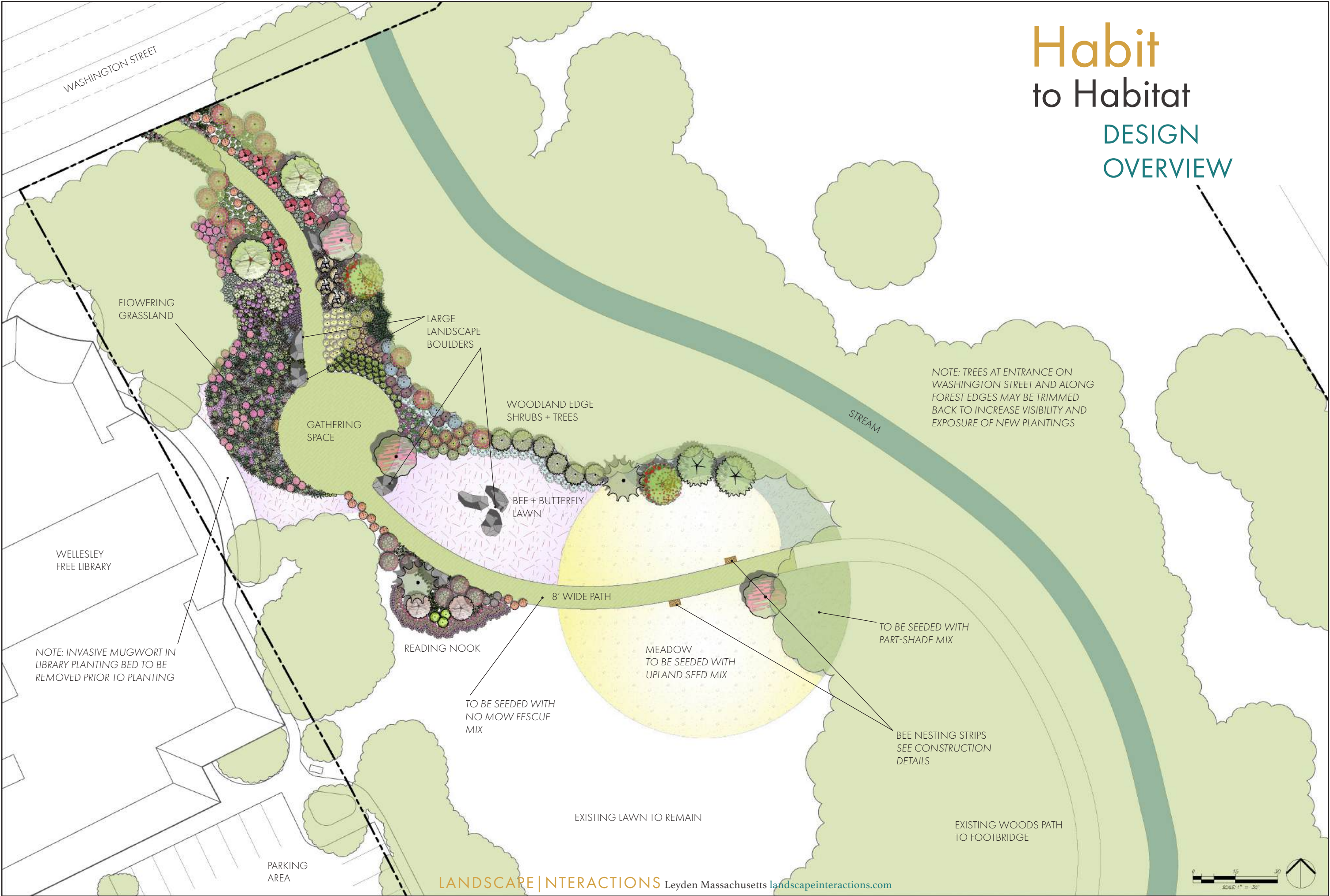
*Above: The Simons Park design site in July 2022. Below: Dr. Gegear surveying bumblebee foraging behavior in the field. Photograph by Christine Peterson/Worcester Telegram.*





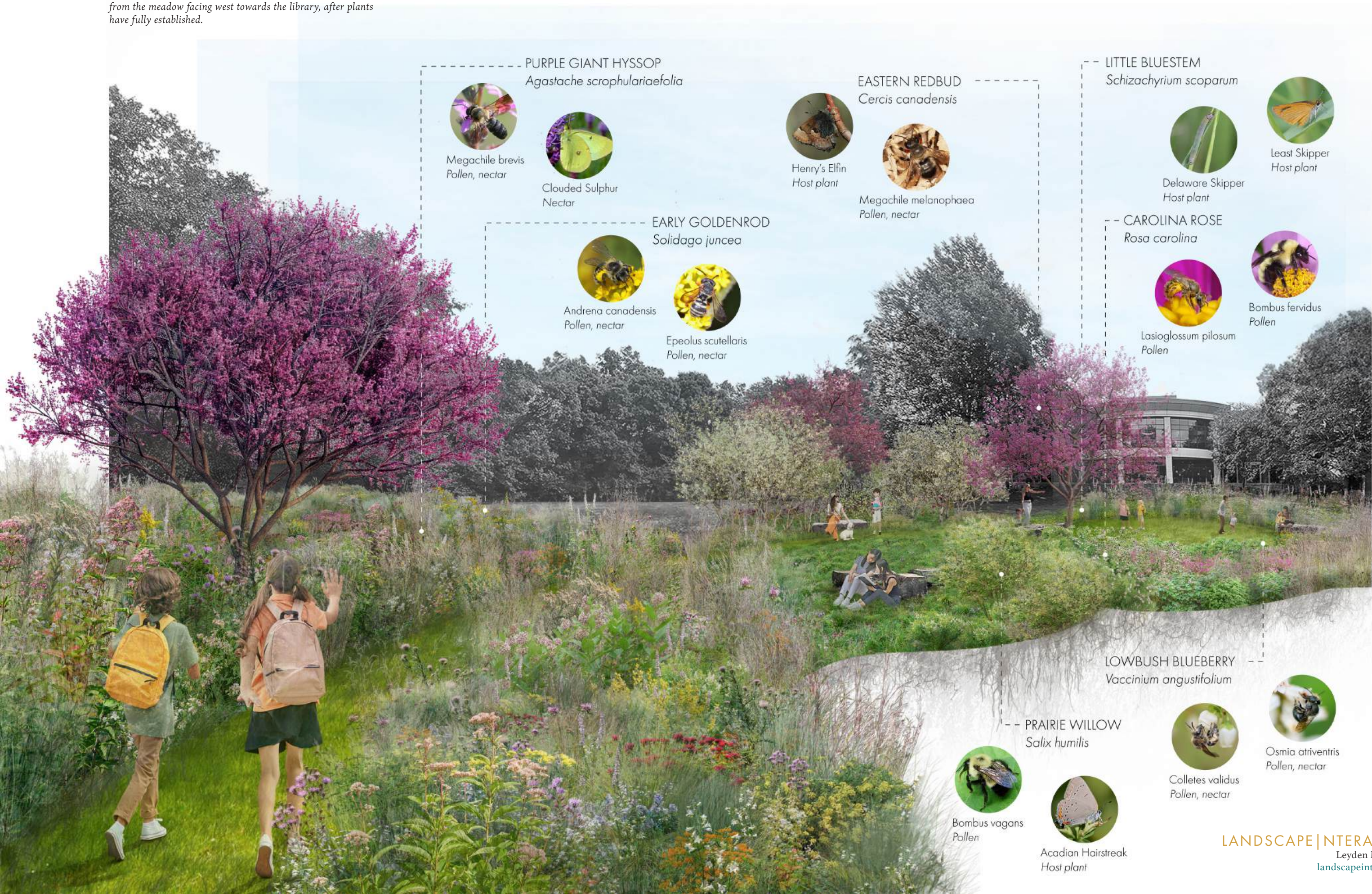
# Habit to Habitat

## DESIGN OVERVIEW





Perspective rendering of the Simons Park Habit to Habitat design from the meadow facing west towards the library, after plants have fully established.



PURPLE GIANT HYSSOP  
*Agastache scrophulariaefolia*



Megachile brevis  
Pollen, nectar



Clouded Sulphur  
Nectar

EARLY GOLDENROD  
*Solidago juncea*



Andrena canadensis  
Pollen, nectar



Epeolus scutellaris  
Pollen, nectar

EASTERN REDBUD  
*Cercis canadensis*



Henry's Elfin  
Host plant



Megachile melanophaea  
Pollen, nectar

LITTLE BLUESTEM  
*Schizachyrium scoparium*



Delaware Skipper  
Host plant



Least Skipper  
Host plant

CAROLINA ROSE  
*Rosa carolina*



Lasioglossum pilosum  
Pollen



Bombus fervidus  
Pollen

LOWBUSH BLUEBERRY  
*Vaccinium angustifolium*



Colletes validus  
Pollen, nectar



Osmia atriventris  
Pollen, nectar

PRAIRIE WILLOW  
*Salix humilis*

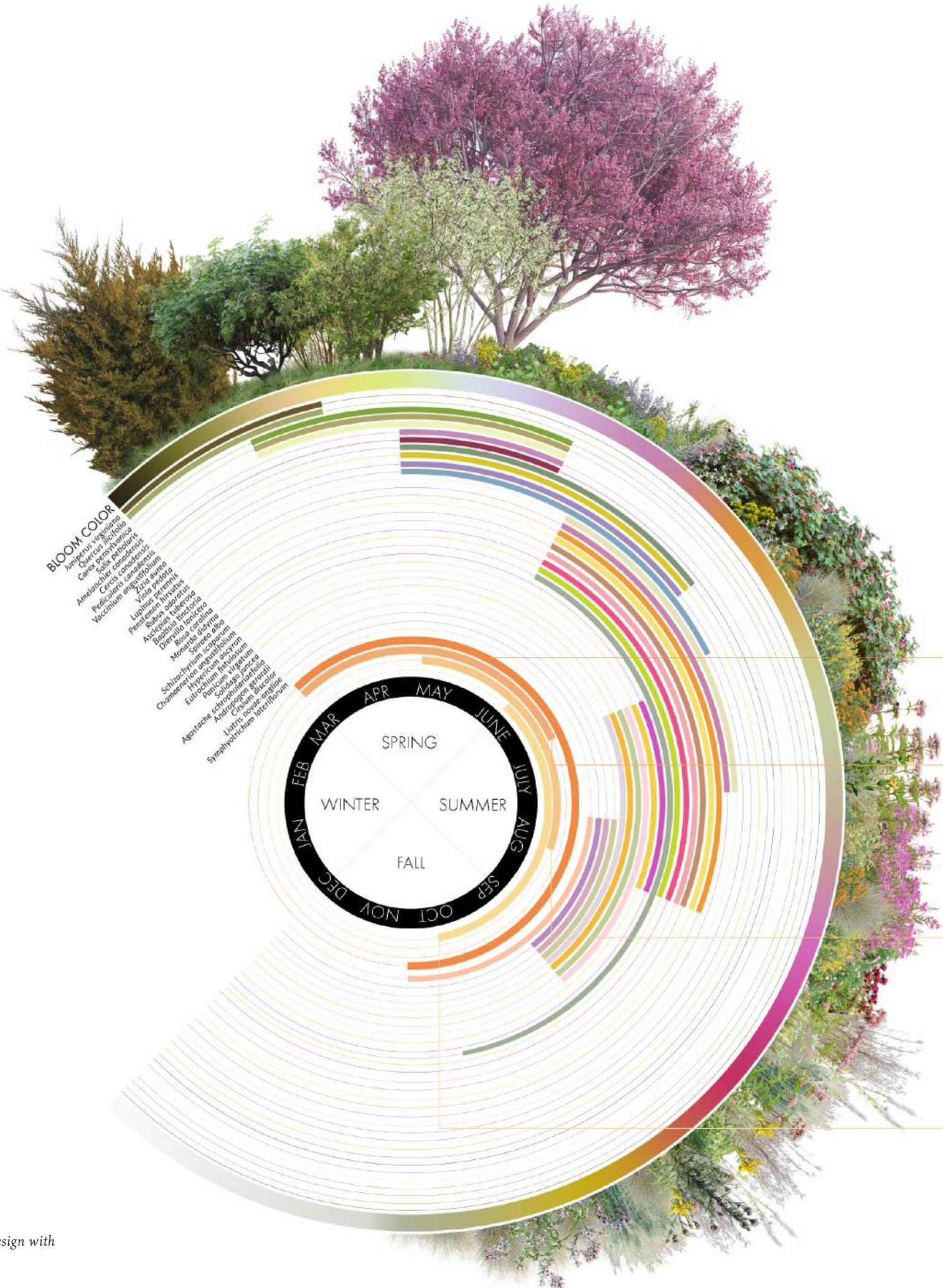


Bombus vagans  
Pollen



Acadian Hairstreak  
Host plant





POLLINATOR FLIGHT TIMES

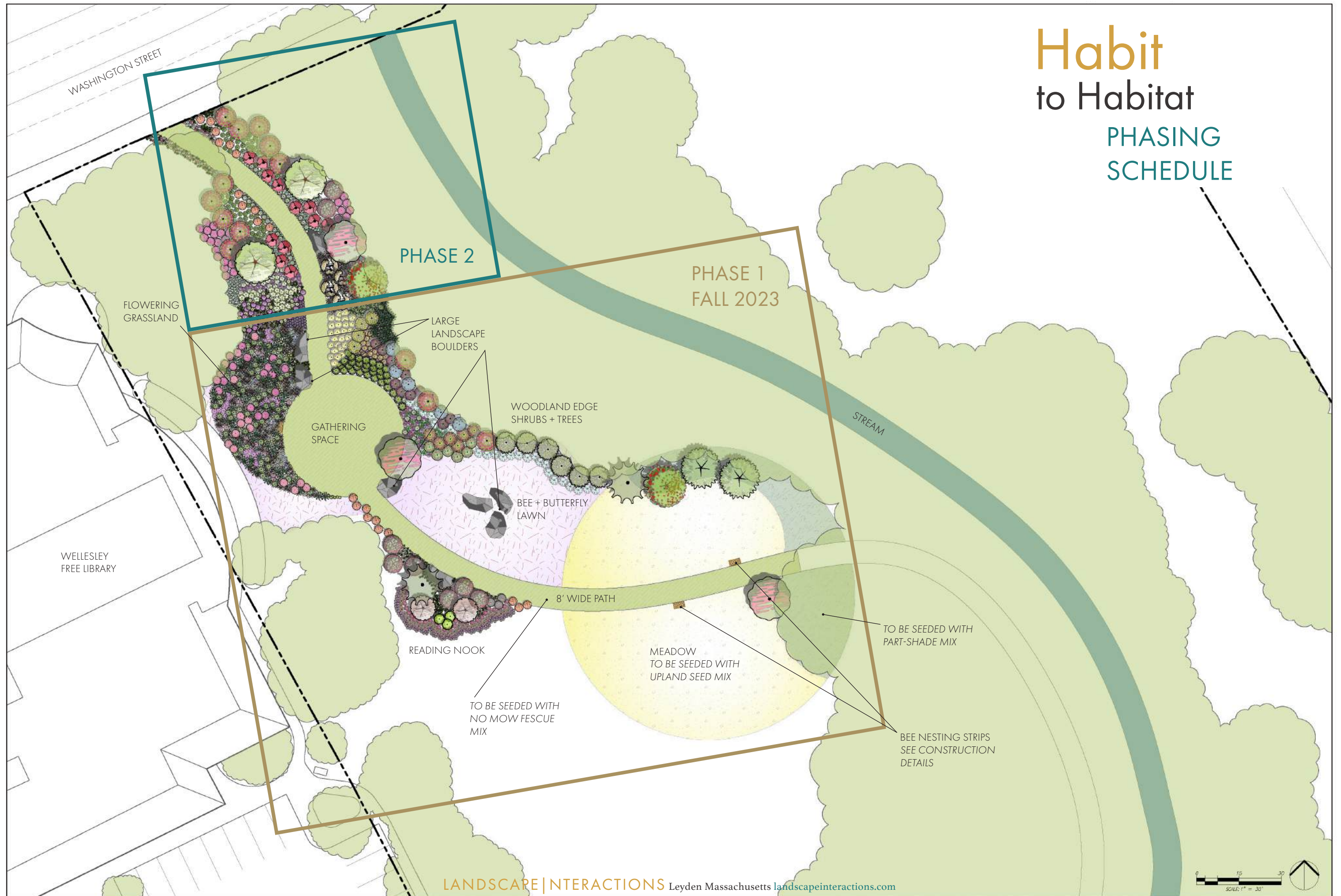
- ALL SEASON**
- Mar-Oct Compton Tortoiseshell
  - Apr-Oct *Bombus vagans*
  - May-Sep *Bombus fervidus*
  - Mar-Oct *Coelioxys modestus*, *C. octodentatus*, *Lasioglossum ssp.*, *Melissodes druriellus*
- EARLY SEASON**
- Apr-Jun Juvenal's Duskywing
  - May-Jun Cobweb Skipper, Dreamy Duskywing, Sleepy Duskywing
  - Mar-May *Andrena miserabilis*
  - Mar-Jun *Andrena sigmundii*, *A. w-scripta*
  - Mar-Jul *Andrena barbilabris*, *A. bisalicensis*, *A. distans*, *A. erigeniae*, *A. erythrogaster*, *A. forbesii*, *A. imitatrix*, *Colletes validus*, *Osmia atriventris*, *O. lignaria*, *Nomada bella*, *N. depressa*
  - Apr-Jul *Andrena geranii*
- MID SEASON**
- May-Aug Common Ringlet, Little Wood Satyr
  - Jun-Jul Delaware Skipper, Eyed Brown
  - Jun-Aug Question Mark, Crossline Skipper, Banded Hairstreak
  - Jul Acadian Hairstreak
  - Jul-Aug Edwards' Hairstreak
  - May-Aug *Macropis ciliata*, *Megachile melanophaea*
  - May-Sep *Andrena integra*
  - Jun-Nov *Colletes compactus*
  - Jun-Sep *Macropis nuda*
- LATE SEASON**
- Jul-Sep Common Wood-nymph
  - Jun-Oct *Coelioxys rufitarsis*, *Epeolus scutellaris*
  - July-Oct *Andrena brevipalpis*, *A. placata*
  - Aug-Oct *Andrena canadensis*, *A. nubecula*

Seasonal bloom diagram of the Habit to Habitat design with pollinator species supported based on flight time.



# Habitat to Habitat

## PHASING SCHEDULE





























Habit  
to Habitat  
PLANTING  
SCHEDULE

PLANT SCHEDULE PHASE 1

TREES	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	AME CAN	Amelanchier canadensis	Canadian Serviceberry	6	7' wide spacing
	CER CAN	Cercis canadensis	Eastern Redbud	2	15' wide spacing
	JUN VIR	Juniperus virginiana	Eastern Red Cedar	2	15' wide spacing
	POP TRE	Populus tremuloides	Quaking Aspen	2	15' wide spacing
	QUE ILI	Quercus ilicifolia	Scrub Oak	2	9' wide spacing
	RHU HIR	Rhus hirta	Staghorn Sumac	1	15' wide spacing
	SAL HUM	Salix humilis	Prairie Willow	3	4' wide spacing
	SAL ODT	Salix occidentalis	Dwarf Prairie Willow	3	3' wide spacing
	SAL PET	Salix petiolaris	Meadow Willow	6	8' wide spacing
SHRUBS	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	BAP TIN	Baptisia tinctoria	Yellow Wild Indigo	26	3' wide spacing
	DIE LON	Diervilla lonicera	Northern Bush-honeysuckle	10	3' wide spacing
	HYP PRO	Hypericum prolificum	Shrubby St. John` s-wort	4	5' wide spacing
	ROS PAS	Rosa carolina	Carolina Rose	6	4' wide spacing
	ROS VIR	Rosa virginiana	Virginia Rose	6	5' wide spacing
	RUB ALL	Rubus allegheniensis	Allegheny Blackberry	5	5' wide spacing
	RUB ODO	Rubus odoratus	Purple-flowering Raspberry	3	7' wide spacing
	RUB PEN	Rubus pensilvanicus	Pennsylvania Blackberry	10	4' wide spacing
	SPI ALB	Spiraea alba	Meadowsweet	24	3' wide spacing
	VAC ANG	Vaccinium angustifolium	Lowbush Blueberry	32	3' wide spacing
BIENNIAL	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	CIR DIS	Cirsium discolor	Field Thistle	22	2' wide spacing
GRASSES	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	AND GER	Andropogon gerardii	Big Bluestem	117	3' wide spacing
	CAR PEN	Carex pensylvanica	Pennsylvania Sedge	141	1' wide spacing
	PAN VIR	Panicum virgatum	Switchgrass	84	3' wide spacing
	SCH SCO	Schizachyrium scoparium	Little Bluestem	253	2' wide spacing

PERENNIALS	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	AGA SCR	Agastache scrophulariifolia	Purple Giant Hyssop	29	2' wide spacing
	AST CAN	Astragalus canadensis	Canadian Milkvetch	69	1.5' wide spacing
	BLE CIL	Blephilia ciliata	Downy Wood Mint	18	1' wide spacing
	BLE HIR	Blephilia hirsuta	Hairy Wood Mint	9	1' wide spacing
	CHA ANG	Chamaenerion angustifolium	Fireweed	8	1.5' wide spacing
	CLA CAR	Claytonia caroliniana	Carolina Spring Beauty	59	0.75' wide spacing
	EUT FIS	Eutrochium fistulosum	Hollow Joe-Pye Weed	15	3' wide spacing
	EUT PUR	Eutrochium purpureum	Purple Joe-Pye Weed	15	3' wide spacing
	GER MAC	Geranium maculatum	Spotted Crane`s-bill	26	1' wide spacing
	HYP ASC	Hypericum ascyron	Giant St. John`s-wort	17	2' wide spacing
	LAP CAN	Laportea canadensis	Canada Wood-nettle	17	2' wide spacing
	LIA NOV	Liatris novae-angliae	Northern Blazing Star	73	1` wide spacing
	LUP PER	Lupinus perennis	Wild Lupine	62	1' wide spacing
	MON DID	Monarda didyma	Scarlet Bee Balm	29	2' wide spacing
	PEN HIR	Penstemon hirsutus	Northeastern Beardtongue	13	1.5' wide spacing
	SOL ARG	Solidago arguta	Atlantic Goldenrod	41	2' wide spacing
	STA PIL	Stachys pilosa	Hairy Hedge-nettle	76	1' wide spacing
	SYM LAT	Symphyotrichum lateriflorum	Calico Aster	7	2' wide spacing
	ZIZ AUR	Zizia aurea	Golden Alexanders	44	1' wide spacing
GROUND COVERS	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	BEE LWN	Bee + Butterfly Lawn	Mow-Tolerant Sedges + Flowers	3,108 sf	
	NO MOW	No Mow Lawn	No Mow Fescue Mix	3,708 sf	
	SHD MDW	Shaded Meadow	Part-Shade Meadow Seed Mix	1,920 sf	
	UPL MDW	Upland Meadow	Upland Meadow Seed Mix	7,653 sf	

PLANT SCHEDULE PHASE 2


















TREES	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	AME CAN	Amelanchier canadensis	Canadian Serviceberry	2	7' wide spacing
	CER CAN	Cercis canadensis	Eastern Redbud	1	15' wide spacing
	PRU MAR	Prunus maritima	Beach Plum	4	6' wide spacing
	QUE PRI	Quercus prinoides	Dwarf Chestnut Oak	2	15' wide spacing
	RHU HIR	Rhus hirta	Staghorn Sumac	1	15' wide spacing
SHRUBS	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	DIE LON	Diervilla lonicera	Northern Bush-honeysuckle	11	3' wide spacing
	RUB ODO	Rubus odoratus	Purple-flowering Raspberry	10	7' wide spacing
	SWI SER	Swida sericea	Red-osier Dogwood	12	5' wide spacing
ANNUALS	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	IMP CAP	Impatiens capensis	Spotted Jewelweed	76	2' wide spacing
GRASSES	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	CAR PEN	Carex pensylvanica	Pennsylvania Sedge	259	1' wide spacing
	SCH SCO	Schizachyrium scoparium	Little Bluestem	62	2' wide spacing
PERENNIALS	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	APO AND	Apocynum androsaemifolium	Spreading Dogbane	23	2' wide spacing
	APO CAN	Apocynum cannabinum	Hemp Dogbane	18	2' wide spacing
	ASC PUR	Asclepias purpurascens	Purple Milkweed	24	2' wide spacing
	BLE CIL	Blephilia ciliata	Downy Wood Mint	51	1' wide spacing
	BLE HIR	Blephilia hirsuta	Hairy Wood Mint	248	1' wide spacing
	CHE GLA	Chelone glabra	White Turtlehead	23	2' wide spacing
	CLA CAR	Claytonia caroliniana	Carolina Spring Beauty	39	0.75' wide spacing
	EUT PUR	Eutrochium purpureum	Purple Joe-Pye Weed	25	3' wide spacing
	GER MAC	Geranium maculatum	Spotted Crane`s-bill	49	1' wide spacing
	LYS CIL	Lysimachia ciliata	Fringed Yellow-loosestrife	32	2' wide spacing
	PEN HIR	Penstemon hirsutus	Northeastern Beardtongue	27	1.5' wide spacing
	PRU VUL	Prunella vulgaris	Selfheal	16	1' wide spacing







# Habit to Habitat

## PHASE 1 DESIGN AREAS



PLANT SCHEDULE WOODLAND EDGE

TREES	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	SAL PET	Salix petiolaris	Meadow Willow	6	8' wide spacing
SHRUBS	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	BAP TIN	Baptisia tinctoria	Yellow Wild Indigo	26	3' wide spacing
	HYP PRO	Hypericum prolificum	Shrubby St. John`s-wort	4	5' wide spacing
	ROS PAS	Rosa carolina	Carolina Rose	6	4' wide spacing
	ROS VIR	Rosa virginiana	Virginia Rose	6	5' wide spacing
	RUB ALL	Rubus allegheniensis	Allegheny Blackberry	5	5' wide spacing
	RUB ODO	Rubus odoratus	Purple-flowering Raspberry	3	7' wide spacing
	RUB PEN	Rubus pensilvanicus	Pennsylvania Blackberry	10	4' wide spacing
	SPI ALB	Spiraea alba	Meadowsweet	24	3' wide spacing
	VAC ANG	Vaccinium angustifolium	Lowbush Blueberry	32	3' wide spacing
GRASSES	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	AND GER	Andropogon gerardii	Big Bluestem	45	3' wide spacing
	PAN VIR	Panicum virgatum	Switchgrass	18	3' wide spacing
	SCH SCO	Schizachyrium scoparium	Little Bluestem	1	2' wide spacing
PERENNIALS	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	BLE CIL	Blephilia ciliata	Downy Wood Mint	18	1' wide spacing
	BLE HIR	Blephilia hirsuta	Hairy Wood Mint	9	1' wide spacing
	CHA ANG	Chamaenerion angustifolium	Fireweed	8	1.5' wide spacing
	GER MAC	Geranium maculatum	Spotted Crane`s-bill	26	1' wide spacing
	HYP ASC	Hypericum ascyron	Giant St. John`s-wort	17	2' wide spacing
	LAP CAN	Laportea canadensis	Canada Wood-nettle	17	2' wide spacing
	PEN HIR	Penstemon hirsutus	Northeastern Beardtongue	13	1.5' wide spacing
	SYM LAT	Symphyotrichum lateriflorum	Calico Aster	7	2' wide spacing

PLANT SCHEDULE READING NOOK

TREES	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	AME CAN	Amelanchier canadensis	Canadian Serviceberry	6	7' wide spacing
	JUN VIR	Juniperus virginiana	Eastern Red Cedar	1	15' wide spacing
	QUE ILI	Quercus ilicifolia	Scrub Oak	2	9' wide spacing
	SAL HUM	Salix humilis	Prairie Willow	3	4' wide spacing
	SAL ODT	Salix occidentalis	Dwarf Prairie Willow	3	3' wide spacing
SHRUBS	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	DIE LON	Diervilla lonicera	Northern Bush-honeysuckle	10	3' wide spacing
GRASSES	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	CAR PEN	Carex pensylvanica	Pennsylvania Sedge	107	1' wide spacing
PERENNIALS	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	CLA CAR	Claytonia caroliniana	Carolina Spring Beauty	59	0.75' wide spacing
	LIA NOV	Liatris novae-angliae	Northern Blazing Star	73	1` wide spacing
	MON DID	Monarda didyma	Scarlet Bee Balm	29	2' wide spacing
	SOL ARG	Solidago arguta	Atlantic Goldenrod	41	2' wide spacing
	STA PIL	Stachys pilosa	Hairy Hedge-nettle	76	1' wide spacing

PLANT SCHEDULE FLOWERING GRASSLAND

BIENNIAL	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	CIR DIS	Cirsium discolor	Field Thistle	22	2' wide spacing
GRASSES	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	AND GER	Andropogon gerardii	Big Bluestem	73	3' wide spacing
	CAR PEN	Carex pensylvanica	Pennsylvania Sedge	34	1' wide spacing
	PAN VIR	Panicum virgatum	Switchgrass	63	3' wide spacing
	SCH SCO	Schizachyrium scoparium	Little Bluestem	256	2' wide spacing
PERENNIALS	CODE	BOTANICAL NAME	COMMON NAME	QTY	REMARKS
	AGA SCR	Agastache scrophulariifolia	Purple Giant Hyssop	29	2' wide spacing
	AST CAN	Astragalus canadensis	Canadian Milkvetch	69	1.5' wide spacing
	EUT FIS	Eutrochium fistulosum	Hollow Joe-Pye Weed	16	3' wide spacing
	EUT PUR	Eutrochium purpureum	Purple Joe-Pye Weed	16	3' wide spacing
	LUP PER	Lupinus perennis	Wild Lupine	62	1' wide spacing
	ZIZ AUR	Zizia aurea	Golden Alexanders	44	1' wide spacing



# Habit to Habitat

## PHASE 1 DESIGN AREAS

### UPLAND MEADOW SEED MIX

LATIN NAME	COMMON NAME
Agastache scrophulariaefolia	Purple giant hyssop
Andropogon gerardii	Big bluestem
Asclepias incarnata	Swamp mikweed
Asclepias syriaca	Common milkweed
Asclepias tuberosa	Butterfly milkweed
Astragalus canadensis	Canada milkvetch
Baptisia tinctoria	Yellow wild indigo
Blephilia ciliata	Downy wood mint
Blephilia hirsuta	Hairy woodmint
Chamaenerion angustifolium	Fireweed
Cirsium discolor	Field thistle
Desmodium canadense	Showy tick trefoil
Eutrochium fistulosum	Hollow Joe-Pye weed
Eutrochium purpureum	Purple Joe-Pye weed
Hypericum punctatum	Spotted St. John's-wort
Lupinus perennis	Wild lupine
Monarda didyma	Scarlet bee balm
Monarda fistulosa	Wild bergamot
Panicum virgatum	Switchgrass
Pedicularis canadensis	Wood betony
Penstemon digitalis	Foxglove beardtongue
Penstemon hirsutus	Northeastern beardtongue
Prunella vulgaris ssp. lanceolata	Common selfheal
Schizachyrium scoparium	Little bluestem
Solidago juncea	Early goldenrod
Solidago odora	Sweet goldenrod
Solidago speciosa	Showy goldenrod
Spiraea alba	White meadowsweet
Spiraea tomentosa	Steeplebush
Symphotrichum lateriflorum	Calico aster
Tridens flavus	Purpletop
Zizia aptera	Meadow zizia
Zizia aurea	Golden Alexanders

### PART-SHADE MEADOW SEED MIX

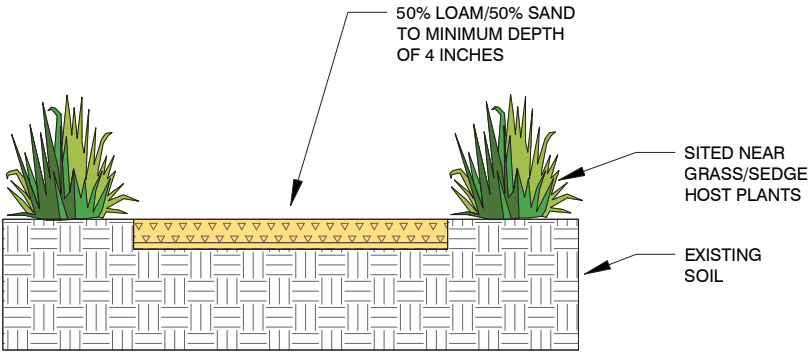
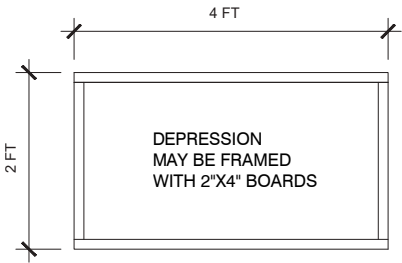
LATIN NAME	COMMON NAME
Andropogon gerardii	Big bluestem
Apocynum androsaemifolium	Spreading dogbane
Apocynum cannabinum	Hemp dogbane
Asclepias incarnata	Swamp mikweed
Astragalus canadensis	Canada milkvetch
Blephilia hirsuta	Hairy woodmint
Carex blanda	Common wood sedge
Carex brevior	Plains oval sedge
Carex sprengeii	Long-beaked sedge
Eutrochium fistulosum	Hollow Joe-Pye weed
Eutrochium purpureum	Purple Joe-Pye weed
Hypericum punctatum	Spotted St. John's-wort
Impatiens capensis	Jewelweed
Lysimachia ciliata	Fringed yellow loosestrife
Pedicularis canadensis	Wood betony
Penstemon digitalis	Foxglove beardtongue
Penstemon hirsutus	Northeastern beardtongue
Prunella vulgaris ssp. lanceolata	Common selfheal
Solidago juncea	Early goldenrod
Symphotrichum lateriflorum	Calico aster
Zizia aptera	Meadow zizia
Zizia aurea	Golden Alexanders

### BEE + BUTTERFLY LAWN PLANTINGS

LATIN NAME	COMMON NAME
Blephilia ciliata	Downy wood mint
Carex brevior*	Plains oval sedge
Carex pensylvanica	Pennsylvania sedge
Danthonia spicata*	Poverty oat grass
Juncus tenuis*	Path rush
Pedicularis canadensis	Wood betony
Prunella vulgaris ssp. lanceolata*	Common selfheal
Viola pallens	Smooth white violet
Viola pedata	Bird's foot violet
Viola striata*	Striped cream violet

\*To be direct seeded

### BEE NESTING STRIP\* (2 FT. X 4 FT.)



NTS (Not to Scale)

\*Bee nesting strips can be installed alongside paths, in meadows, or anywhere with sunny, well draining soil.





# At-Risk Pollinators Supported by this Project

SUBMIT YOUR OBSERVATIONS  
AT SIMONS PARK  
TO BEECOLOGY



Photographs (clockwise  
from top left):  
*Bombus fervidus* by Norm Levey;  
*Epeolus scutellaris* by  
Vermont Center for  
Ecosystem Studies;  
Crossline Skipper by  
Vitaly Charny; *Osmia*  
*lignaria* by Chelsey  
Ritner; Question Mark  
by Cattails.

## BEES:

*Andrena barbilabris*  
*Andrena bisulcata*  
*Andrena brevialpis*  
*Andrena canadensis*  
*Andrena distans*  
*Andrena erigeniae*  
*Andrena erythrogaster*  
*Andrena forbesii*  
*Andrena geranii*  
*Andrena imitatrix*  
*Andrena integra*  
*Andrena miserabilis*  
*Andrena nubecula*  
*Andrena placata*  
*Andrena sigmundi*  
*Andrena w-scripta*  
*Bombus fervidus*  
*Bombus vagans*  
*Coelioxys modestus*  
*Coelioxys octodentatus*  
*Coelioxys rufitarsis*  
*Colletes compactus*  
*Colletes validus*  
*Epeolus scutellaris*  
*Lasioglossum cinctipes*  
*Lasioglossum heterognathum*  
*Lasioglossum imitatum*  
*Lasioglossum leucocomum*  
*Lasioglossum perpunctatum*  
*Lasioglossum pilosum*  
*Lasioglossum quebecense*  
*Lasioglossum truncatum*  
*Macropis ciliata*  
*Macropis nuda*  
*Megachile brevis*  
*Megachile frigida*  
*Megachile latimanus*  
*Megachile melanophaea*  
*Megachile montivaga*

Bearded Miner Bee  
Eastern Willow Miner Bee  
Short-tongued Miner Bee  
Canada Miner Bee  
Distant Miner Bee  
Spring Beauty Miner Bee  
Red-bellied Miner Bee  
Forbes's Miner Bee  
Geranium Miner Bee  
Imitator Miner Bee  
Intact Miner Bee  
Smooth-faced Miner Bee  
Cloudy-winged Miner Bee  
Peaceful Miner Bee  
Sigmund's Miner Bee  
W-marked Miner Bee  
Golden northern bumble bee  
Half-black bumble bee  
Northeastern Cuckoo Leafcutter Bee  
Eight-toothed Cuckoo Leafcutter Bee  
Red-legged Cuckoo Leafcutter Bee  
Aster Cellophane Bee  
Blueberry Cellophane Bee  
Red-chested Cuckoo Nomad Bee  
Band-footed Sweat Bee  
Wide-mouthed Sweat Bee  
Bristle Sweat Bee  
White-haired Golden Sweat Bee  
Densely Punctured Sweat Bee  
Hairy Sweat Bee  
Quebec Sweat Bee  
Truncate Sweat Bee  
Fringed Loosestrife Oil-collecting Bee  
Common Loosestrife Oil Bee  
Little Leaf-cutter Bee  
Frigid Leaf-cutter Bee  
Broad-handed Leaf-cutter Bee  
Black-and-gray Leaf-cutter Bee  
Silver-tailed Petal-cutter Bee

*Megachile relativa*  
*Melissodes druriellus*  
*Nomada bella*  
*Nomada depressa*  
*Osmia atriventris*  
*Osmia lignaria*

## BUTTERFLIES:

Acadian Hairstreak  
American Lady  
Banded Hairstreak  
Clouded Sulphur  
Cobweb Skipper  
Common Ringlet  
Common Sootywing  
Common Wood-nymph  
Compton Tortoiseshell  
Crossline Skipper  
Delaware Skipper  
Dreamy Duskywing  
Dusted Skipper  
Eastern Pine Elfin  
Edwards' Hairstreak  
Eyed Brown  
Frosted Elfin  
Henry's Elfin  
Hobomok Skipper  
Juniper Hairstreak  
Juvenal's Duskywing  
Least Skipper  
Little Wood Satyr  
Long Dash  
Meadow Fritillary  
Mourning Cloak  
Oak Hairstreak  
Peck's Skipper  
Pepper and Salt Skipper  
Question Mark  
Sleepy Duskywing

Relative Leaf-cutter Bee  
Drury's Long-horned Bee  
Beautiful Cuckoo Nomad Bee  
Depressed Cuckoo Nomad Bee  
Maine Blueberry Bee  
Blue Orchard Bee

*Satyrium acadica*  
*Vanessa cardui*  
*Satyrium calanus*  
*Colias philodice*  
*Hesperia metea*  
*Coenonympha tullia*  
*Pholisora catullus*  
*Cercyonis pegala*  
*Nymphalis vau-album*  
*Polites origenes*  
*Anatrytone logan*  
*Erynnis icelus*  
*Atrytonopsis hianna*  
*Callophrys niphon*  
*Satyrium edwardsii*  
*Lethe [Satyrodes] eurydice*  
*Callophrys irus*  
*Callophrys henrici*  
*Poanes hobomok*  
*Callophrys gryneus*  
*Erynnis juvenalis*  
*Ancyloxypha numitor*  
*Megisto cymela*  
*Polites mystic*  
*Boloria bellona*  
*Nymphalis antiopa*  
*Satyrium favonius*  
*Polites peckius*  
*Amblyscirtes hegon*  
*Polygonia interrogationis*  
*Erynnis brizo*

## BIGGEST THREATS FACING POLLINATORS

- » HABITAT LOSS
- » PESTICIDES
- » CLIMATE CHANGE





SITE WAS SOLARIZED WITH  
BLACK SILAGE TARP FOR FIVE  
MONTHS TO KILL EXISTING  
TURF



WE SPRAYPAINTED INSECTS  
AND FLOWERS TO PROMOTE  
PUBLIC ACCEPTANCE



Site  
Preparation  
MAY 2023



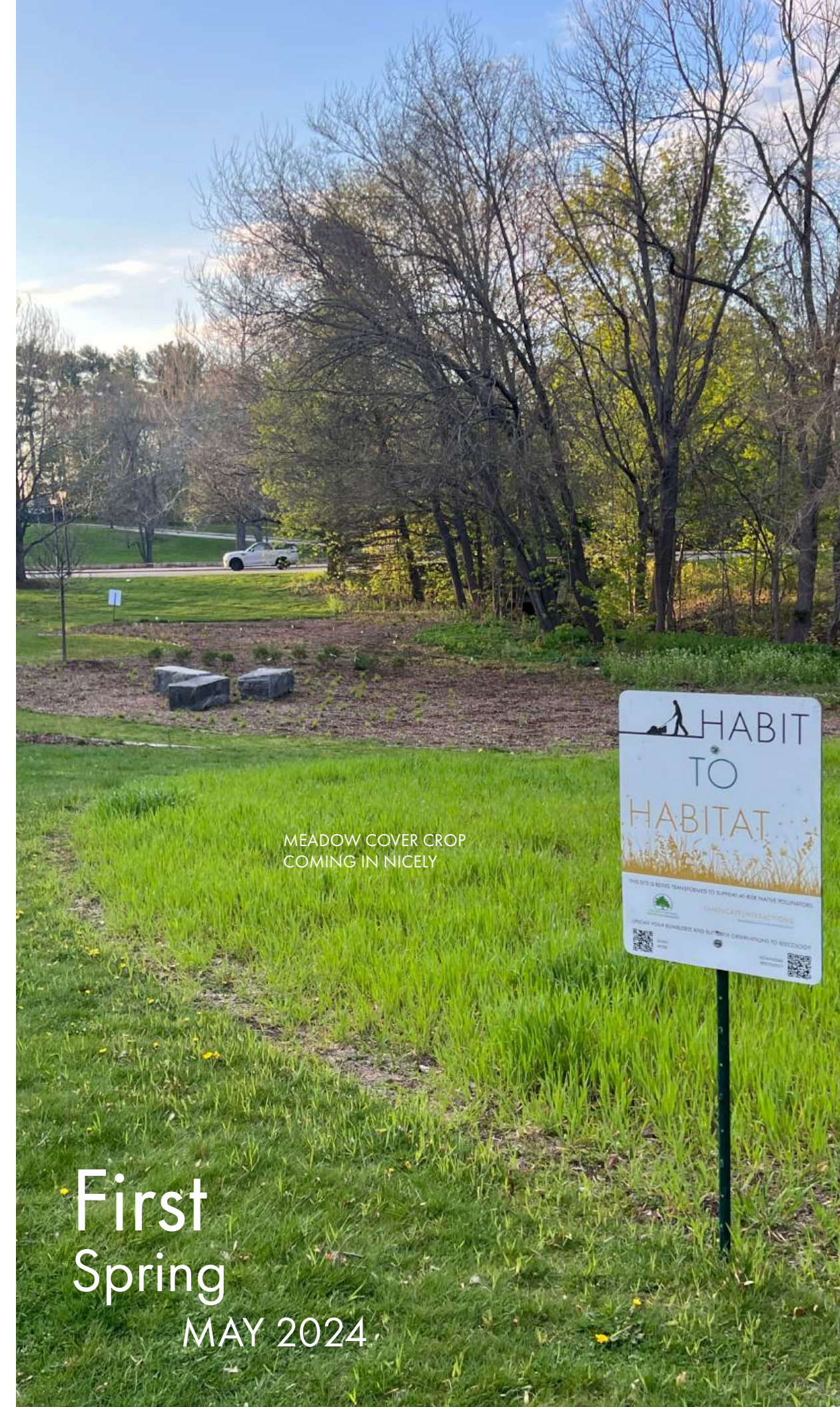
# Design Installation

SEPT 2023



THANKS TO THE WELLESLEY  
PUBLIC WORKS STAFF AND  
OVER 50 VOLUNTEERS WHO  
SHOWED UP!





MEADOW COVER CROP  
COMING IN NICELY

First  
Spring  
MAY 2024





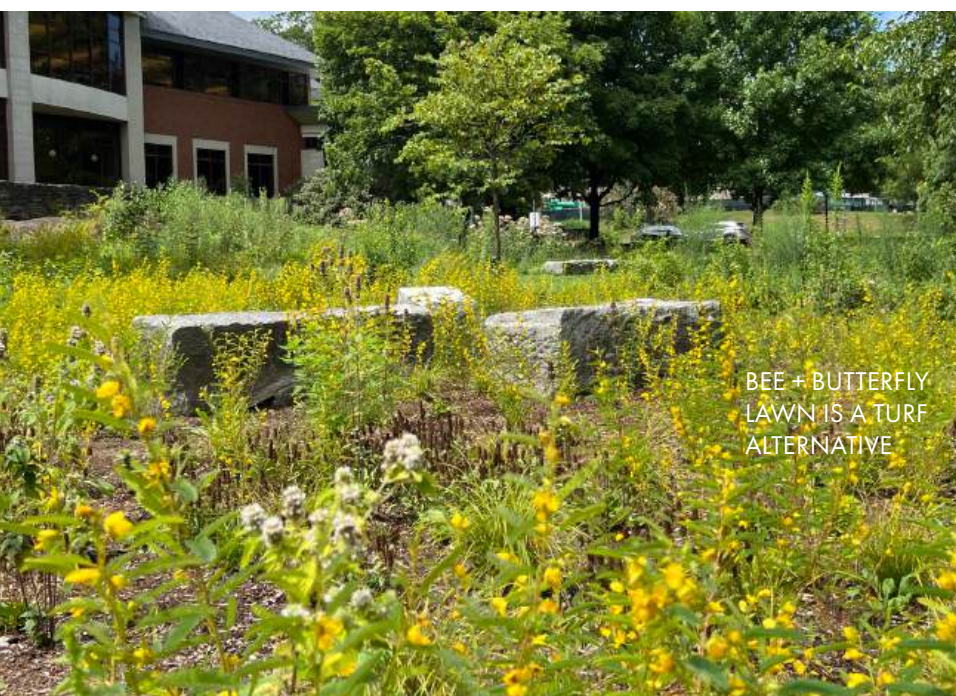
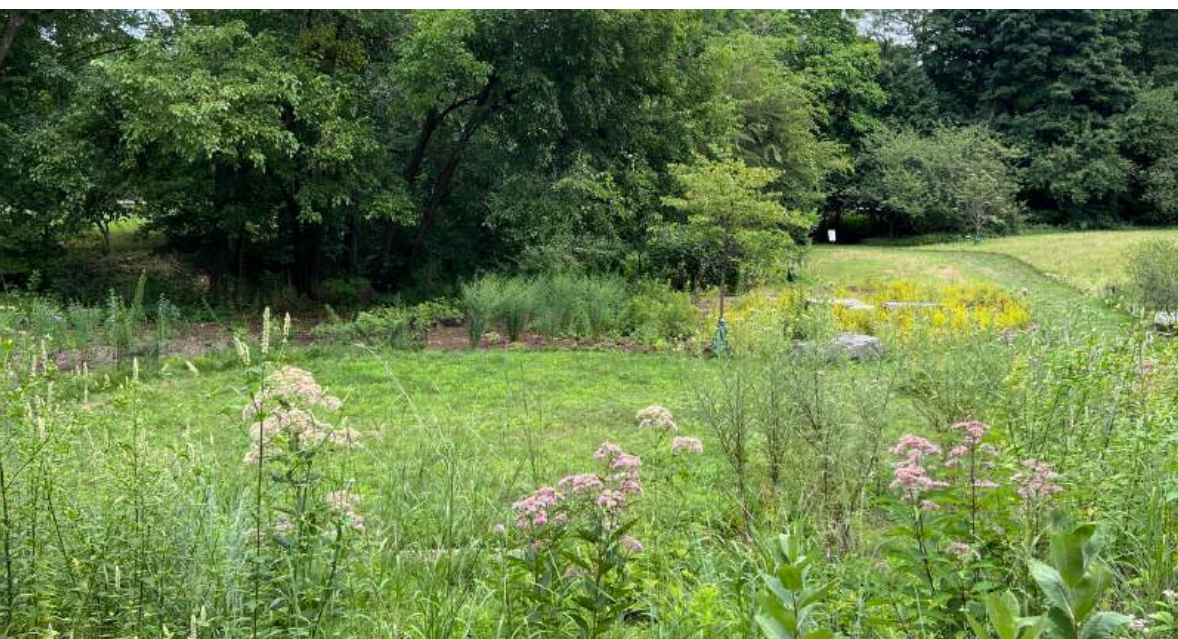
First  
Spring  
JUNE 2024





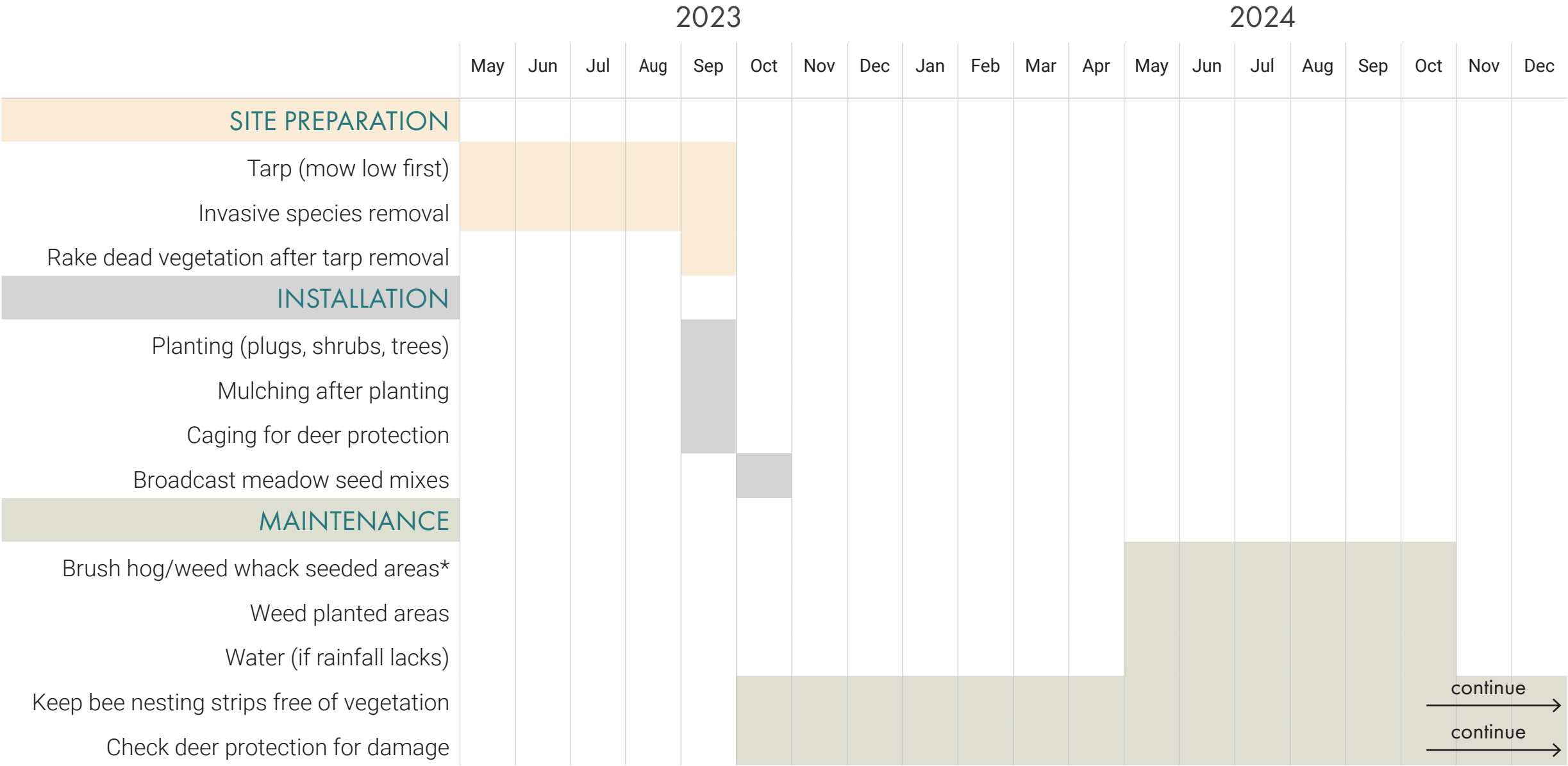


First  
Summer  
AUG 2024





PROJECT  
TIMELINE



\*See following page



## MOWING + MAINTENANCE SCHEDULE

### FOR MEADOW

**Year One (2024):** Meadow should be mowed or weed whacked down to 5 inches height every time vegetation reaches an average of 12 inches height. This will likely occur once per month, depending on rainfall.

**Year Two (2025):** Mow down to 5 inches in the spring, after vegetation reaches 12 inches height. Allow meadow to establish without mowing for the rest of the season, hand pulling or cutting weeds and non-native species as they appear.

**Years Three and Onward (2026+):** Mow down to 5 inches on average once per year during the shoulder season (November 1 - April 1), alternating half of the meadow each time.

**Ongoing Maintenance:** Hand pull or cut non-native and invasive species as they appear, as well as young trees.

Periodic burning of the meadow using a flame weeder or drip torch is highly recommended to encourage the growth of native grassland vegetation, and suppress cool season grasses and weeds. Adjacent vegetation should be mowed down as low as possible beforehand, clearing at least 4 feet in any given direction, and keeping a water source on hand for safety. The best time for burning is in the early spring (April-May) during a dry spell.

### FOR BEE + BUTTERFLY LAWN

**Year One (2024):** Bee + Butterfly Lawn should be mowed or weed whacked down to 6 inches height once, after the growing season ends (November 1).

**Years Two and Onward (2025+):** Bee + Butterfly Lawn should be mowed or weed whacked down to 6 inches height every time vegetation reaches an average of 16 inches height. This will likely occur twice per year, depending on rainfall.

**Ongoing Maintenance:** Hand pull or cut non-native and invasive species as they appear, as well as young trees.

### FOR BEE NESTING STRIPS

**Every Year:** Keep bee nesting strips weeded and clear of any vegetation that attempts to grow inside of them.





# MEADOW SEEDING

It is highly recommended to install native seed mixes in the dormant season, mid-October through January. This is because most native flowering species require between one and three months of cold stratification in order to germinate. Fall and winter naturally provide this opportunity in the Northeast, and are usually followed by rainfall in the spring. It is also possible to sow seeds in the early spring, but many species may not germinate until the following year, and watering may be necessary.

## SEEDING

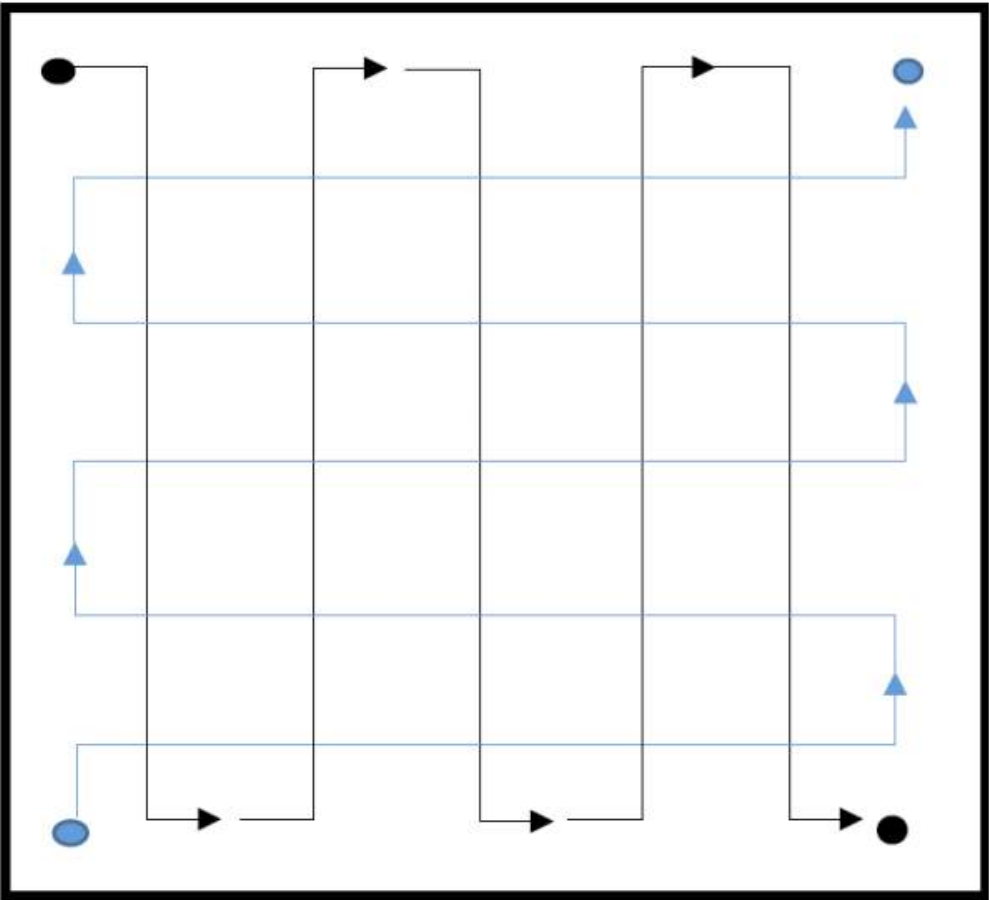
Due to the small scale of the meadow at Simons Park (less than 10,000 sq.ft), it was possible to install all seeds manually by broadcasting the mixes. The process is fairly straightforward: after seed mixes are created and purchased for each area (in this case, the meadow is divided into two mixes: full-sun and part-shade), the mixes are weighed with a food scale and divided in half. Each half is then mixed with a 5 gallon bucket of moistened sand or parboiled rice hulls (PBH) as a carrying agent. The physical areas to be seeded are divided into two sections per mix (a string may be used), and each section is distributed evenly with a bucket containing the seed mix and the carrying agent.

**A cover crop should always be included when direct seeding: winter wheat (*Triticum aestivum*) for fall or winter installations, and wild oats (*Avena sativa*) for spring installations, at 100 lbs/acre. When broadcasting, cover crops can be installed separately following the seed mixes.**

It is best to walk back-and-forth across each area in two directions (West to East and North to South for example) in order to guarantee even coverage. Refer to the diagram to the right for an example of how to evenly broadcast seeds across a site.

For the first growing season following seeding, at least 1 inch of rain per week is ideal. If there is not adequate precipitation, areas recently seeded should be watered 1-2 times per week the first growing season.

For the “no mow” fescue mix which was seeded across the walking path and gathering area at Simons Park, no carrying agent or cover crop is necessary. Fescues are cool season grasses, and should therefore be seeded in early fall, when temperatures are still above 50° at night. Seeds can be hand broadcast or distributed with a grass-seed spreader and should be lightly raked in and then watered for the first month or two, if needed. Depending upon conditions, germination can be expected in one to two weeks.



This diagram from the University of New Hampshire illustrates the two directions that should be walked when broadcasting seeds, in order to ensure even coverage.



# BEST MANAGEMENT PRACTICES



## 1. NO CHEMICALS

Eliminate pesticide use, particularly those containing neonicotinoids. **Backyard mosquito and tick spraying by private companies using “natural” or synthetic pyrethrins is lethal to not only pollinators, but all insects for up to 90 days.** Herbicides and chemical lawn treatments can also be highly damaging to pollinators.

Avoid planting in areas previously contaminated by pesticides or without a spatial buffer from areas where pesticides are applied (at least 100 ft. wide forested buffer is recommended).

**Ensure plants and seeds come from a clean, pesticide-free source.** Many commercial nurseries treat their plants and seeds, oftentimes before retailers receive them. Some pesticides and most neonicotinoids persist in plants and soil for months to years.



## 2. DIVERSE NATIVE PLANTS

**Plant straight native plant species.** Cultivars and exotic plants largely do not support the pollen, nectar and host plant preferences of threatened pollinators and tend to be visited by common pollinator species whose populations are stable.

Include a range of plant types (trees, shrubs, forbs, grasses, sedges) with varying bloom times, to ensure pollen, nectar and host plants are available across the entire growing season.



## 3. CREATE NESTING OPPORTUNITIES

Seventy percent of native bee species in the Northeast are ground nesting. Mulch using natural materials (chopped leaves, seed-free hay, composted wood chips) and leave bare areas of well-drained soil in sunny locations. Thirty percent of native bee species are cavity nesting. Allow dead trees, snags and pithy stemmed plants such as raspberries and Joe-Pye weed to remain standing all winter.

To benefit bumblebees, maintain small brush piles. This will provide cover for rodents that will in turn create nesting habitat for bumblebees. Where possible, leave leaf litter in gardens and allow it to build up over time. This provides cover for overwintering queens. Barns with unbaled hay or a dry, protected cavity containing hay or straw are also ideal.

Limiting or eliminating tillage practices will also limit the potential of harming ground-nesting bees, including bumblebees.



## 4. BE MESSY

Skip the fall clean up, allowing dead stems, leaves and seed heads to stand over winter, and wait until evening temperatures consistently reach 50 degrees before raking in the spring.

Don't be overzealous when it comes to tidying up. Some weeds act as host plants for caterpillars, such as *Solanum ptycanthum* (Eastern black nightshade) for the Five-spotted Hawkmoth, and *Lepidium virginicum* (Virginia peppergrass) for the Checkered White butterfly.



## 5. IT DOESN'T STOP WITH PLANTING

With new plantings, water and weed regularly for the first two years.

To deter deer and rodents until plants fully establish, it is often necessary to construct deer exclosures, fencing or individually cage woody plants until they establish.

Mow less often, mow higher, and delay mowing meadows and fields until the end of the growing season (after November 1 or before April 1). If brush hogging roadsides, fields or meadows, try to cut no more than 1/3 to 1/2 at a time, to allow pollinators to nest undisturbed.



## 6. LAST BUT NOT LEAST

If a water source is not close by, put something in place to catch rainwater, with a dirt base to simulate a puddle, providing pollinators necessary minerals. Make it last between rainy days.

Keep night skies dark for moths and other nocturnal insects: motion-detecting lights or lamps facing down instead of spotlights on all night.

Some plant species establish best by direct seeding: while late fall or early winter is the best time to sow, early spring seeding is also possible, although some species may not germinate until the following year.



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American Museum of Natural History, Bee Specimen Record database  
Bee Biology and Systematics Laboratory database  
Cornell University Insect Collection database  
Entomology Division, Yale University Peabody Museum database  
Rutgers University Arthropod Collection database  
University of California, Riverside, Entomology Research Museum database  
University of Connecticut Insect Collection database



## SUBMIT YOUR OBSERVATIONS TO BEECOLOGY



# Plants + Seeds

## SOURCES FOR NATIVE PLANTS AND SEEDS:

Archewild - Quakertown, PA - <https://archewild.com/nursery/>  
Bigelow Nurseries - Northboro, MA - <https://bigelownurseries.com/>  
Blue Stem Natives - Norwell, MA - <https://www.bluestemnatives.com/>  
Butterfly Effect Farm - Westport, MA - <https://www.butterflyeffectfarm.com/>  
Dragonfly Natives - South Dartmouth, MA - <https://dragonflynatives.com/pages/about>  
Earth Tones Native Plants - Woodbury, CT - <http://www.earthtonesnatives.com/>  
Ernst Seeds - Meadville, PA - <https://www.ernstseed.com/>  
Native Plant Trust - Framingham and Whately, MA - <http://www.nativeplanttrust.org/>  
New England Wetland Plants - South Hadley, MA - <https://newp.com/>  
New Moon Nursery - Bridgeton, NJ - <http://www.newmoonnursery.com/>  
North Creek Nurseries - Oxford, PA - <https://www.northcreeknurseries.com/>  
Northeast Pollinator Plants - Fairfax, VT - <https://www.northeastpollinator.com/>  
Pinelands Nursery & Supply - Columbus, NJ - <https://www.pinelandsnursery.com/>  
Polly Hill Arboretum - West Tisbury, MA - <https://www.pollyhillarboretum.org/plants/plant-sale/>  
Prairie Moon - Winona, MN - <https://www.prairiemoon.com/>  
Prickly Ed's Cactus Patch - Barrington, RI - <https://pricklyeds.com/>  
Toadshade Wildflower Farm - Frenchtown, NJ - <https://toadshade.com/>  
Vermont Willow Nursery - Fairfield, VT - <https://vermontwillownursery.com/>  
Wild Seed Project - Portland, ME - <https://wildseedproject.net/>  
Wing and a Prayer Nursery - Cummington, MA - <https://aliceskitchenathoneyhill.com/amys-nursery/>

## NATIVE PLANT PROPAGATION GUIDELINES:

Wild Seed Project - How to Grow Natives from Seed:  
<https://wildseedproject.net/how-to-grow-natives-from-seed/>

Prairie Moon - How to Germinate Native Seeds  
<https://www.prairiemoon.com/blog/how-to-germinate-native-seeds>

Native Plant Network Propagation Protocol Database:  
<https://nnp.rngr.net/propagation>

Indigenous Landscapes - Native Plant Propagation Guide and Nursery Model:  
<https://indigesapes.com/nativepropguide>

Clockwise from top left: *Vaccinium angustifolium*; *Prunus maritima*; *Rubus odoratus*; *Penstemon hirsutus*; *Bombus ternarius* on *Salix discolor*; *Cercis canadensis*; *Spirea alba*; *Lupinus perennis* ssp. *perennis*; *Carex pensylvanica*; *Schizachyrium scoparium*; *Baptisia tinctoria*; *Zizia aurea*; *Cirsium discolor*; *Agastache scrophulariifolia*; *Amelanchier canadensis*; *Desmodium canadense*.



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