



Native Pollinators in the Midwestern Seed Saving Garden

Native insects such as bees, wasps, beetles, butterflies, moths, and flies play a crucial role in the pollination and fertilization of up to 75% of plant species on earth.¹ While these pollinators are collecting food, pheromones, and nest-building materials, pollen grains cling to their bodies and are incidentally transferred to other flowers during subsequent foraging.

Abundant pollinator populations also help make a home garden more productive as thorough pollination is needed for complete fertilization, resulting in larger fruits and more abundant fruit set.

PROMOTING NATIVE POLLINATORS

Today native pollinator populations are threatened by habitat loss, habitat degradation, invasive species, climate change, and large-scale pesticide applications. However, by maintaining natural and cultivated habitats where beneficial insects can nest, reproduce, and forage, gardeners and seed savers can help conserve these insects and reap the rewards of healthy pollinator populations.

Protect Existing Habitat

Before taking any steps toward creating new habitat, the simplest way to boost native pollinator populations is to protect standing natural areas and greenspaces.

- Consider leaving some areas of a property "wild". Unmanaged areas can provide alternate foraging and nesting sites.
- Make sure existing manicured and unmanaged greenspaces are free of harmful pesticides. Pheromone traps, sticky traps, and trap crops can all be used to combat insect pests rather than synthetic chemicals.
- Plant perennial native plants in borders, natural areas, or flower gardens (see Inset I for a list of recommended species).

Invite Them to the Dinner Table

Planting a variety of ornamental flowering plants in open spaces around the perimeter or within the boundaries of a vegetable garden is a simple way to promote native pollinator activity in the home garden. When selecting plants, choose native perennials or self-seeding annuals and avoid using invasive species. Matching backyard site conditions (sun/shade, wet/dry) to midwestern ecosystems (prairie, wetlands, savanna, woodland) will facilitate successful plantings that attract native pollinators. Local extension agencies can provide listings of well-adapted and safe plants for your region and climate. (See Inset 1 for a short list of plants native to various midwestern ecosystems).

- To ensure that the pollinators will have something to forage from spring through fall, select various natives that flower at different times throughout the growing season.
- Selecting plants with a variety of flower colors and shapes will also help to attract an assortment of insects of a variety of sizes and foraging habits.
- Larger clusters of the a species are better for attracting pollinators than several smaller clusters in and around the garden space.
- Remember that some weeds, such as dandelions and clovers, are non-aggressive and help attract native pollinators.

INSET 1.

A Gallery of Native Midwestern Plants

Prairie

Aster	<i>Aster</i> sp.
Beebalm	<i>Monarda fistulosa</i>
Blazing Star	<i>Liatris</i> sp.
Leadplant	<i>Amorpha canescens</i>
Purple Coneflower	<i>Echinacea</i> sp.

Savanna

Giant hyssop	<i>Agastache foeniculum</i>
Wild Indigo	<i>Baptista alba</i>
Golden Alexanders	<i>Zizia</i> sp.
Joe Pye Weed	<i>Eupatorium fistulosum</i>
Wild Columbine	<i>Aquilegia canadensis</i>

Woodland

Zig-Zag Goldenrod	<i>Solidago flexicaulis</i>
Woodland Sunflower	<i>Helianthus divaricatus</i>
Prickly Ash	<i>Zanthoxylum</i> sp.
Trillium	<i>Trillium</i> sp.
Wild Geranium	<i>Penstemon</i> sp.

Wetland

Steeplebush	<i>Spiraea alba</i>
Swamp Milkweed	<i>Asclepias incarnata</i>
Cup plant	<i>Silphium perfoliatum</i>
Marsh Marigold	<i>Caltha palustris</i>
Ironweed	<i>Vernonia</i> sp.

Give Them More Places to Rest Their Weary Heads

Nesting sites can be used to promote the colonization of garden areas by pollinating insects. Though many varieties of solitary bees normally make ground nests among plants, they will also nest in artificial habitats such as stem bundles and nesting blocks (Figure 1). Install the block with the holes facing east or southeast toward the morning sun. Blocks should be three to six feet off the ground and protected against predators.

Social bees, such as bumblebees, are difficult to entice into artificial nest boxes (Figure 2) and may benefit more from abundant natural areas. Gardeners who choose to try using bumblebee nests should place the box in a shaded location on the ground or just under the ground at the first sign of spring.

Feed Them and They Will Come

Butterflies, moths, wasps, and flies can be attracted to a garden with a plate of fruit. Because these insects do not brood their own young, adding species specific host plants for larvae to feed upon will help their populations grow.

- Prickly Ash (*Aralia spinosa*) does not provide much pollen, but it is the main larval hostplant for Giant Swallowtail butterflies (*Papilio cresphontes*).
- Wild Columbine (*Aquilegia canadensis*) is the sole larval hostplant for Dusky Wing butterflies (*Erynnis lucilius*), but also attracts hummingbirds.



FIGURE 1. A nesting block for solitary bees can be created by drilling various sized holes into a block of preservative-free lumber.²



FIGURE 2. Nesting boxes for social bees should consist of a simple, wooden box with drainage holes on the bottom, a soft bedding material inside, and a short length of piping leading from the outside to the inside for bees to enter the box.³

MAINTAINING VARIETAL PURITY

While an abundance of pollinators is good for the environment and for fruit production in the garden, increased pollinator activity can interfere with a gardener's attempts to produce seed that is true-to-type. Therefore, seed savers may utilize a variety of tactics to help maintain varietal purity. These practices include the use of physical barriers, mechanical isolation through bagging or caging, isolation through distance, pollinator distractions, diversification of gardens, and hand-pollination.

Save Seed From Only One Variety of a Species

Some crops are easier to save seed from than others. Tomatoes, peas, and beans self-pollinate (see Inset 2), lessening the chances that they will be accidentally crossed and increasing the chances that the harvested seed will be true-to-type, even if a neighbor is growing another variety of the same crop.

By planting only one variety of these crop types in a year, a seed saver can easily produce several years worth of seed stock, even in small spaces. Talk to neighbors about what crops they are growing in order to make sure that varieties of the same species are far enough away that crossing is unlikely (50 feet for tomatoes and peas, 100 feet for beans).

Landscape Barriers

Providing a physical barrier that disrupts the line of sight and flight path of pollinators is one way to reduce the chance of accidental crossing by some bee species, which focus their attention on one species of flower at a time. The obstacle may be a fence, a building, or a barrier crop placed between varieties of the same species. Corn, sorghum, and sunflowers are good barrier crops because they are tall and can be planted to form a wall.¹

- The larger the obstacle, the more effective it will be at reducing accidental crossing.
- In general, barriers work best with crops that have relatively short isolation distance recommendations such as tomatoes, beans, peas, and peppers.

INSET 2.

BREEDING SYSTEMS IN PLANTS

Vegetable crops are often categorized as being **selfers** or **out-crossers**. However, most exhibit a mix of selfing and out-crossing.

Plants whose flowers are structured in such a way that the pollen of a flower tends to fertilize the stigma of the same flower are known as **selfers** or **self-pollinating**. They may self on their own, or selfing may be assisted by the wind or insect visitors. Examples of strong selfers include tomatoes and peas.

Out-crossers have flower structures or genetic mechanisms that are favorable for the transfer of pollen between different flowers. Strong out-crossers include insect pollinated crops like the Brassicas (cole crops, mustard, and radish) and Cucurbits (squash, watermelon, and cucumber), as well as wind pollinated crops like corn and spinach

Some plants like peppers and eggplant are able to both self-pollinate and out-cross, depending on pollinator behavior.

Try Blossom Bags

Blossom bags are small, breathable bags that can be easily secured over a flower or flower cluster to prevent insect pollination. Bags can be used with self-pollinating crops like tomato, peas, eggplant, and okra that will usually set fruit even if they are not visited by an insect, or in conjunction with hand-pollination of out-crossing crops like corn (which requires special weatherproof bags; Figure 3) and squash.

- Mesh bags will not effectively prevent pollination in wind-pollinated crops like corn, sorghum, spinach, and beet, whose fine-grained pollen is small enough to pass through the bags. ⁴
- Spun polyester cloth, often sold as row covering, is one common bagging material, although other lightweight fabrics can be used to prevent insects from depositing pollen.
- When using these materials, it is important to securely tie the base of the bag around the stem of the plant. Never use plastic bags or glassine envelopes, which do not allow for ventilation of heat or moisture, resulting in flower wilting or decay.

Be the Bee (or Wind): Hand-Pollination

Hand-pollination is a technique that is used to ensure that out-crossing plants of a variety are pollinated by different individuals of the same variety without becoming contaminated by pollen of another variety. Generally, hand-pollination is easiest with large flowered, insect-pollinated vegetable crops like squash, yet some wind-pollinated crops, such as corn, are conducive to hand-pollination. The process of hand-pollination varies from species to species, but requires that uncontaminated pollen from the male flower is transported to the stigma of unpollinated female flowers. Once the pollen is transferred, the female blossom is again covered to prevent contamination by any additional pollen.

To find out more about hand-pollination practices specific to various species, see Seed Savers Exchange guides, *Hand Pollination: Corn* and *Hand Pollination: Squash*.



FIGURE 3. Water resistant blossom bags are used during the hand-pollination of corn to cover silks and tassels in order to prevent out-crossing.

Caging

Seed savers can construct pollinator exclusion cages out of wood, plastic or metal tubing, or a wire frame that is covered with spun polyester cloth or window screen, which allows air, light, and water to pass through, but blocks out insects. Large commercial cages (Figure 4) can also be purchased. If cages are used with species that are not self-pollinating, insects will need to be introduced into the cages or alternate day caging may be used to ensure a good seed set. Cages should be in place before plants begin blooming

Alternate day caging is a method that is used to isolate two or more varieties of a species that are flowering simultaneously. One cage must be constructed per variety. Every morning, one of the cages is removed allowing pollinators access to the waiting flowers. The cage is then replaced that evening. The following day, the cage covering a different variety is removed, allowing insects to pollinate the flowers, before the cage is repositioned in the evening. This process is repeated for all varieties of the species in succession throughout the growing season or until each variety has sufficient fruit set. To prevent subsequent out-crossing, the cages should remain on the varieties until they are done flowering.

- When using this method of isolation and pollination, it is important to be aware of what is growing in neighboring gardens to avoid inadvertent cross pollination with other varieties of the same species.
- Introducing pollinators into pollinator exclusion cages is also a way for seed savers to manage varietal purity. This practice requires individual cages for each variety, as well as trapped flies or newly emerged bees, which may be caught or purchased commercially.
- For more information about rearing and releasing pollinators, see the Seed Savers Exchange guide, *Rearing Insects for Pollination*.



FIGURE 4. In a home garden, pollinator exclusion cages can be constructed for alternate day caging or used in conjunction with introduced pollinators to manage varietal purity.

Diversified Gardens

Creating a diversified home garden usually means planting an assorted array of vegetable crops within the garden. However, planting additional perennial borders surrounding the seed production area or islands of annuals within the seed production area can also be an effective strategy for distracting pollinators and lessening their pollen load. By increasing the diversity of the garden, including adding a variety of vegetable crops and native perennials or self-seeding annuals, the chances of pollen from one variety of a species being transferred to another variety of that species greatly decreases, because pollinators will constantly be picking up and dropping off pollen as they forage around the garden.

NATIVE POLLINATORS

Flies

Diptera, or flies (Figure 5), are some of the busiest pollinators. Due to their hairy bodies, flies are able to transport large amounts of pollen, which they often pick up from nectar producing flowers (Figure 5). In addition to their hairy bodies, flies generally have tubular, sucking mouthparts, which vary in length and limit which flowers different species will visit. Generally, flies are attracted to *Umbelliferae* (carrots, celery/celeriac, parsnip, and parsley), *Brassicaceae* (cole crops, mustards, and Asian greens), *Rosacea* (strawberry, raspberry, and blackberry), and *Alliaceae* (onions, leeks, and chives), many of which are unattractive to bees.



FIGURE 5. Flies transport pollen with their hairy legs and bodies.

Bees

The bee family, or *Apoidea*, collectively contribute more to the pollination of various flowering plants than any other insect group (Figure 6). In North America alone, there are more than 5,000 species of native bees. Ninety percent of these bees live solitary lives, meaning that rather than dwelling with other individuals, female bees construct and provision their own nests. The remaining 10% are known as social bees. Social bees, including Bumble bees (*Bombus* sp.), live in colonies with at least two adult females and sharing the work of preparing and provisioning the same nest.¹



FIGURE 6. Bees transfer pollen incidentally via their hairy bodies while foraging for nectar, pheromones, and nest-building materials.

Although non-native, the European honeybee (*Apis mellifera*) is a nearly ubiquitous pollinator in both urban and rural environments. Prized for their surplus honey and beeswax, honeybees are also among the most efficient crop pollinators. By collecting nectar and pollen from flowers for food, honey bees incidentally transfer large quantities of pollen from one flower to another.

As social insects, honey bees work and communicate with other members of their hive, making them more effective at locating and collecting pollen and nectar. Honeybees will routinely forage within an eighth of a mile from their home, but have been documented travelling up to three miles for nectar and pollen.¹ Interestingly, honey bees exhibit what is known as “flower constancy,” meaning that they tend to focus on one species of flower at a time rather than wandering from species to species.

Wasps

While bees are covered with dense hairs, a wasp's body is sparsely covered in short spines, making them less effective pollinators than bees or flies (Figure 7). Wasps, like flies, do not show flower constancy, and because of their short tongues, prefer blossoms with easily accessible nectar. For this reason, wasps will pollinate *Umbelliferae*, alfalfa, and even cotton.

Butterflies

Butterflies have well-developed vision and are drawn to bright colors, including reds and oranges (Figure 8). Their poor sense of smell means that flower fragrance is not a primary attractant of butterflies. Butterflies, as well as certain varieties of bees, rely on bright colors, as well as “nectar guides,” which are ultraviolet colored lines or target-like circles on flowers that draw the insects toward the flower's nectar. For these reasons, butterflies are most often drawn toward *Asteraceae* (sunflower, coneflower, artichoke, thistles, and dandelions) and *Lamiaceae* (lavender, mint, and many other culinary herbs). Because butterflies are typically covered in scales rather than hairs, pollen does not readily adhere to their bodies and tends to collect only on their short legs, thus they are less important to the pollination of garden crops than bees and flies. However, because butterflies drift from crop to crop and are able to travel greater distances, they may occasionally contribute to cross-pollination of vegetable crop species.



FIGURE 7. A wasp visiting butterfly weed (*Asclepias tuberosa*).

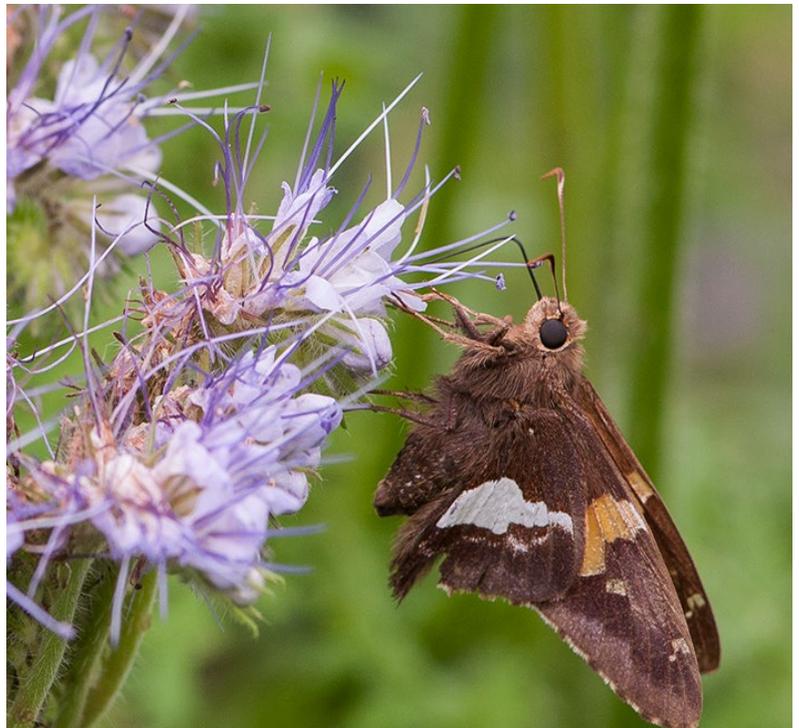


FIGURE 8. The Silver Spotted Skipper (*Epargyreus clarus*) is native to the Midwest, and often feeds on the nectar of various legume blossoms.

Moths

Moths are nocturnal pollinators that have a well-developed olfactory sense, which attracts them to highly perfumed, night blooming flowers. Additionally, these flowers are typically large; tubular; and white, greenish-white, or pale pastel in color, including gourds, evening primrose, and tobacco.⁵ Similar to butterflies, moths cannot carry pollen on their wings. Therefore, moths will pick up and transfer pollen on their bodies and long, tube-like tongues.¹

Beetles

Beetles, or *Coleoptera*, constitute almost 25% of all the animal species and pollinate 88% of flowering plant species on Earth (Figure 9). Though each individual beetle does not transfer a significant amount of pollen to flowering plants, they are a significant group of pollinators because of their abundance in the landscape.¹ Typically, beetles are attracted to flowers that are bowl-shaped and give off specific odors that are alluring to the insects, including Goldenrod (*Solidago* sp.) and Steeplebush (*Spirea douglasii*).

Gardeners should also know that beetles can serve other beneficial roles in the garden. For example, ladybeetles are beneficial predators that eat aphids, scaled insects, thrips, mealybugs, and mites, which are all harmful pests. Similarly, ground beetle larvae inhabit the soil and feed on slugs, root maggots, cutworms, and other ground-dwelling pests that feed on plant roots.



FIGURE 9. A Red Milkweed beetle (*Tetraopes tetrophthalmus*) on a plant.

Sources

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