Introduction



Monarch butterfly

More than 85% of flowering plants require an animal, particularly an insect to transfer pollen. Many of the foods, minerals, and vitamins we consume on a regular basis can be traced back to a pollinator. Our most nutritious crops, such as fruits and vegetables, rely heavily on insect pollination. Pollinators are typically insects like bees, wasps, butterflies, moths, flies, and beetles. Iowa is fortunate to have several wild insect pollinators native to the state, roughly 400 native bees, 110 reproducing butterflies (resident and migratory), and over 2,000 moths. The ruby-throated hummingbird (*Archilochus colubris*) is Iowa's only vertebrate pollinator. While visiting flowers to feed on pollen or nectar, pollinators indirectly move pollen between flowers and plants. Although many different animals contribute to pollination each growing season, bees are the most efficient pollinators. Bees actively collect pollen to feed their offspring, and in doing so, move large quantities of pollen between flowers.

Creating or enhancing habitat for native pollinators on or near farms can offer multiple benefits. Native perennial habitat can support pollinators, as well as beneficial insect populations. Beneficial insects are a varied group of predatory or parasitic insects that feed on crop pests and can contribute to pest management. Habitat planted with pollinators in mind can also help other various wildlife species, such as song and upland game birds. Additional benefits include improving water quality, reducing soil erosion, and increasing carbon sequestration and water infiltration. This document will further explain how to provide food, overwintering, and nesting resources for pollinators and give examples of native functional plant groups to support pollinators.

Bee Biology and Ecology

Solitary bees: Most native bees (about 75%) live solitary lives, with a single female bee that constructs, maintains, and protects her nest. Solitary bees nest aboveground within pithy or hollow stems or in tunnels in snags, and underground in soil nests. Typically, adult solitary bees are only active for a few weeks at a time, emerging from their nests to find mates, food, and to build new nests. Emergence of solitary bees can vary throughout the season, with some species having only one generation per year and others with multiple generations. For example, *Andrena* species (mining bees) are primarily active in the spring, whereas *Melissodes* species (long-horned bees) are active later in the summer and fall. Therefore, having forage availability throughout the growing season is important.

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Bee Biology and Ecology (Continued)

Social bees: A great example of native social bees are bumble bees (*Bombus* species). Bumble bees are like honey bees in that they live socially in a colony founded by a queen and defended by worker (non-reproductive female) bumble bees. Bumble bees and honey bees do have their differences. Bumble bee colonies last only one season (annual) and are founded each year by a new queen. The size of bumble bee colonies is significantly smaller, too, at roughly 25 – 500 or more individuals, depending on species and health of the colony. Bumble bees are active from early spring well into the fall and forage on a wide array of floral resources as generalists. Some flowering species are particularly attractive to bumble bees, such as Virginia bluebells (*Mertensia virginica*), wild geranium (*Geranium maculatum*), wild bergamot (*Monarda fistulosa*), spotted joe pye weed (*Eutrochium maculatum*), showy goldenrod (*Solidago speciosa*), and New England aster (*Symphyotrichum novae-angelia*). These species are also important for the rusty patched bumble bee (*Bombus affinis*), a species listed as endangered under the Endangered Species Act.

Honey bees (Apis mellifera): Honey bees are not native to North America but play a role in agriculture through their pollination services. Honey bees have become widely used in agricultural systems as pollinators because they are easier to manage, transport, and have extremely large colonies. The biology and ecology of honey bees is much different than our native bee populations. Honey bees are typically managed by humans (i.e., beekeepers) and live in social colonies in hives (feral honey bees can be found within the landscape nesting in hollow tree cavities or rock cavities). A honey bee hive can support upwards of 10,000 honey bees. Each colony has a queen, workers (non-reproductive females), and drones (males). Queens can live several years, while workers and drones may only survive a few months. If a colony loses a queen, a new queen can be introduced. Honey bees are commonly managed by beekeepers who apply treatments to reduce disease and mite exposure. Although honey bees experience stressors like lack of floral resources, pesticide exposure, disease, etc., they are not at risk of extinction nor considered a conservation concern.



Honey bee

Key Components of Pollinator Habitat

Food resources: Pollen, nectar and larval host plants are food sources for pollinators. Pollen provides protein and lipids, and nectar provides amino acids and carbohydrates for pollinators. Different pollinators may have different food preferences depending on their life stage. For example, hover flies (*Syrphidae*) are predaceous as larvae, but feed on pollen and/or nectar as adults. Larval host plants are critical to lepidoptera (butterflies and moths) larvae. The most recognized host plant is milkweed, but there are numerous native flowering and non-flowering plants that are considered host plants. See functional plant group tables below for examples of host plants.

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Key Components of Pollinator Habitat (continued)

To support as many pollinators as possible, it is important to provide floral blooms from spring to fall and to have a diverse mix of species as possible. The height, color, flower shape, and scent of flowers all influence what type of floral visitors can be attracted to certain flowering plants. Some pollinators are considered generalists and can feed on a wide range of flowers, while others are specialists and can be restricted to a certain family, genera, or even species of flower. Examples of plants that support pollen specialist bees are sunflowers (*Helianthus*), ironweed (*Vernonia*), asters (*Symphyotrichum*), squash (*Cucurbita*), blueberries (*Vaccinium*), and more.

Nesting: Undisturbed soil, duff, and woody debris are important attributes for pollinator nesting. 70 – 80% of solitary bees nest in the ground and the remainder are considered tunnel nesting species that live aboveground. Stable areas in full sun with good air circulation are preferred nesting/egg laying sites. A diversity of nesting habitat (exposed soil, woody debris, native bunch grasses, ample organic materials, and more) should be available as site conditions allow. Nesting/egg laying should be near food and water resources.

Overwintering: Habitat for overwintering can be very similar to pollinator nesting sites. Woody and leafy debris, native bunch grasses, rock piles, and undisturbed soil are all potential overwintering habitat for pollinators like butterflies, moths, beetles, and flies.

Placement Considerations: When planning pollinator habitat, it is important to not only provide food, shelter, and nesting, but to also reduce the risk of pesticide exposure. Pesticide use in and near pollinator habitat can have negative effects on pollinator populations. Insecticides, which are designed and used to kill insects, have the greatest impact on insect pollinators. Locate pollinator habitat where pesticide drift can be avoided as much as possible.



Ground nesting queen bumble bee. (Xerces Society)



Solitary small carpenter bee entering a tunnel nest. (Xerces Society)

Seed Mix Composition and Planting Guidance

Pollinator habitat will be seeded to a minimum of 40 seeds per square foot Pure Live Seed (PLS), of which at least 20 seeds per square foot will be forbs and legumes. Refer to CPS 327 Conservation Cover as well as the Native Seeding Calculator to develop and/or evaluate a mix of site-specific appropriate species.

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Seed Mix Composition and Planting Guidance (Continued)

A minimum of 10 species is required for Farm Bill program pollinator plantings. A seed mix must have three blooming species per season (spring, summer, fall), one legume, and one native bunch grass. Keep in mind this is the minimum requirement and a higher diversity of native grasses, sedges, forbs, and legumes is preferred to support a fuller array of pollinators, as well as other wildlife.

If planning habitat for the monarch butterfly (*Danaus plexippus*) under a Farm Bill program, additional criteria apply. The seed mix must contain at least 1.5% of one or more milkweed species and must also contain at least 60% monarch nectar plants. Introduced forbs are not allowed. Big bluestem (*Andropogon gerardii*) and switchgrass (*Panicum virgatum*) are limited to one seed per square foot and Indiangrass (*Sorghastrum nutans*) is limited to 1.30 seeds per square foot.

The seed mix may be broadcasted, hydroseeded, no-till drilled, or hand seeded. Due to the high forb content, broadcasting during the dormant season or frost seeding is preferred. Many forb species need to undergo freezing and thawing to stimulate germination. Once the ground is frozen, the use of a no-till drill is not an option. Fertilizer or other soil amendments are not recommended.

Maintenance After Planting

Maintaining diversity of native habitats is vital to the success of a planting. Careful consideration of management techniques and timing is key. Examples of management or maintenance activities include prescribed fire, light tillage, grazing, or haying. Maintaining the planting according to the conservation plan is important. A rule of thumb is to disturb only one-third of habitat per year. Disturbance through maintenance activities can occur every three to six years, depending on the goals and objectives of the pollinator planting and Farm Bill program requirements. Seasonality of disturbance should be timed to meet the goals and objectives of the planting.



Native habitat for pollinators and beneficial insects on an urban farm. (Sarah Nizzi)



CP42 pollinator planting (Sarah Nizzi)

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Tables

Table 1. Native grasses and sedges for pollinator mixes. Note: mixes are not restricted to these species.

Native Cool Season Grasses					
Scientific Name	**Common Name**	**Growth Form**	**Soil Moisture**	**Butterfly or Moth Larval Host Plant**	**Bee Nesting Structure**
Elymus canadensis	Canada wildrye	Bunch	Wet-mesic, mesic, dry-mesic, dry	X	X
Koeleria macrantha	Junegrass	Bunch	Dry-mesic, dry	X	X
Glyceria striata	fowl mannagrass	Rhizomatous	Wet, wet-mesic, mesic	X	
Native Warm Season Grasses					
Scientific Name	**Common Name**	**Growth Form**	**Soil Moisture**	**Butterfly or Moth Larval Host Plant**	**Bee Nesting Structure**
Andropogon gerardii	big bluestem	Bunch	Wet-mesic, mesic, dry-mesic, dry	X	X
Bouteloua curtipendula	sideoats grama	Rhizomatous	Mesic, dry-mesic, dry	X	X
Panicum virgatum	switchgrass	Rhizomatous	Wet-mesic, mesic, dry-mesic, dry	X	X
Schizachyrium scoparium	little bluestem	Bunch	Mesic, dry-mesic, dry	X	X
Sorghastrum nutans	Indiangrass	Bunch	Mesic, dry-mesic, dry	X	X
Sporobolus compositus	rough dropseed	Bunch	Mesic, dry-mesic, dry		X
Sporobolus heterolepis	prairie dropseed	Bunch	Wet-mesic, mesic, dry-mesic, dry	X	X
Native Sedges					
Scientific Name	**Common Name**	**Growth Form**	**Soil Moisture**	**Butterfly or Moth Larval Host Plant**	**Bee Nesting Structure**
Carex brevior	prairie oval sedge	Bunch	Wet-mesic, mesic, dry-mesic, dry		
Carex molesta	troublesome sedge	Bunch	Wet-mesic, mesic, dry-mesic, dry		
Carex stricta	upright sedge	Bunch	Wet, wet-mesic	X	
Carex vulpinoidea	fox sedge	Bunch	Wet, wet-mesic, mesic, dry-mesic		

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Tables (Continued)

Table 2. Native forbs and legumes for pollinator mixes. Monarch nectar plants are highlighted. Legumes are noted with an asterisk. Note: mixes are not restricted to these species.

Bloom Periods
Spring: April – June **Summer:** June – August **Fall:** August – October

Native Forbs and Legumes					
Scientific Name	**Common Name**	**Moisture Regime**	**Bloom**	**Butterfly or Moth Larval Host Plant**	**Bee Nesting Structure**
Asclepias species	milkweed	Wet-mesic, mesic, dry-mesic, dry	Summer	X	X
Astragalus canadensis *	Canada milkvetch	Wet-mesic, mesic, dry-mesic, dry	Summer	X	
Baptisia alba *	white wild indigo	Wet-mesic, mesic, dry-mesic, dry	Spring, summer	X	
Baptisia bracteata *	cream false indigo	Mesic, mesic-dry, dry	Spring	X	
Desmodium canadense *	showy tick trefoil	Wet-mesic, mesic, dry-mesic	Summer	X	
Echinacea pallida	pale purple coneflower	Wet-mesic, mesic, dry-mesic, dry	Summer		X
Eryngium yuccifolium	rattlesnake master	Wet-mesic, mesic, dry-mesic	Summer	X	
Eupatorium perfoliatum	boneset	Wet, wet-mesic	Summer, fall	X	X
Helianthus grosseserratus	saw-tooth sunflower	Wet-mesic, mesic, dry-mesic	Summer	X	X
Heliopsis helianthoides	ox-eye, false sunflower	Wet-mesic, mesic, dry-mesic	Summer	X	X
Lespedeza capitata *	round-headed bush clover	Mesic, dry-mesic, dry	Summer, fall	X	
Lobelia siphilitica	great blue lobelia	Wet, wet-mesic, mesic	Summer, fall	X	
Monarda fistulosa	wild bergamot	Wet-mesic, mesic, dry-mesic, dry	Summer	X	X
Oligoneuron rigidum	stiff goldenrod	Wet-mesic, mesic, dry-mesic, dry	Summer, fall		
Penstemon digitalis	foxglove beardtongue	Mesic, dry-mesic, dry	Spring, summer	X	
Phlox pilosa	prairie phlox	Wet-mesic, mesic, dry-mesic, dry	Spring, summer	X	
Pyncanthemum virginianum	common mountain mint	Wet, wet-mesic, mesic, dry-mesic	Summer, fall	X	X
Ratibida pinnata	gray-headed coneflower	Mesic, dry-mesic	Summer		X
Silphium integrifolium	rosinweed	Wet-mesic, mesic, dry-mesic, dry	Summer	X	

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Tables (Continued)

Silphium laciniatum	compass plant	Wet-mesic, mesic, dry-mesic, dry	Summer	X	
Solidago speciosa	showy goldenrod	Mesic, dry-mesic, dry	Summer, fall		X
Symphyotrichum laeve	smooth blue aster	Wet-mesic, mesic, dry-mesic	Summer, fall	X	X
Symphyotrichum novae-angliae	New England aster	Wet, wet-mesic, mesic, dry-mesic	Summer, fall	X	X
Symphyotrichum oolentangiense	blue sky aster	Mesic, dry-mesic, dry	Summer, fall		
Tradescantia ohiensis	Ohio spiderwort	Wet-mesic, mesic, dry-mesic, dry	Spring, summer		
Verbena stricta	hoary vervain	Wet-mesic, mesic, dry-mesic, dry	Summer	X	
Vernonia fasciculata	ironweed	Wet-mesic, mesic, dry-mesic	Summer	X	X
Veronicastrum virginicum	Culver's root	Wet-mesic, mesic, dry-mesic	Summer	X	X
Zizia aurea	golden Alexanders	Wet-mesic, mesic, dry-mesic	Spring	X	X

Table 3. Potential native shrubs and sub-shrubs for pollinator plantings. Monarch nectar plants are highlighted. Note: mixes are not restricted to these species.

Native Shrubs and Sub-shrubs					
Scientific Name	**Common Name**	**Moisture Regime**	**Bloom**	**Butterfly or Moth Larval Host Plant**	**Bee Nesting Structure**
Amorpha canadensis	lead plant	Mesic, dry-mesic, dry	Summer		
Ceanothus americanus	New Jersey tea	Mesic, dry-mesic, dry	Spring, summer	X	
Ceanothus herbaceus	red root	Dry-mesic, dry	Spring	X	
Cephalanthus occidentalis	buttonbush	Wet, wet-mesic	Summer	X	
Cornus species	gray dogwood and others	Wet, wet-mesic, mesic, dry-mesic	Spring, summer, fall	X	
Hypericum prolificum	shrubby St. Johnswort	Wet-mesic, mesic, dry-mesic	Summer, fall	X	
Rosa species	prairie rose and others	Wet-mesic, mesic, dry-mesic, dry	Summer	X	X

Resources

Pollinator Conservation Resource Center https://www.xerces.org/pollinator-resource-center

Prairies, Pollinators and Wildlife Habitat https://www.nrcs.usda.gov/resources/guides-and-instructions/prairie-pollinators-and-wildlife-habitat

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