

POLLINATOR HABITAT GUIDELINES



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RECREATION AND PARKS
DEPARTMENT

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Introduction

Columbus Recreation and Parks Department manages over 13,900 acres of parkland, totaling over 400 parks. Columbus parkland encompasses many diverse ecosystems, including habitat suitable for pollinators. Pollinators are animals that move pollen from one flower to another such as butterflies, bees, beetles, moths, birds, and bats. In recent years, pollinator populations have been declining due to habitat loss and over-use of pesticides. Dedicated habitat of native wildflowers and grasses provide pollinators and other wildlife with habitat, food sources, and mating opportunities. Urban pollinator habitats also provide opportunities for education, programming, and demonstrations of how the public can support pollinators in their own landscaping.

To further enhance pollinator habitat, CRPD invests in the establishment and maintenance of designated locations. As of 2022, CRPD has 35 pollinator habitats; a complete list is included in Appendix A: List of CRPD Pollinator Habitats.

Purpose: This document is a compilation of guidelines to be used by CRPD in support of pollinator land management practices in public spaces. The guidelines are meant to augment existing land use, education, and promote pollinator-friendly land use practices. The pollinator practices provide flexibility in guidance, keeping in mind the feasibility of resources. CRPD is committed to following best practices for managing pollinator habitats. With new advances in the field, changes in resource availability and overall content, the guidelines will be updated when deemed necessary.

Pollinator Habitat Guidelines

1. Habitat Selection

Characteristics of Habitats

- Small Spaces
 - For the purpose of this document, habitats less than 0.5 acres are generally defined as small spaces. These habitats are located in high visibility areas near CRPD facilities or trails. One example is Dodge Park Pollinator Habitat, located near Dodge Community Center.
 - At these habitats, there is potential for educational programming, such as summer camp or community center activities as well as partnership opportunities for dedicated volunteers and groups.
- Large Spaces
 - For the purpose of this document, habitats greater than 0.5 acres are generally defined as large spaces. These habitats are located in less trafficked areas that require less staff resources. One example is Hoover Prairie, near Hoover Reservoir.
 - The purpose of these larger areas is to have greater biodiversity and provide wildlife habitat for many species, including pollinators.

Location Selection

- The location should have support from internal department stakeholders, including Parks Maintenance, Capital & Strategic Planning, Community Relations, Outdoor Recreation, and any users of the space such as Rental Services or Community Recreation.
- The area should take into consideration: mowing, facility access, proximity to facility and overall plantings for the area.
- Habitat planting designs should take into consideration machinery capabilities, access for volunteers, and programming.
- See Appendix B: CRPD Potential Pollinator Habitat Evaluation Checklist.

2. Habitat Preparation

Pre-Restoration Survey (Optional)

- CRPD staff should evaluate the site based on its characteristics prior to the removal of vegetation.
- If possible, CRPD staff or a trained volunteer should conduct a pre-restoration survey documenting plant and pollinator species prior to the removal of vegetation. See Monitoring and Adaptive Management in Section 4: Maintenance.

Removal of Existing Vegetation

- To remove woody vegetation, use a brush bull attachment.

- The habitat should be mowed prior to planting or seeding. If resources allow, herbicide should be applied across the site.
- **Small Spaces:**
 - If resources allow, two rounds of non-selective herbicide should be applied to the space using appropriate spray equipment at a minimum of three weeks between applications.
 - Examples of herbicide application intervals include:
 - Application round in spring and/or early summer
 - Second application round in late summer or fall
 - Seed in winter
 - An example herbicide is a glyphosate product and surfactant at 3% solution to eliminate grasses and other vegetation. Applications should be made by trained, licensed herbicide applicators using U.S. EPA approved herbicides and adjuvants.
 - If time and resources allow, volunteers can rake off existing vegetation to further expose soil for seeding.
- **Large Spaces:**
 - Best practices for habitat preparation would be to apply herbicide to establish a weed free seed bed. However, due to the size of the area this method may not be possible.
 - If resources allow applying herbicide, this approach should follow the small space guidelines above.
 - If resources do not allow for the application of herbicide, ensure that woody vegetation is removed.

3. Plantings

Plant Species Selection

- Select a diverse mix of low maintenance, sustainable native plants for the habitat. Native plants provide more environmental benefits by fostering insect populations that feed wildlife, filtering water through extensive root systems, and providing refuge to wildlife. Native plants are also more adapted to local conditions and typically establish quickly. They do not require fertilizers, need less water, and are less likely to become invasive than non-natives. Native grass and forb species are also preferred by pollinators over non-native species, generally providing higher quality food and more abundant shelter resources.
- Choose native plants that offer significant pollen and nectar food resources throughout the growing season, as well as showing visible diversity. For example, choose plants with different flower color, sizes, shapes, and heights.
- When purchasing seed or plugs, a variable to consider and evaluate is the soil content and condition. Mixes available may fit dry, mesic, or wet sites. Sites such as Web Soil Survey or other GIS based soils map can be used to evaluate soil conditions.
- According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), it is recommended to have a total of ten (10) native species with three (3) to four (4) different flowering plants per bloom period, between May to October, to provide greater foraging opportunities ¹.

- Comparison of Forbs and Grasses/ Sedges
 - Herbaceous plants, also known as forbs, are more visually appealing but tend to be more expensive than grasses. They also do not burn as well as grasses.
 - Grasses and sedges are less expensive than forbs. They are not showy in colors, but they provide fuel for burnings.
 - Plantings should include at least one (1) native bunch grasses or sedge in addition to the three (3) or more forbs from each bloom period. This results in a minimum of 10 plant species per planting ¹.

Planting Options

- Smaller pollinator gardens should consider planting plugs which will establish more quickly than seed. For larger areas, consider only using seed ².
- Seeding
 - According to USDA NRCS, seed cost can range from \$30-\$600+ per pound depending upon the species. Seed rate calculators are available through Xerces Society and other organizations to help design a pollinator planting mix. Pollinator plantings are usually designed on a seeds per square foot basis. The target range is 40-60+ seeds per square foot ³.
 - See Appendix C: ODOT Recommended Species List, for examples of seed mixes.
 - Native seed can be spread by broadcast seeding or via a seed drill. See Appendix D: ODOT Pollinator Manual, for Ohio Department of Transportation's recommended site preparation for smaller, high-profile areas ⁴ or Appendix E: ODOT Seed Drilling Practices ⁴ for seed drilling practices.
 - Broadcast the desired native seed mix using the vendor recommended seeding rate in pounds of pure live seed per acre (PLS LBS/AC).
 - Use broadcast seeding equipment with an internal agitator and a flow gate that can be closed enough to create a slow, steady flow, allowing for even distribution of the smaller seeds. An inert carrier or bulking agent, such as rice hulls or sawdust, can be used to better provide an even distribution and provide a visual aid to the installer.
 - Volunteers or staff can spread seed via a seed spreader or by hand using buckets. Divide and spread the seed in two directions in a crosshatch pattern.
- Plug Planting (for **Small Spaces**)
 - Native plant plugs can be more expensive than seed, so not every project will have plugs. If the area is high-visibility and small, place plants on boundaries first to quicken the establishment of the space.
 - Native plant plugs range from \$1.20-\$3.00 per plug depending on the plant species and vendor. For example, in 2022 CRPD purchased 2,348 plugs to be used across four (4) pollinator sites for \$3,145.80 (not including shipping).
 - Purchase enough plants to space plugs 12" on center, if possible. To calculate number of plugs to order, there should be as many plugs as there are square feet of the habitat. If the habitat is too large to allow purchase of enough plants, concentrate plants on edges for high visual impact. Plants can also be planted farther apart, at 1.5' or 2' spacing ⁵.

- It is recommended that plugs of the same species be planted in groupings of 3-5 individual plants, 12 inches apart to produce a mass of blooms for pollinators. The entire habitat should be composed of these different groupings forming a biodiverse mosaic.
- Plant native plugs in spring (April or May). According to Spence Restoration Nursery, plug planting in April and early May is highly effective because plants typically have a surge of root growth right after they break dormancy in early spring. The result is rapid establishment and a reduced need for watering ⁶.
- Seeding is recommended along with plug plants, to fill in the bare soil between plugs. An annual cover crop such as oats in the seed mix will help reduce weed pressure while the native perennial plants establish root systems in year 1.

4. Maintenance

Mowing

- Disturbing pollinator habitat by mowing or burning is critical to control woody plants and overall vegetation height.
- In **large spaces**, it is critical to leave some areas un-mowed so nesting and overwintering populations of bees, butterflies, and moths are not all destroyed. It is recommended that at least 1/3 and up to 1/2 of the space should be left un-mowed at a time.
- When mowing, to reduce harm to wildlife, mow the habitat only once per year, or every other year once established. CRPD adheres to mowing no earlier than October 15th, and no early spring mowing to protect early nesting birds. Additionally, reducing mower speed and setting mowing decks heights high can also be beneficial techniques to avoid wildlife casualties.

Prescribed Burning (Large Spaces over one (1) acre)

- Low intensity prescribed burns can allow germination of seed bearing annuals, increase plant species diversity, control unwanted woody vegetation, and open up the stand for pollinator nest sites. However, not all habitats are appropriate to burn. Take into consideration the surrounding land uses and parkland.
- If burning is appropriate in the habitat, conduct a burn in fall (October or early November) or early spring (April).
- Currently, CRPD does not have the capability to conduct a burn. In the past CRPD has partnered with other entities (Metro Park and Columbus Fire Department) that are capable to conduct these burns.
- Potential partners include the following: Metro Park, Columbus Fire Department, and The Ohio State University School of Environment and Natural Resources (OSU SENR) students as well as entering into contract, if resources allow, with a third-party contractor.
- If prescribed burning is not possible, the habitat should instead be disturbed by mowing.

Maintenance Schedule Guidelines:

- **Year 0 (Habitat Preparation)**
 - Scout potential habitats between May and June to identify problems such as emerging noxious weeds or trees. These areas may need treatment to control.
 - See Section 2: Habitat Preparation.
- **Year 1 (Planting Year)**
 - After preparing the site the year before, seed or plant plugs in spring or fall. See Section 3: Planting.
 - The habitat should be mowed when the vegetation reaches a height of eight (8) to ten (10) inches. During the first growing season it is important to keep weeds from maturing by mowing at a height of six (6) inches before weed seed production starts (usually June/July).
 - When resources allow, it is recommended that CRPD contracts a third party for assistance with maintenance. Example of work to be contracted is for noxious weed control. Ideally, weeds should be cut down before they get taller than 16 inches, and do not allow them to exceed 18 inches or form seed heads.
 - A second mowing will be required before fall. Some of the native plants will get mowed down during the second mowing, but this will not set back growth.
- **Year 2**
 - Inspect pollinator habitats in early spring for undesirable vegetation dominating more than 30% of the stand (potential effort for third party assistance or knowledgeable volunteer). Mow these areas very short (4-6 inches) until the native forbs start to green up.
 - Continue to mow throughout the season as needed, at a height just above the native seedlings to prevent undesirable vegetation from dominating the site.
***Note:** Avoid mowing more than 50% of a site at any given point to avoid removing all food and shelter resources for pollinators.
 - Continue to monitor the sites throughout the second year.
 - **For large spaces over one (1) acre:** if possible and deemed necessary, arrange partnership for a spring burn.
- **Years 3 & 4:**
 - By the third or fourth year, the pollinator habitat should be well established. It will continue to need some disturbance, such as mowing or burning, to encourage native plant growth and remove undesirable species.
 - Repeat steps for Year 2 if weeds are persistent.
 - Continue to monitor the habitats throughout the year.

Additional Plantings

- During the first three years it is important to monitor the project areas for plant success. Some areas may require additional plantings or seeding.
- If resources allow, these areas should be re-seeded during the next seeding period. It will be important to assess the likely cause of the failure to determine if the species

selected were not appropriate for the area(s) that did not establish, if weed pressure prevented establishment, or if another factor was at play. Once this is determined, make any necessary adjustments to the seed mix and/or management regime and make preparations for supplemental seeding if needed.

- If using an equipment-mounted or handheld broadcast seeder, mix all seed with a carrier and cover crop as needed. This will aid in even distribution of the seed mixture.
- Broadcast the seed mixture in the problem areas.
- Watering after planting is not necessary. The seeds will germinate but at a slower rate.

Monitoring and Adaptive Management

- The two major components that contribute to the success of a pollinator habitat are the plants and the pollinators. If possible, both should be evaluated on an annual basis. These assessments can be completed by trained CRPD staff members, by university researchers, citizen science groups, or other volunteer groups with plant and pollinator identification knowledge.
- Habitat Monitoring
 - CRPD staff or trained volunteers should survey the habitat and record existing plants and pollinators. Data collected from surveys help assess the quality of pollinator habitats which informs current and future maintenance and expansions.
 - Habitat Monitoring Goal: To have CRPD staff or a trained volunteer visit each pollinator habitat and document species yearly.
 - A survey is conducted by walking a 160x6 foot fixed route and documenting observations using iNaturalist (a website and app used to share observations of plants and animals).
 - Refer to CRPD's Volunteer Pollinator Monitoring Documentation Protocol (2022).
- To evaluate the success of a pollinator habitat, the goals for each of CRPD's habitats are to:
 - Reduce woody plants
 - Reduce invasive plants
 - Increase biodiversity of native forbs and grasses
 - Increase number and biodiversity of pollinators

5. Volunteer Events and Public Engagement

Volunteer Events for Maintenance

- **Small Space Goal:** Volunteer event at every small habitat, twice a year.
- **Large Space Goal:** Volunteer event at every large habitat, once a year.
- An example of a volunteering event for both small and large spaces is a weeding event in the spring and/ or fall.
- Volunteers should target a specific area/ section designated by a CRPD staff person to remove unwanted woody plants, noxious weeds, and invasive species from the habitat.
- For the removal of woody plants, volunteers can cut the woody species with hand tools. CRPD staff who are certified pesticide applicators can follow to paint the stumps with herbicide, if resources allow.

- For noxious weed control and invasive species removal, volunteers should be taught how to recognize common weeds and common invasive plants. With guidance from CRPD staff, volunteers should choose one plant to remove at a time in a designated area of the habitat. Examples of species to remove are Canada thistle, cutleaf teasel, curly dock, bindweed, and grapevine.
- Depending on the size of the space, 10-20 volunteers led by a staff person or an experienced partner can remove weeds and cut woody plants.
- Volunteers are unable to use power tools or herbicide and must comply with all terms of the volunteer liability waiver.

Bioblitzes

- The goal of biological inventories or biological census is to get an overall count of the organisms in the habitat and to understand change in species.
- Bioblitz days can be established and advertised on CRPD social media platforms to generate interest. Partnerships with other local organizations and universities is also encouraged.
- Bioblitzes should use iNaturalist and contribute observations to the CRPD Pollinator Habitat Project.

Signage

- Educational Signage
 - Educational pollinator signs highlight pollinator species and plants, inform park visitors on the benefits of pollinators, and ways visitors can help. As resources allow, educational signage will be installed at pollinator habitats that are in high visibility areas.
 - The most recent pollinator educational signage was designed in April 2022. See Appendix F: Educational Signage Design and Appendix G: Educational Signage Specification.
- Boundary Signage
 - When establishing pollinator habitats, no-mow markers should be placed at regular intervals along the boundary of the new pollinator habitat.

Appendices

Appendix A: List of CRPD Pollinator Habitats

Updated: June 3, 2022

	Pollinator Habitat Properties	Acres	Year Added
1	Airport Golf Course	19.68	2018
2	Anheuser Busch Sports Park	0.16	2019
3	Anheuser Busch Sports Park	0.51	2021
4	Antrim Park	0.12	2018
5	Bicentennial Park / Miranova	0.09	2016
6	Big Run Park	0.52	2019
7	Big Walnut Park	1.28	2021
8	Big Walnut Park	4.08439	2003
9	Carriage Place Park	0.15	2020
10	Clinton-Como Park	0.23	2015
11	Clinton-Como Park	0.94	2015
12	Clinton-Como Park	0.30	2021
13	Colerain Park	0.03	2017
14	Dodge Park	0.026556	2021
15	Dorrian Green	.088918	2019
16	Franks Park	1.21	2021
17	Godown Dog Park	0.279782	2009
18	Hoover Prairie	2.81	Remnant
19	Jeffrey Scioto Park	1.62659	2006
20	Kilbourne Run Sports Park	0.18	2021
21	Linden Park	.35231	2021
22	McKnight Outdoor Education Center	0.05	2017
23	McKnight Outdoor Education Center	0.11	2019
24	Mock Park	0.767234	2021
25	O'Shaughnessy Nature Preserve Twin Lakes	0.510627	2000
26	Raymond Memorial Golf Course	9.01	2021
27	Retreat at Turnberry Park	0.33382	2021
28	Scioto Audubon Metro Park	0.15	2016
29	Three Creeks Park	4.66	2021
30	Topiary Garden at Deaf School Park	0.01	2014
31	Tuttle Park	0.01	2000
32	Whetstone Prairie	3.67	2004
33	Williams Creek Park	1.0422	2022
34	Woodward Nature Preserve (Marathon Oil easement)	0.463141	2020
35	Worthington Hills Park	0.01	2015

Appendix B: CRPD Potential Pollinator Habitat Evaluation Checklist

Adapted from: ODOT Statewide Roadside Pollinator Program Potential Site Evaluation Form

Potential Pollinator Habitat Evaluation Checklist



Instructions: This evaluation checklist is intended to provide documentation on how sites for pollinator habitats get chosen. Evaluate each site individually using the criteria listed under each category. Mark only one box for each criteria according to the most dominant feature of the entire site.

Submitted By: _____

Date: _____

Park/ Property Name: _____

Potential Site Acreage: _____

Existing Vegetation/ Site Condition

Type of Vegetation Cover

- ☐ Thin and sparse
☐ Dense in some areas, patchy in others
☐ Thick and dense throughout

Bare ground present

- ☐ Absent - 25%
☐ 25% - 50%
☐ >50%

Type of Vegetation Cover

- ☐ Forested
☐ Herbaceous/ shrub mix
☐ Herbaceous

Noxious/ Undesirable Species (Percent Cover)

- ☐ Over 66% noxious
☐ 33% - 66% noxious
☐ Below 33% noxious

Site Parameters

Existing land

- ☐ Mowed turf
☐ Conservation mow area
☐ Other _____

Primary Adjacent Land Use

- ☐ CRPD Public Facility/ Community Center
☐ Playground
☐ Other _____
- ☐ Trail
☐ Forest
☐ Field

Maintenance Equipment Accessibility

- ☐ Existing equipment cannot access
☐ Limited accessibility
☐ Easily accessible

Soil Condition

- ☐ Wet
☐ Medium
☐ Dry

Notes:

Appendix C: ODOT Recommended Species List

Adapted from: Ohio Department of Transportation Statewide Roadside Pollinator Habitat Program Restoration Guidelines and Best Management Practices (June 2016) ⁴

Plant Selection Master List						
Species Name	Common Name	Plant Type	Bloom Period	Light Requirement	Water	Tolerance Characteristics
<i>Achillea millefolium</i>	common yarrow	perennial forb	June-Sept	full sun	dry to medium	deer, drought, dry soil
<i>Allium cernuum</i>	nodding onion	perennial forb	June-Aug	full sun to part shade	dry to medium	deer, drought, dry soil, shallow-rocky soil
<i>Aquilegia canadensis</i>	Eastern red columbine	perennial forb	April-May	full sun to part shade	Medium	rabbit, deer, drought, dry soils
<i>Asclepias syriaca</i>	common milkweed	perennial forb	June-Aug	full sun	dry to medium	deer, drought, erosion, dry soil, shallow-rocky soil
<i>Asclepias tuberosa</i>	butterfly weed	perennial forb	June-Aug	full sun	dry to medium	deer, drought, erosion, dry soil, shallow-rocky soil
<i>Aster laevis</i>	smooth aster	perennial forb	Sept-Oct	full sun	dry to medium	drought, erosion, dry soil, shallow-rocky soil
<i>Aster novae-angliae</i>	New England aster	perennial forb	Aug-Sept	full sun	medium	clay soil
<i>Aster umbellatus</i>	flat-topped white aster	perennial forb	July-Sept	full sun to part shade	medium to wet	
<i>Baptisia alba</i>	white false indigo	herbaceous perennial (shrubby)	Apr-May	full sun to part shade	dry to medium	drought, erosion, dry soil
<i>Baptisia australis</i>	blue false indigo	herbaceous perennial (shrubby)	May-June	full sun to part shade	dry to medium	rabbit, drought, erosion, clay soil, dry soil, shallow-rocky soil
<i>Chamaecrista fasciculata</i>	partridge pea	annual forb	June-Sept	full sun	dry to medium	drought, dry soil
<i>Coreopsis lanceolata</i>	lanceleaf coreopsis	perennial forb	May-July	full sun	dry to medium	deer, drought, dry soil, shallow-rocky soil
<i>Coreopsis tinctoria</i>	plains coreopsis	annual forb	June-Sept	full sun	dry to medium	deer, drought, clay soil, dry soil, shallow-rocky soil
<i>Cosmos bipinnatus</i>	cosmos	annual forb	June-frost	full sun	Medium	

Master List Continued						
Species Name	Common Name	Plant Type	Bloom Period	Light Requirement	Water	Tolerance Characteristics
Cosmos sulphureus	sulphur cosmos	annual forb	June-Sept	full sun	dry to medium	drought, dry soil
Dalea candida	white prairie clover	perennial forb	May-June	full sun	Medium	drought
Dalea purpurea	purple prairie clover	perennial forb	June-Aug	full sun	Medium	drought
Desmodium canadense	showy tick trefoil	perennial forb	June-Sept	full sun	dry to medium	
Echinacea purpurea	purple coneflower	perennial forb	June-Aug	full sun to part shade	dry to medium	deer, drought, clay soil, dry soil, shallow-rocky soil
Eryngium yuccifolium	rattlesnake master	perennial forb	June-Sept	full sun	dry to medium	drought, erosion, clay soil, dry soil, shallow-rocky soil
Gaillardia pulchella	Indian blanket	annual forb	June-frost	full sun	dry to medium	drought
Helianthus mollis	ashy sunflower	perennial forb	July-Sept	full sun	dry to medium	drought, dry soil, shallow-rocky soil
Heliopsis helianthoides	ox-eye sunflower	perennial forb	June-Aug	full sun	dry to medium	drought, erosion, clay soil, shallow-rocky soil
Hibiscus moscheutos	swamp rose mallow	perennial forb	July-Sept	full sun	medium to wet	deer, wet soil
Iris versicolor	northern blue flag	perennial forb	May-June	full sun to part shade	medium to wet	deer, wet soil
Iris virginica	blue flag iris	perennial forb	June	full sun	medium to wet	deer, wet soil
Lespedeza capitata	roundheaded bushclover	perennial forb	July-Sept	full sun	medium	
Liatris spicata	dense blazingstar	perennial forb	July-Aug	full sun	medium	drought, clay soil
Lobelia cardinalis	cardinal flower	perennial forb	July-Sept	full sun to part shade	medium to wet	rabbit, deer, wet soil
Lobelia siphilitica	great lobelia	perennial forb	July-Sept	full sun to part shade	medium to wet	deer, heavy shade, wet soil

Master List Continued						
Species Name	Common Name	Plant Type	Bloom Period	Light Requirement	Water	Tolerance Characteristics
Mimulus ringens	monkey flower	perennial forb	June-Sept	full sun to part shade	medium to wet	deer, wet soil
Monarda citriodora	lemon mint	annual forb	May-Aug	full sun to part shade	dry to medium	deer, drought
Monarda fistulosa	wild bergamot	perennial forb	July-Sept	full sun to part shade	dry to medium	deer, drought, clay soil, dry soil, shallow-rocky soil
Nepeta racemosa	catmint	perennial forb	April-Sept	full sun to part shade	dry to medium	deer, drought, dry soil, shallow-rocky soil
Penstemon digitalis	smooth penstemon	perennial forb	April-June	full sun	dry to medium	deer, drought, clay soil, dry soil
Physostegia virginiana	obedient plant	perennial forb	June-Sept	full sun	medium	deer, clay soil
Pycnanthemum tenuifolium	narrow-leaved mountain mint	perennial forb	July-Sept	full sun to part shade	dry to medium	drought, erosion, clay soil, dry soil, shallow-rocky soil
Ratibida pinnata	grey-headed coneflower	perennial forb	June-Aug	full sun	medium	drought, clay soil
Rudbeckia hirta	black-eyed Susan	perennial forb	June-Sept	full sun	medium	deer, drought, clay soil
Rudbeckia subtomentosa	sweet black-eyed Susan	perennial forb	July-Sept	full sun	medium	deer, drought, clay soil, dry soil
Rudbeckia triloba	brown-eyed Susan	perennial forb	July-Oct	full sun	medium	deer, drought
Silphium perfoliatum	cup plant	perennial forb	July-Sept	full sun	medium to wet	clay soil, wet soil
Solidago ohioensis	Ohio goldenrod	perennial forb	July-Sept	full sun	dry to medium	deer, drought, clay soil
Solidago rigida	stiff goldenrod	perennial forb	Aug-Sept	full sun	medium	deer, clay soil
Solidago speciosa	showy goldenrod	perennial forb	July-Sept	full sun	dry to medium	deer, drought, clay soil
Verbena hastata	blue vervain	perennial forb	July-Sept	full sun	medium to wet	wet soil
Veronicastrum virginicum	Culiver's root	perennial forb	May-Aug	full sun	medium to wet	wet soil

Grasses, Sedges, and Rushes						
Species Name	Common Name	Plant Type	Bloom Period	Light Requirement	Water	Tolerance Characteristics
<i>Avena sativa</i>	oats	annual grass (cover crop)	June-July	full sun	dry to medium	drought tolerant
<i>Bouteloua curtipendula</i>	side-oats grama	perennial grass (warm season, clump)	July-Aug	full sun	dry to medium	drought, erosion, dry soil, shallow-rocky soil
<i>Carex comosa</i>	bristly sedge	perennial sedge	June	full sun	medium to wet	
<i>Carex crinita</i>	fringed sedge	perennial sedge	May-June	full sun to part shade	medium to wet	deer, erosion, wet soil
<i>Carex grayi</i>	grey's sedge	perennial sedge	May-Oct	full sun to part shade	medium to wet	deer, erosion, wet soil
<i>Carex lurida</i>	lurid sedge	perennial sedge	May-June	full sun to part shade	medium to wet	deer, erosion, wet soil
<i>Carex vulpinoidea</i>	brown fox sedge	perennial sedge	May-June	full sun	medium to wet	deer, erosion, wet soil
<i>Elymus canadensis</i>	nodding wild rye	perennial grass (cool season, clump)	July-Sept	full sun	dry to medium	drought, erosion, dry soil
<i>Lolium multiflorum</i>	annual rye grass	annual grass (cover crop)	May-Sept	full sun	medium	
<i>Schizachyrium scoparium</i>	little bluestem	perennial grass (warm season, clump)	July-Oct	full sun	dry to medium	deer, drought, erosion, dry soil, shallow-rocky soil
<i>Schoenoplectus tabernaemontani</i>	great bulrush	perennial rush	Apr-May	full sun	wet	
<i>Scirpus atrovirens</i>	dark green bulrush	perennial rush	June-July	full sun to part shade	medium to wet	wet soil
<i>Scirpus cyperinus</i>	woolgrass	perennial rush	June-July	full sun to part shade	wet	wet soil
<i>Secale cereale</i>	winter rye	annual grass (cover crop)	May-July	full sun	medium	drought tolerant
<i>Sporobolus heterolepis</i>	prairie dropseed	perennial grass (warm season, clump)	Aug-Oct	full sun	dry to medium	deer, drought, erosion, dry soil, shallow-rocky soil
<i>Tridens flavus</i>	purpletop	perennial grass (warm season)	Aug-Nov	partial shade	dry	
<i>Triticum aestivum</i>	winter wheat	annual grass (cover crop)	June-July	full sun	medium	

General Pollinator Habitat Seed Mix for Sunny, Mesic to Wet Sites (suitable for roadside ditches, stormwater basins, and low-lying areas; colors denote bloom color)

Scientific Name	Common Name	Apr	May	Jun	Jul	Aug	Sep	Oct
<i>Aster novae-angliae</i>	New England Aster							
<i>Carex comosa</i>	Bristly Sedge							
<i>Carex crinita</i>	Fringed Sedge							
<i>Carex grayi</i>	Gray's Sedge							
<i>Carex lurida</i>	Shallow/Lurid Sedge							
<i>Carex vulpinoidea</i>	Brown Fox Sedge							
<i>Echinacea purpurea</i>	Purple Coneflower							
<i>Elymus canadensis</i>	Virginia Wild Rye							
<i>Liatris spicata</i>	Dense Blazingstar							
<i>Lobelia cardinalis</i>	Cardinal Flower							
<i>Lobelia siphilitica</i>	Great Lobelia							
<i>Mimulus ringens</i>	Monkey Flower							
<i>Monarda fistulosa</i>	Wild Bergamot							
<i>Physostegia virginiana</i>	Obedient Plant-Purple							
<i>Rudbeckia subtomentosa</i>	Sweet Black-eyed Susan							
<i>Scirpus atrovirens</i>	Dark Green Bulrush							
<i>Scirpus validus</i>	Great/Soft-stemmed Bulrush							
<i>Veronicastrum virginicum</i>	Culver's Root							

General Pollinator Habitat Seed Mix for Sunny, Dry Upland Sites (suitable for hillsides, well-drained, rocky soils, and other dry sites; colors denote bloom color.)

Scientific Name	Common Name	Apr	May	Jun	Jul	Aug	Sep	Oct
<i>Achillea millefolium</i>	common yarrow							
<i>Asclepias syriaca</i>	common milkweed							
<i>Asclepias tuberosa</i>	butterfly weed							
<i>Aster laevis</i>	smooth aster							
<i>Chamaecrista fasciculata</i>	partridge pea							
<i>Coreopsis lanceolata</i>	lanceleaf coreopsis							
<i>Coreopsis tinctoria</i>	plains coreopsis							
<i>Cosmos sulphureus</i>	sulphur cosmos							
<i>Desmodium canadense</i>	showy tick trefoil							
<i>Echinacea purpurea</i>	purple coneflower							
<i>Eryngium yuccifolium</i>	rattlesnake master							
<i>Gaillardia pulchella</i>	indian blanket							
<i>Helianthus mollis</i>	ashy sunflower							
<i>Heliopsis helianthoides</i>	ox-eye sunflower							
<i>Monarda citriodora</i>	lemon mint							
<i>Monarda fistulosa</i>	wild bergamot							
<i>Nepeta racemosa</i>	catmint							
<i>Penstemon digitalis</i>	smooth penstemon							
<i>Pycnanthemum tenuifolium</i>	narrow-leaved mountain mint							
<i>Solidago ohioensis</i>	Ohio goldenrod							
<i>Solidago speciosa</i>	showy goldenrod							
<i>Bouteloua curtipendula</i>	side-oats grama							
<i>Elymus canadensis</i>	nodding wild rye							
<i>Schizachyrium scoparium</i>	little bluestem							

Low-Cost Pollinator Habitat Seed Mix for General Roadside Use (suitable for most upland roadside pollinator habitat applications; colors denote bloom color.)

Scientific Name	Common Name	Apr	May	Jun	Jul	Aug	Sep	Oct
<i>Aquilegia canadensis</i>	eastern red columbine							
<i>Asclepias syriaca</i>	common Milkweed							
<i>Aster laevis</i>	smooth aster							
<i>Aster novae-angliae</i>	New England aster							
<i>Bouteloua curtipendula</i>	side-oats gramma							
<i>Chamaecrista fasciculata</i>	partridge pea							
<i>Coreopsis lanceolata</i>	lanceleaf coreopsis							
<i>Echinacea purpurea</i>	purple coneflower							
<i>Elymus canadensis</i>	nodding wild rye							
<i>Gaillardia pulchella</i>	indian blanket							
<i>Heliopsis helianthoides</i>	false sunflower							
<i>Monarda citriodora</i>	lemon mint							
<i>Monarda fistulosa</i>	wild bergamot							
<i>Penstemon digitalis</i>	foxglove beardtongue							
<i>Rudbeckia hirta</i>	black-eyed Susan							
<i>Schizachyrium scoparium</i>	little bluestem							
<i>Solidago rigida</i>	stiff goldenrod							

Showy Seed Mix for Sunny, Mesic Sites (suitable for sites with moderate moisture levels)

Scientific Name	Common Name	Apr	May	Jun	Jul	Aug	Sep	Oct
<i>Aquilegia canadensis</i>	eastern red columbine							
<i>Asclepias syriaca</i>	common Milkweed							
<i>Asclepias tuberosa</i>	butterfly Weed							
<i>Aster laevis</i>	smooth aster							
<i>Aster novae-angliae</i>	New England aster							
<i>Baptisia alba</i>	white wild indigo							
<i>Bouteloua curtipendula</i>	side-oats gramma							
<i>Chamaecrista fasciculata</i>	partridge pea							
<i>Coreopsis lanceolata</i>	lanceleaf coreopsis							
<i>Coreopsis tinctoria</i>	plains coreopsis							
<i>Dalea candida</i>	white prairie clover							
<i>Dalea purpurea</i>	purple prairie clover							
<i>Echinacea purpurea</i>	purple coneflower							
<i>Elymus canadensis</i>	nodding wild rye							
<i>Gaillardia pulchella</i>	indian blanket							
<i>Heliopsis helianthoides</i>	false sunflower							
<i>Liatris spicata</i>	dense blazingstar							
<i>Monarda citriodora</i>	lemon mint							
<i>Monarda fistulosa</i>	wild bergamot							
<i>Penstemon digitalis</i>	foxglove beardtongue							
<i>Ratibida pinnata</i>	grey-headed coneflower							
<i>Rudbeckia hirta</i>	black-eyed Susan							
<i>Schizachyrium scoparium</i>	little bluestem							
<i>Silphium perfoliatum</i>	cup plant							
<i>Solidago rigida</i>	stiff goldenrod							
<i>Tradescantia ohiensis</i>	Ohio spiderwort							
<i>Verbena hastata</i>	blue vervain							
<i>Zizia aurea</i>	golden alexanders							

Tree and Shrub Species Beneficial to Pollinators						
Scientific Name	Common Name	Bloom Period	Average Height at Maturity (ft.)	Shade Tolerance	Form	Pollinator Preference
Acer rubrum	red maple	Very Early (March - April)	90	Tolerant	Tree	Bees
Sambucus canadensis	elderberry		7	Intermediate	Tree/Shrub	Bees
Cercis canadensis	eastern redbud		16	Tolerant	Tree/Shrub	Bees, Butterflies
Salix sp.	willow		15-40	Tolerant	Tree/Shrub	Bees, Moths
Prunus americana	American plum	Early (March - May)	30	Intolerant	Tree/Shrub	Bees, Butterflies
Diospyros virginiana	persimmon		50	Tolerant	Tree	Bees
Nyssa sylvatica	black gum		95	Tolerant	Tree	Bees
Prunus serotina	black cherry		100	Intolerant	Tree	Bees, Butterflies
Robinia pseudoacacia	black locust	Mid (May - July)	70	Intermediate	Tree	Bees, Butterflies
Liriodendron tulipifera	tulip tree		120	Intolerant	Tree	Bees, Hummingbirds
Tilia americana	American basswood		90	Intermediate	Tree	Bees, Butterflies

Appendix D: ODOT Pollinator Manual

Adapted from: Ohio Department of Transportation Statewide Roadside Pollinator Habitat Program Restoration Guidelines and Best Management Practices (June 2016) ⁴

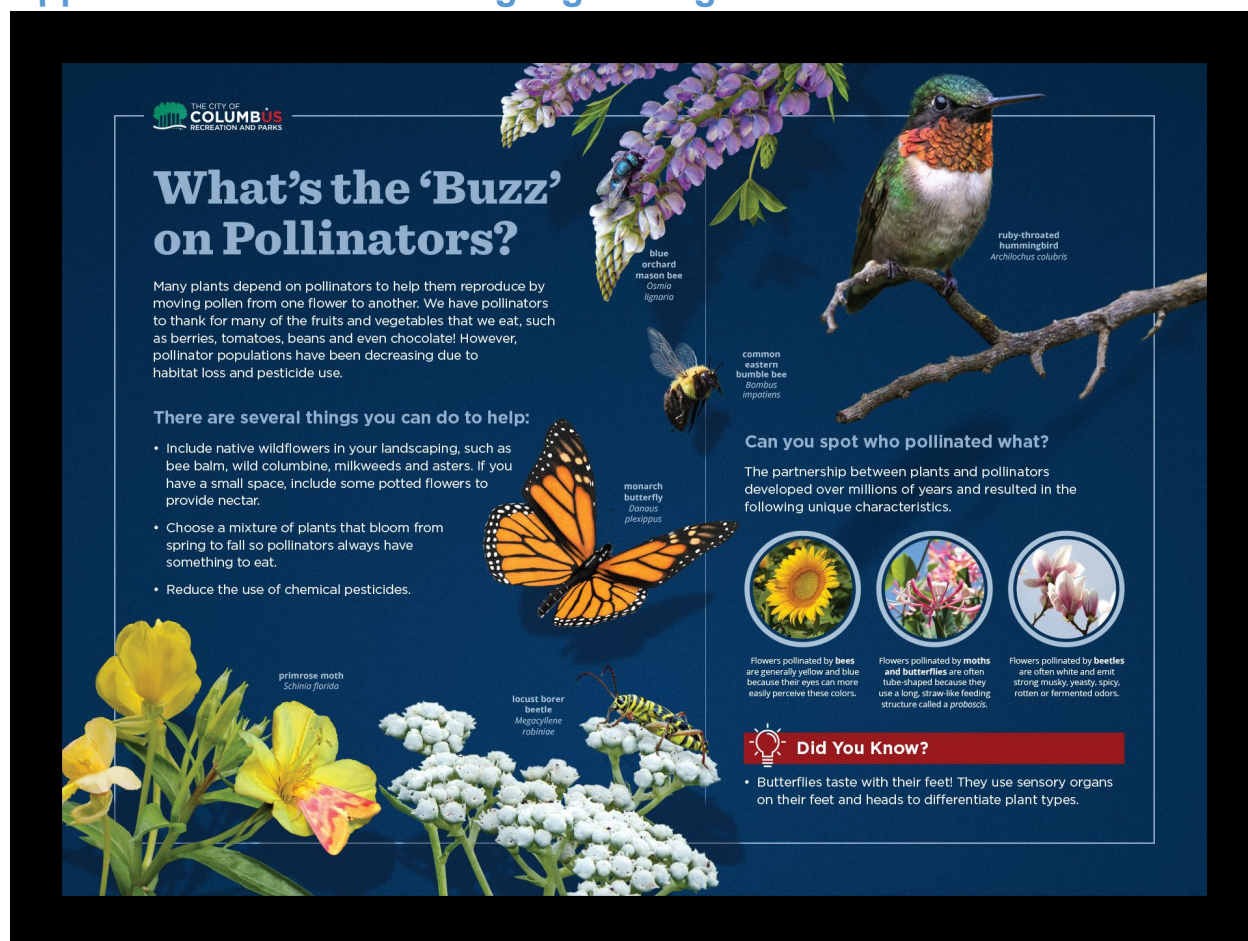
Application: High-Profile Areas	
Preparation Timeline: <ul style="list-style-type: none"> • Total site preparation time: a minimum of 6 months • Planting timeframe: Early spring or late fall (after hard frost) 	
Benefits: <ul style="list-style-type: none"> • Intensive soil preparation alleviates compaction. • Provides a more landscaped appearance. 	Drawbacks: <ul style="list-style-type: none"> • Labor intensive process that can increase costs.
Installation Instructions (Seed): <ol style="list-style-type: none"> 1) If sod or other vegetative cover is present: <ol style="list-style-type: none"> a. Apply a broadcast herbicide treatment, using glyphosate at the rate specified on the label for the vegetation being treated, in early spring (beginning of the growing season) to kill the existing vegetation and follow up with tilling the site under after the vegetation has died back. b. Or, use a mechanical sod-cutter, or other equipment to directly remove the vegetative layer within the site. This can be done with or without an initial herbicide application. 2) Following removal of the vegetation, broadcast seed a temporary cover crop, such as common oats (<i>Avena sativa</i>). This will be necessary to stabilize the soil until the site can be treated with herbicide again following germination of weed seeds. 3) Allow the site to grow through the fall season. If the undesirable vegetation is controlled, mow the vegetation to less than 6 to 8 inches and rake the thatch. 4) Broadcast the desired native seed mix using the vendor recommended seeding rate (in pounds of pure live seed per acre (PLS LBS/AC)). 5) Use broadcast seeding equipment with an internal agitator and a flow gate that can be closed enough to create a slow, steady flow, allowing for even distribution of the smaller seeds. An inert carrier or bulking agent can be used to better provide an even distribution and provide a visual aid to the installer. 6) If the site is smaller than 2 acres, broadcast seeding can also be done by hand. If using this method, divide the seed mix into two or more batches to ensure the seed is evenly distributed. Walk in parallel, overlapping passes, using the larger seeds as a visual aid, and then spread the remaining batch(es) in a perpendicular direction. 7) <u>Do not</u> till or cover the seed with soil. 	

Appendix E: ODOT Seed Drilling Practices

Adapted from: Ohio Department of Transportation Statewide Roadside Pollinator Habitat Program Restoration Guidelines and Best Management Practices (June 2016) ⁴

Application: Large sites with existing vegetative cover, i.e., old fields, interchanges, etc.	
Preparation Timeline: <ul style="list-style-type: none"> • Total site preparation time: a minimum of 6 months • Planting timeframe: Early spring or late fall (after hard frost) 	
Benefits: <ul style="list-style-type: none"> • No soil preparation is required, resulting in minimal soil disturbance, and fewer weeds. • Easy use for planting large areas. • Specialized native seed drills have more accurate calibration and depth controls to ensure proper installation, and are equipped to handle small and fluffy seeds found in native mixes. • A separate step for cultipacking is not required, as the drill is equipped with packer wheels. 	Drawbacks: <ul style="list-style-type: none"> • Native no-till seed drills are expensive to purchase and not readily available in many areas. • Require careful calibration to ensure proper seeding rates and depths. • Requires the use of a tractor and operator. • Requires clean seed. Native seed that is not well cleaned can become clogged in the delivery tubes.
Seed Installation Instructions: <ol style="list-style-type: none"> 1) Plant only when soil is dry enough, as wet conditions can cause mud and seed to stick to the coulters, packer wheels, and other components rather than being planted in the ground. 2) Keep seed separated by size/type until ready to plant, and loosely fill each seed box with the appropriate seed type. If ordering a pre-mixed seed mix, ask the vendor to separate small, fluffy, and grain seeds into separate bags. Alternately, the pre-mixed seed can be added to the fluffy seed box only, where the agitator wheels will help to keep the small seed mixed in. The cover crop seed (i.e., oats or rye) can be added to the grain box separately. 3) Adjust the planting depth to no more than 1.5 times the small seed diameter, which for most wildflower seed mixes is no deeper than ¼ inch. Periodically check to see that the seed is being dispersed at the correct depth and adjust as necessary. 4) Calibrate the seed drill per the manufacturer's instruction manual to ensure the mix is applied at the appropriate seeding rate specified by the vendor. 5) Operate the drill at less than 5 mph to ensure seeds are sown evenly and the equipment is not damaged. Periodically check the drill throughout the seed installation process to ensure the feeder tubes are flowing freely, seed is being deposited in the furrows, and that the equipment is not damaged and functioning properly. 	

Appendix F: Educational Signage Design



Appendix G: Educational Signage Specification

Mounting System Specifications:

- Single Post Interpretive Display (See Interpretive Displays Graphic)
- 3" X 5 Ft Square Posts, Cut Top At 30 Degree Angle
- 1/8" Main Panel To Hold 18" T X 24" W Panel
- Live Area 16" X 22"
- 1" X 2" Removable Retainer Frame (Adjusts To Panel Thickness Up To 1/2" Thick)
Black Semi-gloss

Panel Specifications:

- Size: 18" T X 24" W / Live Area 16" x 24"
- Avery Dennison MPI 1105 SuperCast RS/DOL 1360Z Gloss Overlamine Vehicle Vinyl
- 3mm 1/8" MaxMetal (ACM) 4x8 White Aluminum composite panel, lightweight and highly durable. Resists scratching and denting.



Appendix H: References

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6. Spence Restoration Nursery. April is Plug Planting Time. https://ofswcd.org/file_download/104b1c43-c230-4c4a-b923-b549438cf405