
CAMPUS
POLLINATOR
HABITAT
PLAN
UIC

INTRODUCTION

UIC pledges to protect bees, bats, butterflies and other pollinators on campus by providing **healthy habitats** through creation, restoration and protection efforts.

CAMPUS POLLINATOR PLEDGE

UIC pledges to protect bees, bats, butterflies and other pollinators on campus by providing healthy habitats through creation, restoration and protection efforts. We will engage all campus stakeholders in our pollinator actions, including students, faculty, and staff, and educate the campus community on the importance of pollinators and our goals for their protection (National Wildlife Federation).

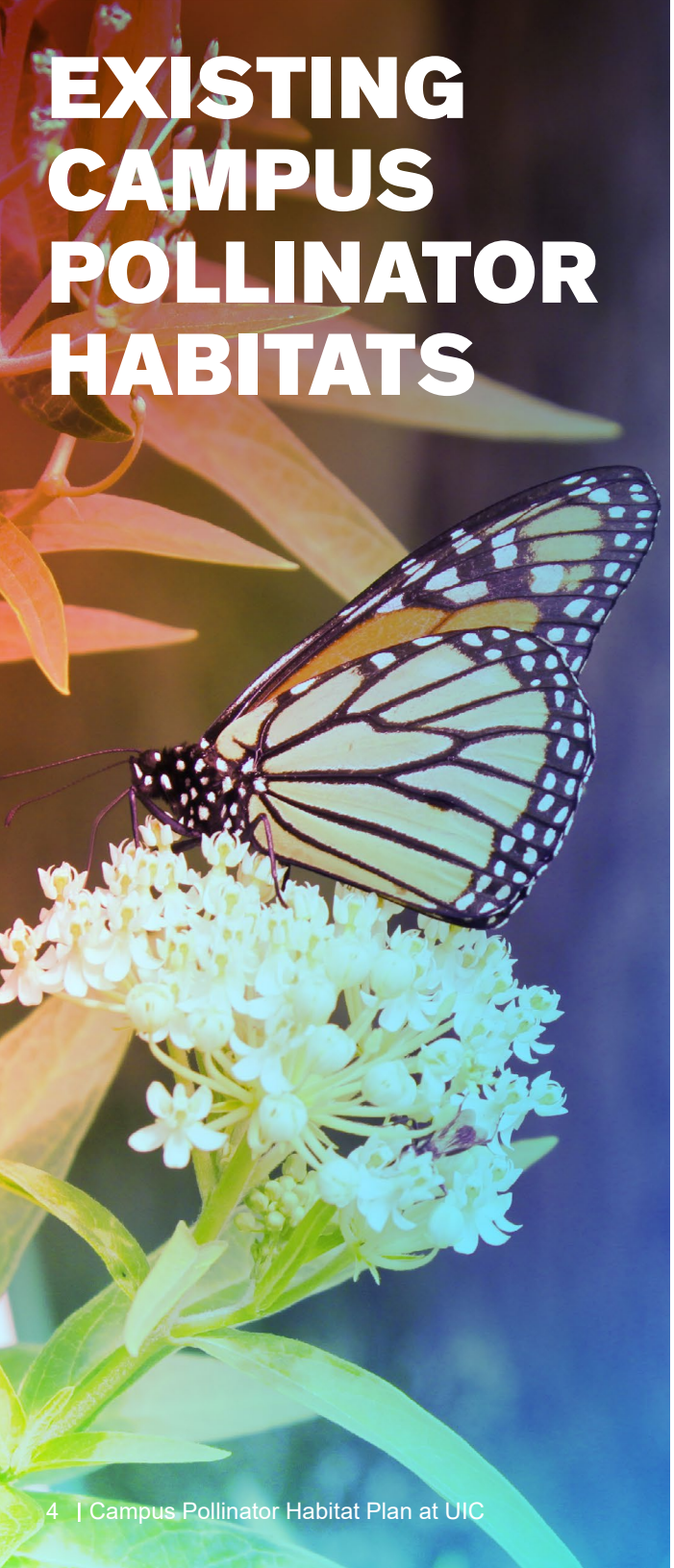
PURPOSE

The purpose of this Campus Pollinator Habitat Plan is to educate anyone performing work on campus including faculty, staff, students, architectural firms, and contractors on the importance of pollinators and their habitats. This plan will also create a set of recommendations and practices that allow diverse and ecologically important species of pollinators to thrive on the area occupied by the University of Illinois at Chicago (UIC). By implementing the use of native plant species, this plan will promote the diversity of pollinator communities. Through placement of strategic educational signage, local communities will understand that animals are protected, learn about biodiversity and community interactions, and promote the benefits of biodiversity.

INTRODUCTION

The University of Illinois at Chicago spans approximately 260 acres just west of Chicago's main business center (the "Loop") and is comprised of more than 60% impervious land cover. UIC is unique because the campus enjoys a significant ratio of open space (such as lawns and gardens) compared to the built environment (such as buildings and parking structures) in such a densely urbanized setting. However, a majority of this open space is comprised of lawns. Just 0.1 acres of campus land houses native plantings.

EXISTING CAMPUS POLLINATOR HABITATS



1 LINCOLN AND DOUGLAS HALLS RAIN GARDEN

The east side of campus features bioswales and rain gardens adjacent to Lincoln and Douglas Halls. As part of the 2009 and 2010 LEED (Leadership in Energy and Environmental Design) renovation, each building received Gold Level Certification for their achievement in sustainable sites through implementation of rain gardens adjacent to the buildings. *Pictured p. 6

2 LITTLE PRAIRIE ON CAMPUS

This west campus native plant garden is just south of the School of Public Health and Psychiatric Institute and is a 2,000 square foot biodiversity island that attracts life in an urban habitat. This garden transformed an area of grass to a pollinator-friendly habitat with over 20 different species of native plants in 2017. In the same year, the garden has already seen multiple bees, butterflies and other pollinators visit the multi-colored flowering plants. The species of the Little Prairie replicate many species found in the James Woodworth Prairie. *Pictured p. 8, 16, 18

3 HERITAGE GARDEN

The UIC Heritage Garden is a hands-on internship program that manages 8 satellite gardens on east campus. From tilling the soil to collecting seeds, interns are involved throughout the entire process of maintaining the gardens every season, including a monarch butterfly habitat and a bioswale, among others. *Pictured p. 4, 20

MONARCH BUTTERFLY HABITAT

This butterfly habitat was created by the UIC Heritage Garden Interns in 2015 in response to a natural crisis: an 80% drop in the Monarch butterfly population from their historic average over the past 20 years due to the destruction of the Monarch butterfly habitat. Caterpillars feed exclusively on milkweed, which has become less available due to pesticides and prairie destruction. The Monarch also serves as an educational piece for the diverse UIC student population: Monarchs are a symbol of immigration for the Latino community, as it moves freely across North American borders over a series of generations, representing beauty, resilience, and natural survival. In addition to inspiring environmental and climate action, this habitat can help spark conversations about cultural understanding and social justice.

BIOSWALE

The Heritage Garden Bioswale contains a variety of culturally significant native plants to Illinois, many of which were donated from the American Indian Center of Chicago. With time, these plants will spread throughout the entire site, mimicking a native prairie. This site was created in the summer of 2016 alongside the north side of Lecture Center B.

4 THE JAMES WOODWORTH PRAIRIE

UIC owns and operates a plot of prairie land located roughly 20 miles northwest of the campus. The James Woodworth Prairie is a 5.5 acre remnant of Mesic, bottomland, tallgrass prairie. It has never been plowed or heavily grazed, nor has it ever given way to woody vegetation. As such, it is one of the

last remaining habitats of its kind in Illinois. Vegetation surveys were conducted in 1929, 1969, 1984, and 2000 and it has retained much of its distinctive flora. It also retains populations of distinctive animal species, including the Prairie cicada, and the Prairie crayfish. The extent to which sites like this can act as refugia for prairie species, in the long term, is not known, nor are the ecosystem services it can provide. However, this site does serve as an example of what restored prairie gardens on campus have the potential to provide. *Pictured p.12

5 UIC PLANT RESEARCH LAB

Operated by the department of Biological Sciences the UIC Plant Research Laboratory ("UIC Greenhouse") is a 1-acre facility with a greenhouse, cold frames, planting boxes, and open lawn. The greenhouse contains 3,600 sq ft of environmentally controlled growth space in five compartments, a cold room, and a prep room that supports faculty research on various environmental factors on plant growth. In addition, the grounds are used for experiments on animal feeding behavior.

Thanks to funding from the UIC Sustainability Fee, undergraduate student Armando Ponce was able to install 3 working beehives at the UIC Plant Research Laboratory and research bees, beehive behavior, help the bee populations, and collect honey. The student is researching Colony Collapse Disorder, Cost and Benefits of Queen Excluders, as well as bee species in hope to help bee colonies. One of the beehives was populated with bees specifically bred to withstand a Chicago winter. After the first summer, the project included a harvest honey for research from two frames in one of the hives and over 50,000 bees. The result of the honey harvest was 120 ounces. Traditionally, honey is not extracted from an establishing beehive (less than 1 year old). *Pictured p. 10, 14

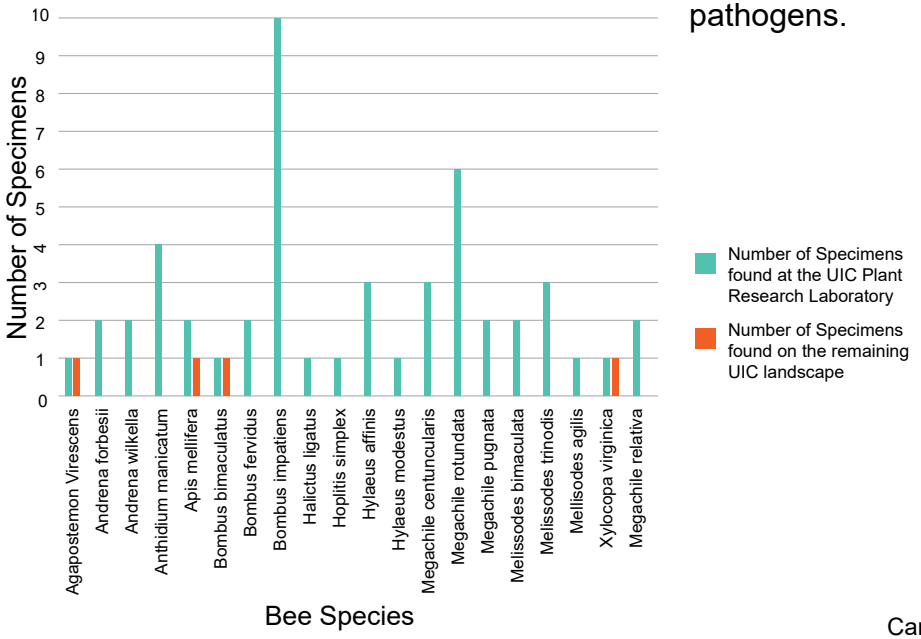
There are many other areas of pollinator friendly native plants around campus: The Grove, Peoria Street Bridge...

UIC POLLINATOR POPULATION

Because UIC is comprised of green spaces, the campus harbors significant populations of animal pollinators, but for the most part, their numbers and diversity were concentrated in a small area near the UIC Plant Research Laboratory. Collections from 2004 - 2007 in that area indicated the regular occurrence of at least 20 bee species, with a comparable diversity of pollinating wasps, diptera, lepidoptera, and coleoptera (Molumby, unpublished data). This site provides nesting sites and resources for sustained populations. By contrast, at the same time period, the rest of the UIC landscape that lacked the rain gardens, bioswales, and prairie gardens, harbored only four species of bees on a regular basis, and provided few resources for most pollinating species. (Figure 1).

There is considerable evidence that many species of animal pollinators like bees, butterflies, moths, hummingbirds, flies, and beetles have suffered significant declines in recent decades (Biesmeijer et al, 2006, Goulson et al. 2015). The main factors implicated in pollinator decline in the United States are habitat loss, agricultural practices, urbanization, change in ecosystem processes, pesticides, and introduced pathogens.

Figure 1: UIC Bee Collections 2004-2007



UIC RELATED PLANS & GOALS

UIC CLIMATE COMMITMENTS

Policies and suggestions outlined in this plan should be observed in order to further the goals of the UIC Climate Commitments, which were designed to offset the campus-wide carbon footprint and ultimately benefit the environment and campus community.

BIODIVERSE CAMPUS

It is important that the campus landscaping remain resilient to infestation by insect, fungal, and viral pests, and to storm damage. This concern can be addressed by planting a variety of different species. A biodiverse tree and plant inventory also allows for habitats for a wide range of urban animal life, including pollinators.

CARBON NEUTRAL CAMPUS

All plants capture carbon dioxide and release oxygen through photosynthesis. For many types of vegetation, particularly long-lived trees, peat bogs, wetlands, and grasslands harboring native plants that sequester carbon in biomass beneath the ground, there is a net drawdown of carbon from the atmosphere (for example, see Waddington et al., 1996). Thus, landscaping practices have the potential to reduce the campus carbon footprint. There is some evidence that the widespread implementation of green roof top areas, ie., plants on top of a building, can reduce the urban heat island effect.

The urban heat island effect, which refers to built-up areas that are hotter than rural areas due to modified land surfaces and the generation of waste heat,occurs in cities around the world. Green roofs reduce a building's cooling load, thus reducing the need for additional electrical power to run the cooling system. Extensive research in Chicago has demonstrated that green roof tops can harbor diverse assemblages of bees (Tonietto, et al., 2011). Thus, green roof top designs would serve multiple purposes for conservation.

NET ZERO WATER CAMPUS

Along with proper soil management, the root systems of plants intercept and divert damaging stormwater and prevent flooding. Native plant species can also reduce the need for traditional irrigation. Many native plant species have deep root systems and can tap water sources that are unavailable to more traditional managed cultivars. If managed well, these areas with native woodland and prairie plants can be quite beautiful and self-sustaining with very little maintenance required. This reduces the need for irrigation and power landscaping equipment, another source of greenhouse gas emissions.

CLIMATE ACTION IMPLEMENTATION PLAN

The Climate Action Implementation Plan (CAIP) outlines strategic solutions that will be supported, developed, invested in, implemented, and re-evaluated on a 5-year incremental basis through 2050. Strategy 4.0 - Natural Resources and Ecosystem Services, will help UIC achieve its commitment to be a Net-Zero Water Campus as well as a Biodiverse Campus. Solution 4.3.1 is this plan, the Campus Habitat Politantor Plan.

THE COMPREHENSIVE FIELD GUIDE TO THE PLANT LIFE ON OUR CAMPUS

UIC currently keeps sustainable design in mind when maintaining buildings and surrounding grounds. When possible, plants are purchased locally, and priority is given to native plants. The UIC plant field guide highlights 23 of the most popular shrubs, ornamental grasses, and perennials found throughout the campus and helps the Grounds crew (Facilities Management) properly identify and care for each species. The Comprehensive Field Guide to the Plant Life on Our Campus can be accessed through the Grounds subsection of the UIC Office of Sustainability's website.

UIC TREE CARE PLAN

UIC encourages a greater diversity of trees on campus and encourages the use of native plants. As trees are selected for planting, priority is given to those species of trees that pose a pollinator habitat potential (by referencing the National Wildlife Foundation's Native Plant Finder). All trees inventoried follow a strict Integrated Pest Management (IPM) plan. This plan dramatically reduces the amount of pesticides used by as much as 90% and optimizes pest suppression through preventive maintenance and early detection of problems.

URBAN TRANSFORMATION V2.0: GREEN STORMWATER INFRASTRUCTURE PLAN

UIC's comprehensive green infrastructure plan notes that native plantings and rain gardens have a very efficient area-to-runoff-reduction potential and can also provide protection against nuisance flooding. Replacing hardscapes like pavement with native plants, bioswales and rain gardens can reduce stormwater runoff by 34,000,000 gallons per year, if the area is increased to 32 acres. These green infrastructure practices are highly visible and can be used to educate the campus community and greater public through the inclusion of signage.

IMPORTANCE & THREATS TO POLLINATORS

Worldwide, there are approximately 20,000 species of bees in seven families (Mitchner, 2000). The United States has over 4,000 species of bees with Illinois having about 500. Note that there are other important pollinators include pollinator flies, particularly in the families Syrphidae, Bombyliiidae, Stratiomyidae and Calliphoridae, as well as beetles, birds, bats, hummingbirds, Bombyliidae, butterflies, and ants.

As pollinators, bees are ubiquitous and essential components of terrestrial ecosystems. The pollination services of bees are essential for ecosystem function, since the majority of angiosperm species (flowering plants) rely on insect pollinators-particularly bees-for reproduction (Ollerton, 2001). It has been estimated that 35% of human food production (roughly $217 billion worldwide) relies on animal pollinators, with 87 leading crops requiring pollinators for seed set and fruit production, to increase yield, or to improve crop quality (UC Berkeley, 2018 and Helmholtz Association, 2008). The majority of these services are provided by unmanaged pollinators. The decline of both domesticated and wild pollinators poses potentially serious consequences to natural ecosystems, and also has the potential to affect human food production.

IMPORTANCE OF FLOWERING PLANTS

Several studies of urban bee assemblages suggest that the presence of native vegetation is key to supporting a larger biodiversity of local bees (Molumby and Przybylowicz, 2012, Tonietto et al., 2011). This is true of other groups of pollinators as well, particularly Lepidopteran species whose larval form (i.e., caterpillars) require specialized host plants.

Bees require flowers, of the right general type and near their nest site, for the entire time they are active. Like many other creatures, such as hummingbirds, flies, moths, and flower beetles, adult bees use nectar as a food source. Unlike these other animals, however, bees also use a floral product, pollen, as a means of providing nutrition for their young. Thus, the entire bee life cycle is tied to the presence of flowers. Pollination, aswith other animal pollinators, is an incidental byproduct of foraging for nectar and/or pollen. A bee's effectiveness as a pollinator depends greatly upon its own morphology and the morphology of the flower, specializations in its life history and behavior, its foraging patterns, and the extent to which other flowers in the environment compete for the bee's attention as a food source.

Oligolectic bees are specialists that require particular species of flowers. These bees have life histories which are very closely tied to the ecology of the flowers they visit. They only forage for pollen at a particular type of flower, and often restrict their foraging for nectar to this type of flower, or similar types

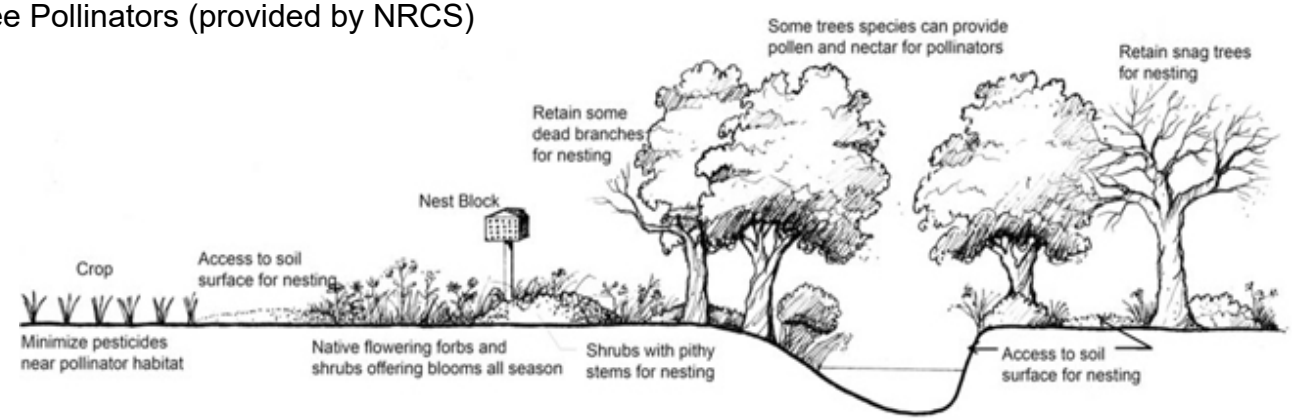
of flowers. Other examples include the long-horned bee, Melissodes agilis, which only visits sunflowers when foraging for pollen. It is only active in late summer, when sunflowers are in bloom.

IMPORTANCE OF NEST SITES

Bees also require nest sites of the right substrate and with appropriate environmental conditions such as sunlight and drainage. Native wild bees have various nest site requirements, including packed sand, hollow twigs, pre-existing holes, re-used beetle tunnels, opportune holes such as keyholes and soda straws, free-hanging mud or wax structures, tussocks of grass or tree cavities, and finally re-used or purloined nests of other species, and rodent burrows. Bumble bees are social and nest in small colonies numbering in the tens to hundreds. Their colonies are annual, founded in spring by fertilized queens, and nest below ground and near the ground, and many species favor rodent burrows, wood piles, or clay pots.

Sweat bees of the family halictidae nest in packed sand, and have annual colonies numbering in the tens to hundreds. Most other species of bee are solitary and do not form colonies. A. mellifera requires a tree hollow or nest box, and generally also requires a human helper to ward off various diseases. Commercial beekeepers and hobbyists provide honey bee colonies with nesting sites, in the form of hive boxes. Honey bees are a non-native managed species with no intrinsic conservation value in Illinois. Small-bodied bees may only travel 200 yards or less from their nests, so it is important that nesting habitat be located near pollinator-attractive flowers (See Figure 2).

Figure 2: Enhancing Nest Sites for Native Bee Pollinators (provided by NRCS)



IMPORTANCE OF PROTECTED OVERWINTERING SITES

Many, if not most, of our native pollinators do not migrate and instead stay in the Chicago region during the winter months, referred to as “overwintering”. Depending on the species, they may overwinter as eggs, larvae, pupae/chrysalises, or adults. Some species overwinter underground in the soil, but other species spend the winter attached to plant stems, wrapped in dead leaves, or otherwise protected by plant material. For example, the black swallowtail butterfly, pictured page 18 (Papilio polyxenes), overwinters by attaching its chrysalis to a stem, branch, or other hard structure. In the spring, the adult butterfly emerges from the chrysalis to look for a mate. Cutting down vegetation and removing all litter in the fall has the unintended consequence of removing pollinators from the garden. For that reason, it is important to leave dead stems, leaf litter, and other vegetation standing in place as often as possible. Leaving litter and dead stems in place has the additional benefit of returning nutrients to the soil and providing nesting habitats for many species during the following summer.

IMPORTANCE & THREATS TO POLLINATORS

In the past ten years, there has been a dramatic decline in populations of bumblebees once thought to be common. These include several bumblebees that occur in the Chicago area. Bombus affinis, a species formerly abundant here, was listed as an endangered species in 2017. Other bumblebees, including Bombus pennsylvanicus and B. terricola are likely to be listed soon. A bumblebee of conservation interest, the Great Northern Bumblebee, Bombus fervidus, actually occurs at the UIC Plant Research Laboratory and forages there frequently.

Monarch butterflies (Danaus plexippus) are another pollinator of conservation concern. The monarch butterfly's population has decreased significantly over the past two decades (Monarch Watch). Declining host plant populations, due to changes in land use, has been implicated. There is concern for other pollinators as well, and the impact of lost pollinators on the ecosystems they serve (Burkle et al. 2013).

PESTICIDES & DISEASE

Pesticides known as neonicotinoids are thought by many to be a contributing factor to colony collapse disorder in some areas of the country. Overuse of other pesticides has contributed to declines in native pollinators, and an over-reliance on honeybees, apis mellifera, to be essential for American agriculture. Unfortunately, the honeybee has also suffered a great deal from introduced diseases, notably the mite Varroa destructor, and many viruses. Finally, North American Bumblebees have suffered tremendous losses due to an introduced protozonan, Nosema ceranae.

HABITAT LOSS

Habitat loss is considered to be a principal causal factor in pollinator population decline (Goulson, 2011). The loss of the North American prairie is a lamentable example of habitat destruction. Tallgrass prairie once covered 170 million acres. Today, only 1- 4% is left (Molumby, 2018). Since the European settlers, this landscape has virtually disappeared. Black soil, bottomland, mesic tallgrass prairies are great farmland, and nearly all of this subtype has been farmed, grazed, or otherwise permanently altered. Nearly all the remnants, such as the Flint Hills of Kansas, are west of the Mississippi.

DESIGN & PLANNING

UIC's grounds will be **home** to a wider variety of pollinators, and more species of conservation interest.

IMPROVING POLLINATOR HABITAT IN GARDENS AND LAWNS

A great majority of flowering plants require animal pollinators, and animal pollinators require flowers as a resource. Native plants harbor more diverse assemblages of pollinators, and more native species (Molumby and Pryzbylowicz, 2012). By planting a diverse array of native flowers and implementing more biodiversity-centered gardening practices, UIC's grounds will be home to a wider variety of pollinators, and more species of conservation interest.

POLLINATOR HABITAT PLAN

1

PLAN

When beginning a pollinator habitat project, it is important to outline **short and long-term goals** so that a management strategy can be created to meet these goals. Xerces Society, the University of Illinois Extension, or NRCS may be able to provide guidance for the process.

Important questions to answer during the planning stage include:

- How much land is currently covered by flowering plants? Are any of these flowering species key pollinator plants? Are any of them invasive species that need to be controlled?
- Are there existing non-invasive, herbaceous flowering plants, shrubs, or trees at the site? Is it possible to enhance rather than replace the habitat?
- Are there nearby areas that might be used as nesting habitat for bees?
- What is the land use on adjacent sites? What weeds are present and what pesticides are used there that might affect the project site?

2

DESIGN

A healthy pollinator community depends on a **variety of flowering plants** that have adequate nectar and pollen resources.

- The minimum goal is to have at least three plant species flowering at all times from early spring through late fall. The **diverse wildflower mix** the better.
  - Bees are most attracted to blue, white, yellow, and purple flowers.
  - Butterflies are drawn to orange, red, yellow, and purple.
  - Flower flies mainly visit white and yellow flowers while hummingbirds are attracted to red flowers.
- A good seed mix will contain plants that host butterfly larvae and bunch grasses that provide nesting habitats for bees and birds.
- The J**ames Woodworth Prairie** can serve as a source of seed for native plantings. Typically, seeds are available for collection year round, depending upon the species, with winterized seeds available for plantings available in spring.

3

PLANT

Regional seed mixes, vendor information, planting instructions, and a seed mix calculator are provided by the Xerces Society. **Regional plant lists and planting guides** for the great Lakes and Midwest region are available from the Xerces Society, Midwest Groundcovers, and Chicago Botanic Garden.

Whereas native plantings are always the goal, being an urban campus, UIC recognizes that there are plenty of non-native plantings that do well to attract pollinators. The Daylily, American Native Trumpet Honeysuckle, Anemone, Coneflower and many types of Ornamental Grasses are great examples found on campus.

Additional Resources:

- Xerces Society (https://xerces.org/pollinators-great-lakes-region/)
- Pollinator Partnership (http://pollinator.org/)
- Illinois Department of Natural Resources (DNR) (https://www.dnr.illinois.gov/).
- Midwest Groundcovers http://www.midwestgroundcovers.com/
- Chicago Botanic Garden

Table 1: An example of a seed mix from the Illinois Biology Technical Note.

Example 1 - Native Seeding for Pollinators on Mesic Sites

The example seed mix below meets requirements for both the Illinois NRCS 327 Conservation Cover and 643 Restoration and Management of Rare and Declining Habitats. The mixture has 31 seeds per square foot of pure live seed (PLS) with 20 PLS per square foot of forbs and 11 PLS per square foot of grasses with the predominant species being little bluestem and prairie dropseed. The mix includes 2.5 PLS per square foot of forbs. There are at least 3 forbs in each bloom period with a variety of bloom colors.

FORBS

Common Name	Scientific Name	PLS Oz/Ac	Bloom Period	Color
Cream Wild Indigo	*Baptisia leucophaea*	6.0	Early	White
Smooth Penstemon	*Penstemon digitalis*	1.0	Early to Mid	White
Spiderwort	*Tradescantia ohiensis*	2.0	Early to Mid	Blue
Wild Bergamot	*Monarda fistulosa*	1.5	Early to Mid	Blue
Purple Prairie Clover	*Dalea purpurea*	6.0	Mid	Purple
Pale Purple Coneflower	*Echinacea pallida*	6.0	Mid	Purple
Culver's Root	*Veronica strum virginicum*	0.2	Mid	White
Prairie Milkweed	*Asclepias sullivantii*	3.0	Mid to Late	Pink
Prairie Blazing Star	*Liatris pycnostachya*	4.0	Mid to Late	Purple
Rattlesnake Master	*Eryngium yuccifolium*	6.0	Mid to Late	White
New England Aster	*Aster novae-angliae*	2.0	Late	Purple
Showy Sunflower	*Helianthus laetiflorus*	3.0	Late	Yellow
Showy Goldenrod	*Solidago speciosa*	1.0	Late to Very Late	Yellow
	Total Pounds	**2.6 lbs.**		

GRASSES*

Common Name	Scientific Name	PLS lbs/Ac	Bloom Period	Color
Big Bluestem	*Andropogon gerardii*	0.2	N/A	N/A
Eastern Gamma Grass	*Tripsacum dactyloides*	0.5	N/A	N/A
Little Bluestem	*Schizachyrium scoparium*	0.8	N/A	N/A
Prairie Dropseed	*Sporobolus heterolepis*	0.15	N/A	N/A
Switchgrass	*Panicum virgatum*	0.1	N/A	N/A
	Total Pounds	**1.8 lbs.**		

*Five species of grasses are required for the 643 Restoration and Management of Rare and Declining Habitats. If 327 Conservation Cover standard is planned, the grass mixture could be simplified to just two species, little bluestem and prairie dropseed with 1 pound PLS and 0.2 pounds PLS respectively. Using 327 Conservation Cover, sideoats grama could also be substituted for prairie dropseed at 1 pound per acre PLS.

TREES AND SHRUBS – Depending on the objective for the site, native species of trees and/or shrubs may be added to enhance the area for pollinators. For example, a few clumps of prairie willow, *Salix humilis*, and false indigobush, *Amorpha fruticosa*, could be added to the planting for additional very early to mid season pollen sources.

MAINTENANCE & MONITORING

Increasing pollinator habitat compliments UIC's other climate commitment goals by **encouraging native plant propagation and wildlife habitat.**

IMPROVING POLLINATOR HABITATS IN OPEN SPACES & ROADSIDES

Maintaining a high diversity of flowering native species throughout the growing season is the most important action that can be taken to promote health in various pollinator communities. Of almost equal importance is providing nest sites, host plants, prey for larvae, and other resources certain pollinators require. These needs can often be met by small patches of land, linear strips, or roadsides that are managed in such a way as to provide habitat structure and resources for biological communities. In agriculture, intercropping with strips of wildflowers and native vegetation is becoming an established technique in integrated pest management and has a documented ability to increase pollinator populations (Feltham et al, 2015). Increasing pollinator habitat compliments UIC's other climate commitment goals by encouraging native plant propagation and wildlife habitat.

POLLINATOR HABITATS

NESTING HABITAT FOR POLLINATORS

To provide nesting habitat in summer months and preserve pollinators that are overwintering on vegetation, minimize autumn “clean up” of garden beds. Leave fallen branches, standing dead stems, and leaf litter in place as much as possible. This dead plant material is important for many species throughout the year. Table 2 also provides guidance on optimal nesting sites for pollinators.

Pollinator	Food	Shelter
Solitary Bees	Nectar & Pollen	Most nest in bare or partially vegetated, well-drained soil; many others nest in narrow tunnels in dead standing trees, or excavate nest within the pith of stems and twigs; some construct domed nests of mud, plant resins, saps, or gums on the surface of rocks or trees
Bumble Bees	Nectar & Pollen	Most nest in small cavitites (approx. softball size), often underground in abandoned rodent nests or under clumps of grass, but can be in hollow trees, bird nests, or walls
Butterflies & Moths - Eggs	Non-feeding Stage	Usually on or near larval host plant
Butterflies & Moths - Caterpillar	Leaves of larval host plants	Larval host plants
Butterflies & Moths - Pupa	Non-feeding Stage	Protected site such as a bush, tall grass, a pile of leaves or sticks or in the case of some moths underground
Butterflies & Moths - Adult	Nectar; some males obtain nutrients, minerals and salt from rotting fruit, tree sap, animal dung and urine, carrion, clay deposits, and mud puddles	Protectd site such as a tree, bush, tall grass or a pike of leaves, sticks or rocks
Hummingbirds	Nectar, insects, tree sap, spiders, caterpillars, aphids, insect eggs, willow catkins	Trees, shrubs and vines, typically red, deep-throated flowers, such as twin berry or penstemons

Table 2. General Native Pollinator Habitat Requirements (provided by NRCS)

BLOOMING "BEE LAWNS"

Provide nesting habitat for bees and wasps:

- **Leave some areas undisturbed.** Most solitary bee species nest in the ground, in bare patches of semi-loose soil. Deep or frequent tilling can disturb nests. Areas of packed sand are of particular interest to certain pollinator species.
- When possible, **leave undisturbed canes and thatch**. Many bee species, especially in the families Colletidae and Megachilidae, nest in cavities. Bumble bees nest in cavities, abandoned bird nests, rodent burrows, and brush piles. Solitary bee species nest in hollow or pithy plant stems, logs, leaf litter, and old beetle holes.
- **Avoid disturbing existing bee nests**. Packed earth, mud river banks, and packed sand are common nesting substrates for solitary bees. Take time to observe and identify their inhabitants before assuming nests are homes for nuisance species. Solitary bees are docile and rarely sting unless handled.
- Use homemade "bee hotels" or nests with caution as they can often be colonized by wasps or harbor predators and pathogens if not properly cleaned and maintained. For more information see "Providing Nest Sites for Pollinators" from Xerces Society (https://xerces.org/providing-nest-sites-for-pollinators/).

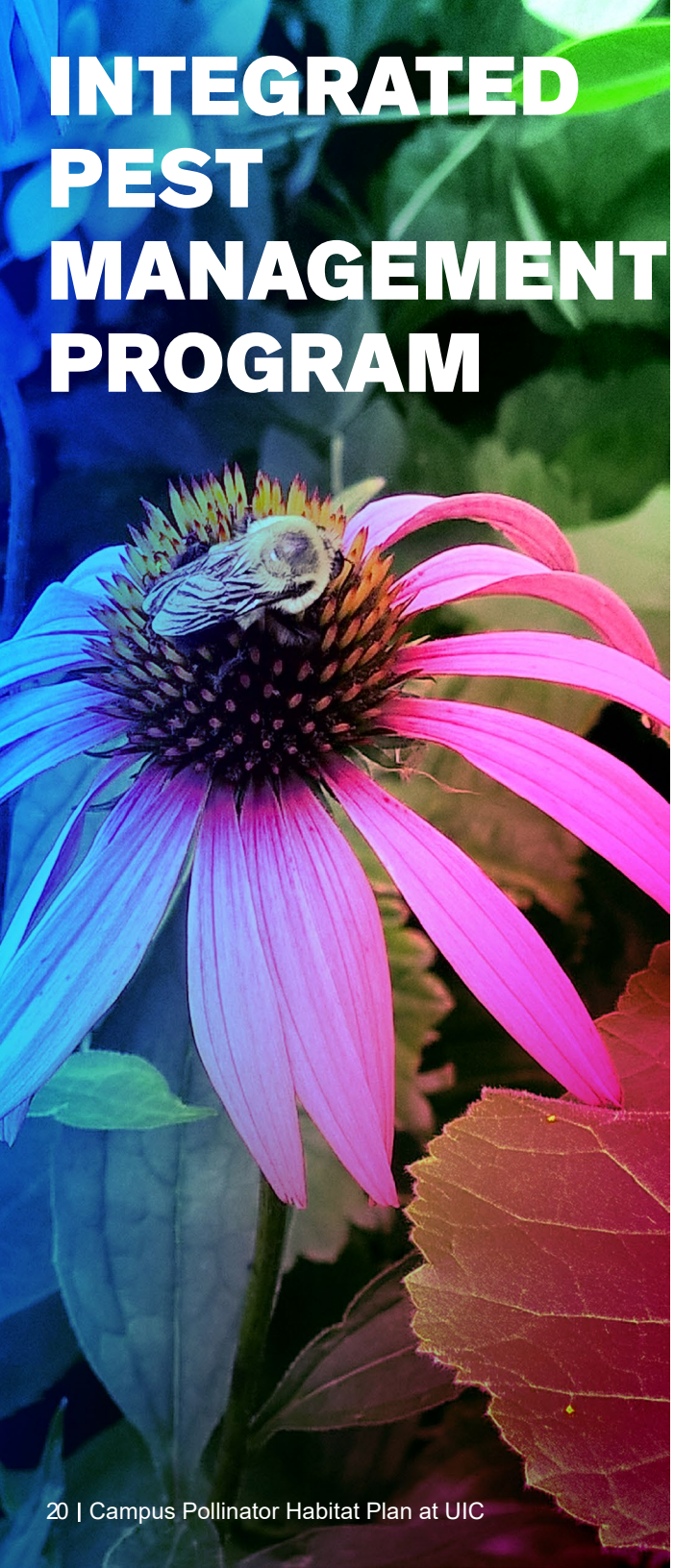
Provide nesting habitat for pollinator flies, beetles, and lepidoptera:

- **Do not remove aphids**. Many of the most important pollinator flies prey on aphids as larvae. Aphids, in and of themselves, should not be considered to be a problem unless they are a threat to particular ornamental vegetation.
- **Do not clear** dead wood, leaf litter, or vegetation, whenever practical. Other pollinator flies require decomposing compost or leaf litter. Decomposition is a natural process, and pollinator-friendly plantings should be managed in such a way.
- **Do not remove herbivorous insects** in native plantings. Butterflies and moths require host plants for developing larvae. This is true of some pollinator flies as well. Herbivorous insects in native plantings should not be regarded as pest species unless they are providing a nuisance to humans or damaging economically important ornamental vegetation.

Suggestions for lawn maintenance:

- Before spraying herbicides or insecticides, mow off **any blooms from weeds** so these chemicals are not introduced to a pollinators diet. Do not spray the lawn when it is windy
- **Mow at a higher setting**, greater than 3 inches, to keep grass blades longer which will shade the soil and keep roots cooler in heat.
- **Reduce the frequency** of mowing and **leave grass clippings** on the lawn to fertilize it.
- For more information on lawn care and maintenance, visit the University of Illinois Extension (http://web.extension.illinois.edu)

INTEGRATED PEST MANAGEMENT PROGRAM



An IPM Program for UIC will coincide with the IPM plan from University of Illinois at Urbana-Champaign. All employees who apply pesticides go through rigorous training and education to become State Licensed Public Pesticide Operators or Applicators. This high level of training, along with monthly meetings, ensures that FM Grounds employees understand and follow the IPM strategy.

ACCEPTABLE PEST LEVEL

The emphasis is on control of pests on campus, not eradication. IPM holds that wiping out an entire pest population is often impossible, and the attempt can be expensive and environmentally unsafe.

PREVENTATIVE PRACTICES

1. Do not add fertilizer to native plantings. These plants do not need it as they are accustomed to the area's climate and soil. Fertilizer only enables weeds to grow
2. Control the weeds. While seedling and new plants are getting established, weed control is necessary. Herbicides are not recommended but if used, always follow product label exactly for application timing and dose.
3. Preventing weed outbreaks and protecting sensitive species are proactive endeavors. They require knowledge of unfavorable species. Search the area during mid-spring for weeds and remove by hand when possible.

MONITORING

Regular observation is the cornerstone of IPM. Observation is broken into two steps: inspection and identification. The Grounds department consistently inspects the different areas of campus; all of the staff are trained and knowledgeable on what to look for and how to identify the presence of pests. There are three main indicators that pests have reached a level of economic and ecological threat:

1. When the plant is dying (e.g., turf grass that is infected with grubs to the extent of large brown patches)
2. When the plant is defoliating prematurely due to an insect infestation (defoliation from fungal reasons are treated with sanitation methods only)
3. When a plant's foliage is being eaten to a point where aesthetics are being negatively affected (i.e., off color, not blooming, appears defoliated, etc.).

In order to use pesticides/herbicides on campus, FM Grounds Workers are licensed by the Illinois Department of Agriculture every year. The license is valid from January 1 through December 31. Licenses must be renewed every year and a retest is required every third year. Employees attend what is called a "general standards training" before taking a thorough exam. Grounds Workers must have, at minimum, the general standards pesticide operator license, and supervisors must obtain a pesticide applicator license by passing the general standards plus a category exam (turf, right of way,

ornamental, and/or aquatics). This serves UIC well, as any Grounds Worker can help to identify and address pests and outbreaks on the campus.

MECHANICAL CONTROLS

Mechanical controls are another important line of defense in pest management. Should a pest reach an unacceptable level, mechanical methods are the first option, including using string trimmers to reduce the level of weed growth.

Additionally, FM Grounds utilizes large amounts of green waste wood chips in the planter bed areas of campus to suppress weeds. Application of the wood chips helps to reduce the amount of germination from weed seeds in the soil while also moderating moisture levels. For difficult sites to maintain, a layer of crushed granite may be used in lieu of mulch to suppress weed growth. The previously mentioned sanitation, in addition to the mulch regiment greatly assist the overall pest management.

BIOLOGICAL CONTROLS

Natural biological processes and materials can provide control with minimal environmental impact, and often at lower cost. The focus here is to promote beneficial insects that eat or parasitize target pests. The U of I planting designs incorporate specific types of flowering plants that attract predator insects, in order to naturally encourage an acceptable predator/pest balance. The planned Turf Type Tall Fescue mix is one example of this type of control.

PESTICIDE RESTRICTIONS

Pesticides are one of the many tools available to manage lawn and garden pests. When using pesticides, follow the label directions exactly. Before using any pesticide on lawns or gardens:

- **Identify the pest and assess the damage**. Many plants can tolerate insect damage and no action may be necessary.
- If pest damage is extensive, explore and understand options for management by choosing methods that **minimize harmful effects** on pollinators and beneficial insects that prey on pests.
- **Do not apply insecticides** to flowering plants or to areas where pollinators may be **nesting**.

HABITAT COSTS

Generally, the more plants and seed mixes there are, the more expensive it is. Methods used to prepare a site will depend on site conditions. For sites that were historically native, tree and brush removal may be enough to promote flowering plants that had been suppressed by shade. Roadside maintenance requires a balancing act to control erosion, stop the spread of invasive weeds, protect driver safety, and provide attractive vistas for drivers.

HABITAT BENEFITS

Despite the upfront costs and effort, the benefits of native plants will **pay off in the future.**

1. They require less maintenance and reduced herbicide use.
2. Native plants also prevent erosion and the amount of stormwater runoff.
3. Beauty of native plants and the wildlife they attract.
4. Healthier places due to less chemical pesticides and mental health benefits due to attractive green spaces.

ACKNOWLEDGMENTS

CCSE GROUNDS SUBCOMMITTEE

Co-Chairs:

- Roberta Mason-Gamer
- Carly Rizor

Members:

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- Carly Rizor, Facilities Management (Grounds)
- Lisa Sanzenbacher, Office of Sustainability

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PHOTOGRAPHY

1. Lisa Sanzenbacher, UIC Office of Sustainability (p.1 & p.24)
2. Brad Cavanaugh, University of Illinois Board of Trustees (p.2)
3. Heritage Garden <http://heritagegarden.uic.edu/> (p. 4)
4. Lisa Sanzenbacher, UIC Office of Sustainability (p.6)
5. Katerina Fiedler, UIC Office of Sustainability (p.8)
6. Rachel Ceckowski, UIC Office of Sustainability (p.10)
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