(G4001)

Supporting native bees: Our essential pollinators

Sweat bee (*Halictus sp.*) on rattlesnake master

Fruit and vegetable pollination

Approximately 75% of the world's major food crops require or benefit from animal pollination. This includes many of the fruits and vegetables grown in Wisconsin gardens, such as strawberries, blueberries, raspberries, currants, plums, apples, sweet cherries, pears, watermelon, cantaloupe, cucumbers, squash, and tomatoes. For other crops such as carrots, onions, broccoli, cauliflower, cabbage, and many herbs, pollinators are beneficial solely for seed production.

Pollinators

Pollinators in Wisconsin are comprised mostly of insects such as bees, flies, wasps, butterflies, moths, beetles, and ants, as well as hummingbirds. Bees are the most important pollinators for many plant species and feed almost exclusively on pollen and nectar. The non-native honeybee (*Apis mellifera*) is the most commonly used managed bee for pollination of large acreage crop plants, primarily because it is easily reared and transported and lives in perennial colonies that can attain a size of 50,000 or more at their peak. The blue orchard bee, also referred to as the mason orchard bee (*Osmia lignaria*), is a native managed pollinator for orchards. Just 250 of these bees, as opposed to 20,000 honeybees, will pollinate an acre of apple trees.

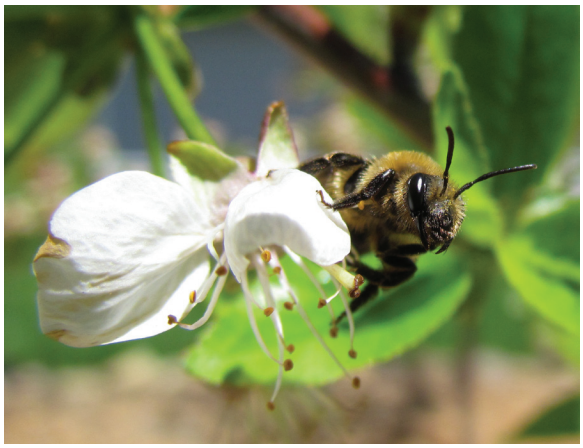
Rusty-patched bumblebee (*Bombus affinis*) with pollen collected from purple prairie clover

Small carpenter bee (*Ceratina sp.*) nectaring on alpine strawberry blossom

Wild native bees also contribute substantially to fruit and vegetable pollination, especially when farmers provide ample habitat nearby for nesting and foraging and employ farming practices that benefit pollinators. Home gardeners can have all of their pollination needs supplied by wild native bees, although if there are honeybee hives located nearby, they may contribute to pollination as well.

Bee diversity and life cycles

When most people hear the term bee, they envision a honeybee or a bumblebee. In actuality, there are approximately 400 verified species of bees in Wisconsin and likely more that have not yet been identified. These include various species of miner bees, mason bees, leafcutter bees, and sweat bees, among many others. Honeybees and most bumblebees live in a large social group with one queen, a worker caste of non-reproductive females, and, at various times in the life cycle, males. The vast majority of bees, however, are solitary with each individual bee making her own nest and providing for her offspring.



Mining bee (*Andrena sp.*) **on cherry blossom**

Attracting and supporting native pollinators

Most people are aware of the recent decline in honeybee populations. However, some of our native bee populations are also declining. Cultivating flowering plants, providing nesting sites, and eliminating or greatly reducing pesticide use will benefit bee populations.

Cultivating flowering plants

Maintain flowering plants to provide food and nesting habitat for pollinators, as well as birds and other wildlife. Consider converting part of your lawn to habitat for pollinators. Listed below are commercially available, flowering, native plants that are especially good sources of food for bees. Provide a diversity of plants that will bloom from early spring, to feed early emerging bees, until late fall when some bees such as bumblebee queens are preparing to overwinter. Have at least 2–3 plant species flowering at any given time.

Wisconsin native trees and shrubs

Common name	Scientific name	Bloom time	Typical height	Light	Soil moisture
Pussy willow	*Salix discolor*	Early spring	10–25′	Sun	Average to wet
Downy serviceberry	*Amelanchier arborea*	Spring	15–25′	Sun to part shade	Average to wet
Plum and cherry trees	*Prunus spp.*	Spring	Varies	Sun to part shade	Average
Lowbush blueberry	*Vaccinium angustifolium*	Spring	1′	Sun	Average to dry
Highbush blueberry	*Vaccinium corymbosum*	Spring	6–12′	Sun	Average
Leadplant	*Amorpha canescens*	Summer	1–3′	Sun	Average to dry
New Jersey tea	*Ceanothus americanus*	Summer	3′	Sun to part shade	Average to dry
Carolina rose	*Rosa carolina*	Summer	1–4′	Sun	Average to dry
Swamp rose	*Rosa palustris*	Summer	6′	Sun	Wet
White meadowsweet	*Spiraea alba*	Summer	3–5′	Sun	Average to wet
American basswood	*Tilia americana*	Summer	75–130′	Sun to shade	Average
Steeplebush	*Spiraea tomentosa*	Summer to fall	2–4′	Sun to part shade	Average to wet

Wisconsin native herbaceous flowering plants

Common name	Scientific name	Bloom time	Typical height	Light	Soil moisture
Spotted geranium	*Geranium maculatum*	Early spring to summer	1–2′	Sun to shade	Average
Cream wild indigo	*Baptisia bracteata*	Spring	1–2′	Sun to part shade	Average to dry
Wild lupine	*Lupinus perennis*	Spring	2′	Sun to part shade	Average to dry
Common spiderwort	*Tradescantia ohiensis*	Spring to summer	2–3′	Sun to part shade	Dry to wet
Anise hyssop	*Agastache foeniculum*	Summer	1–3′	Sun to part shade	Average to dry
White wild indigo	*Baptisia leucantha(alba)*	Summer	3–5′	Sun to part shade	Average to dry
Purple prairie clover	*Dalea purpurea*	Summer	2–3′	Sun	Average to dry
Pale purple coneflower	*Echinacea pallida*	Summer	2–4′	Sun	Average to dry
Wild bergamot	*Monarda fistulosa*	Summer	2–4′	Sun to part shade	Average to dry
Prairie spiderwort	*Tradescantia occidentalis*	Summer	1–2′	Sun	Average to dry
Culver's root	*Veronicastrum virginicum*	Summer	3–6′	Sun to shade	Dry to wet
Butterfly milkweed	*Asclepias tuberosa*	Summer to fall	2–3′	Sun	Average to dry
Spotted Joe-Pye weed	*Eupatorium maculatum*	Summer to fall	3–7′	Sun	Average to wet
Purple Joe-Pye weed	*Eupatorium purpureum*	Summer to fall	4–6′	Sun to part shade	Average to dry
Woodland sunflower	*Helianthus divaricatus*	Summer to fall	2–5′	Sun to part shade	Dry
Prairie sunflower	*Helianthus petiolaris*	Summer to fall	3–4′	Sun	Dry
Prairie blazing star	*Liatris pycnostachya*	Summer to fall	2–4′	Sun	Average to wet
Great blue lobelia	*Lobelia siphilitica*	Summer to fall	2–4′	Sun to part shade	Average to wet
Spotted beebalm	*Monarda punctata*	Summer to fall	2–3′	Sun	Dry
Riddell's goldenrod	*Solidago riddellii*	Summer to late fall	2–4′	Sun	Wet
Stiff goldenrod	*Solidago rigida*	Summer to late fall	2–5′	Sun to part shade	Average to dry
Rough blazing star	*Liatris aspera*	Fall to late fall	2–4′	Sun	Average to dry
Showy goldenrod	*Solidago speciosa*	Fall to late fall	3–5′	Sun	Average to dry
Smooth blue aster	*Symphyotrichum (Aster) laeve*	Fall to late fall	4′	Sun to part shade	Average to dry
New England aster	*Symphyotrichum (Aster) novae-angliae*	Fall to late fall	1–7′	Sun to part shade	Average

Bee stings

Bee ancestors possessed an egg-laying tube called an ovipositor at the end of their abdomen. This structure has evolved into a stinger in bees and is no longer capable of releasing eggs. Eggs are instead laid through an opening at the base. Since only the female ancestors had ovipositors, only female bees have stingers. While social bees, such as honeybees and bumblebees, will sting to protect their nest, solitary bees will rarely sting unless provoked.

Nesting sites

Providing nesting areas near foraging sites is critical because female bees must transport pollen and nectar from foraging sites to the nesting area for their offspring. Nesting sites vary greatly among species; however, the majority of bees nest underground. Bumblebees that nest underground will use abandoned rodent nests, but most ground-nesting bees dig their own tunnels. These bees prefer areas of bare ground with sandy or loamy soil. Most of the remaining bee species nest in tunnels in twigs, plant stems, stumps, and snags. Bumblebee species that nest above ground will also nest in grass tussocks, piles of debris, or other cavities.

Solitary bee nesting

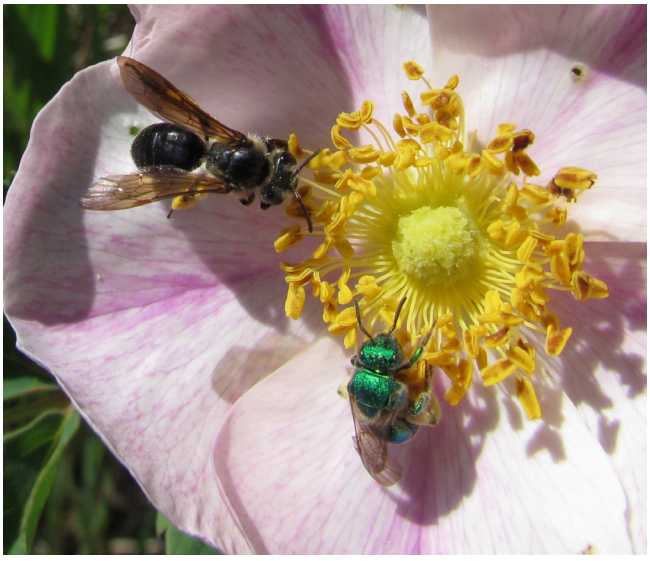
A female solitary bee lays each egg in an individual cell she forms. Females usually line the cells with leaves, plant hairs, resin, pebbles, mud, or secretions from their glands. These linings help prevent desiccation, water penetration, and spoilage of the provisioned food. After lining an individual cell, she provisions it with a mass of pollen and nectar and lays an egg. She then seals the cell to protect the egg and subsequent developing larva from desiccation and predators and begins working on the next cell.

In most solitary species, the female adult bee then leaves, never to encounter her offspring. A solitary bee may commonly lay up to 20 or 30 eggs in her short lifespan of about 3–6 weeks. She may make up to 20 or more foraging trips to provision just one egg with food. During each foraging trip, she often visits hundreds of flowers.

Common Eastern bumblebee (*Bombus impatiens*) **pollinating a tomato flower**

Stem nest of a solitary bee with developing pupae

Green sweat bee (***Agapostemon virescens***) **coming out of her ground nest**



Mining bee (*Andrena sp.*) **and green sweat bee** (*Augochlorini*) **collecting pollen on Carolina rose**

Preserving natural nesting sites

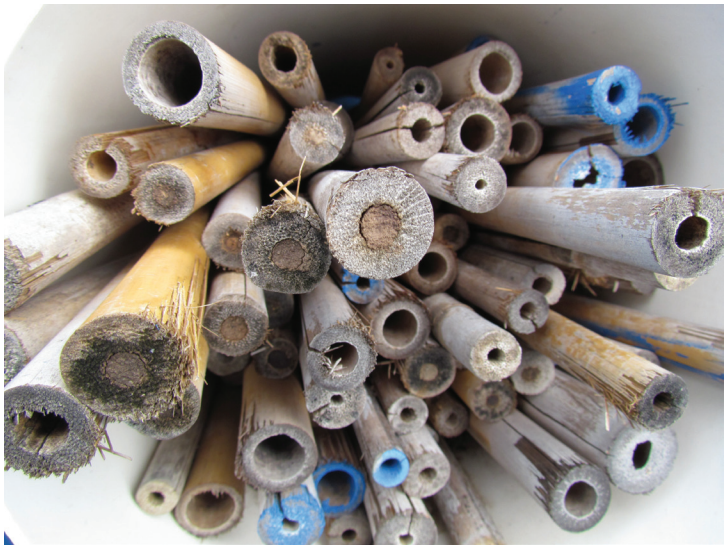
To provide natural nesting habitat for bees, leave standing dead trees when possible. When trimming plants and shrubs, leave stems on your property since many will have bee larvae in them. Don't mulch all parts of your yard; allow bare areas to persist for use by ground nesters. Practice no-till methods in your vegetable garden to allow underground larvae to develop into adult bees.

Artificial nests

Solitary bee nesting

Artificial nests can be made or purchased that will attract various species of solitary bees such as mason bees, leafcutter bees, and yellow-faced bees. Mason bees surround each egg cell with mud; their nests can be identified by the mud plug the female places at the end of the cells. Yellow-faced bees surround each cell with clear secretions from a gland in their abdomen. Look for a shiny cellophane-like covering. Leafcutter bees surround each cell with pieces of leaves that the female cuts with her jaws. Leafcutter nests can be identified by the leaf plug placed at the end of the cells. A female leafcutter makes approximately 15 trips to line just one cell containing one egg with leaf pieces. She may make another 20 trips to provision the cell with pollen and nectar that the emerging larvae will later feed on. A female leafcutter will typically lay 20–30 eggs in her lifetime.

You will likely see all these various bees coming and going from the nest as they line and provision each cell. Female solitary bees will usually sleep in the nest they are filling; check your artificial nests at night with a flashlight to see them.



A bamboo stem nest with some stems filled by mason bees

Leafcutter bee carrying a leaf piece to nest

Leafcutter bee (*Megachile sp.*) cutting a fireweed leaf piece and flying away with it

Building a log nest or wood nest block

Holes can be drilled into standing dead trees, logs, or preservative-free lumber. Drill several sizes of holes to attract the greatest variety of bee species. Use an extra-long drill bit to drill holes that are 3⁄32–3⁄8 of an inch in diameter. Holes larger than ¼ of an inch in diameter should be 5–6 inches deep, and those less than ¼ of an inch should be 3–5 inches deep. Holes drilled shorter than these recommended lengths will produce a greater percentage of male bees, which pollinate far less than females. Optimal hole size for blue orchard bees is 19⁄64 of an inch in diameter and 6 inches long. If holes are drilled all the way through the log or block, attach a board to the back; bees will not nest in tunnels that are open at both ends.

The interior of the holes should be smooth, so use a sharp drill bit or a brad-point drill bit, or line holes with paper tubes. Do not use plastic straws or tubes since moisture will build up and very few bees will survive. The nesting site's exterior can be left natural or painted any color, but some bees may be more attracted to dark boxes. Attach an overhanging roof to protect from rain.

Stem bundles

Gather dry hollow stems such as common reed, teasel, or cup plant. Alternatively, you can use natural bamboo stakes with holes between 3⁄32 of an inch and 3⁄8 of an inch in diameter. Cut stems or stakes into lengths of 6–8 inches, making one of the cuts just below a node (where you see a ridge), so that one end is closed. Tightly bundle groups of stems or stakes together and tape them. Or, you can tightly pack a small plastic container or pipe or build a wooden frame to hold the stems. Be sure the stems will not move around.

Placement of nests

In early spring, place the nest in a sheltered location, such as under eaves or on the side of a shed. Face the nest east so it receives morning sun but is shaded in the afternoon. If placing a wooden nest block or stem container on a pole, secure it well so that the nest will not move; movement disrupts nesting and larval development.

Care of nests

While some new bees may emerge in the same season in which they are laid, most will overwinter and emerge the following spring; some do not emerge until the spring after that. Nests can be left outdoors for the winter.

Because artificial nests concentrate a large number of bees in a small area, they can harbor parasites and disease. Artificial nests must be disinfected and phased out to prevent harming wild bee populations.

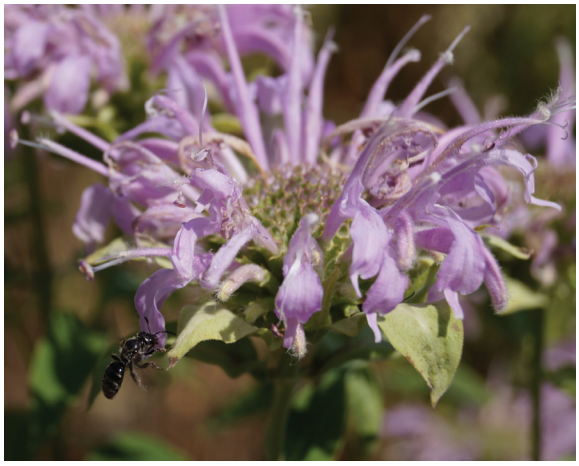
Sweat bee (*Augochlorini*) visiting butterfly milkweed

Mining bee (*Andrena sp.*) on currant flower

If using a log nest with tubes or a wood block with tubes, at season's end, remove paper tubes with the bee larvae still in them and refrigerate. If tubes are unused, clean debris out of the holes by drilling them. To disinfect the empty outer nest, submerge in a solution of 1 part bleach to 3 parts water. The following spring, new paper tubes can be placed in the nest, and the refrigerated tubes with bee larvae can be placed in an emergence chamber.

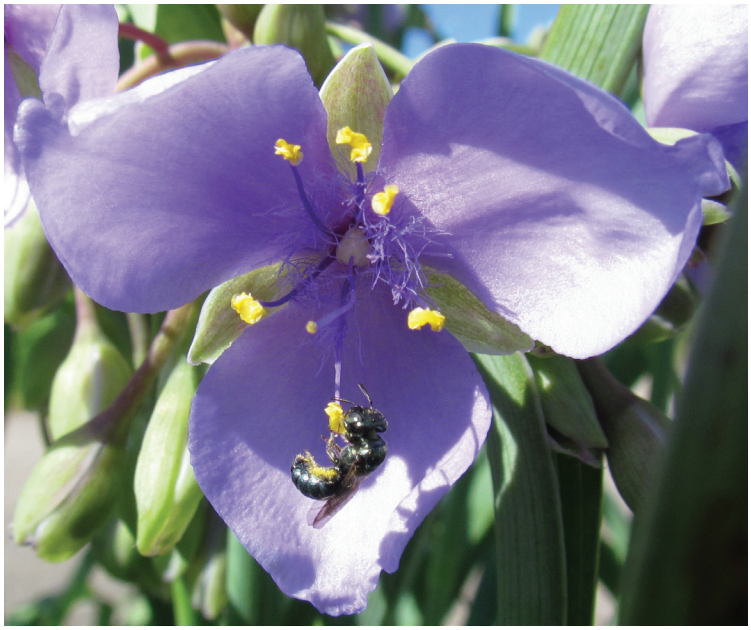
If using stem bundles, log nests, or wood blocks without tubes, phase them out every two years by placing in an emergence chamber in the spring. Make an emergence chamber by drilling a single ⅜-inch hole in a light-proof container such as a wooden box or dark-colored bucket with a lid. Be sure the hole is placed in an area where the bee can crawl out of it, preferably towards the bottom.

Put your wood block or stem bundle inside the chamber, and place outside near a new nest block or stem bundle. Emerging bees will be attracted to the light from the hole and crawl out. Once mated, new females may be attracted to the new nearby nest. Discard the old nests once the bees have emerged. The nests can be kept in the emergence chamber for multiple seasons if needed.



Sweat bee (*Dufourea monardae,* a specialist of *Monarda*)) **on wild bergamot**

Bumblebee (*Bombus sp.*) **approaching Culver's root**



Small carpenter bee (*Ceratina sp.*) **collecting pollen from spiderwort**

Sweat bee (*Lasioglossum sp.*) **collecting pollen on a male pussy willow**

Eliminating or greatly reducing pesticide use

Bees are very susceptible to direct pesticide contact, as well as pesticide residues on plants. Most plants can easily tolerate some insect damage, and the insects feeding on your plants support birds and other wildlife. Employ non-chemical alternatives, such as row covers, or pull pests off by hand and place into a bucket of soapy water to kill them. If you feel pesticides are necessary, apply when plants are not flowering, or in the evening when temperatures are cooler and bees are unlikely to be foraging. Also consider pesticides that are less toxic to bees such as bacterial products, insecticidal soap, horticultural oil, and narrow-spectrum insecticides.

For more information on supporting pollinators, visit www.xerces.org/pollinator-resource-center.

Squash bee (*Peponapis pruinosa*) in squash flower

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