



Wild bees pollinate a wide variety of food and fiber crops. As managed honey bee populations experience periodic declines due to parasites and disease, wild bees may help supplement pollination services. Who are these wild bees? How can we enhance their activity?

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Mader, E. *Conserving Pollinators: A Primer for Gardeners*. Extension, 2009. articles.extension.org/pages/19581/conserving-pollinators-a-primer-for-gardeners

Mid-Atlantic Agriculture Research and Extension Consortium (MAAREC): agdev.ansr.udel.edu/maarec

Natural Resources Conservation Service (NRCS) Technical and Funding Assistance for Creating and Preserving Pollinator Habitat: www.nrcs.usda.gov/PROGRAMS

Pennsylvania Department of Conservation and Natural Resources (DCNR): www.dcnr.state.pa.us/forestry/plants/index.htm

Pennsylvania IPM Program: extension.psu.edu/pests/ipm

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Conserving Wild Bees in Pennsylvania

AGROECOLOGY IN PRACTICE

IMPORTANCE OF WILD BEES TO AGRICULTURE

Wild bees, which include native and naturalized bees, pollinate a variety of crops, including apples, pears, nuts, strawberries, tomatoes, peppers, blueberries, squash, and melons. In areas of Pennsylvania, wild bees already provide the majority of pollination for some summer vegetable crops. Conserving wild bee populations is essential for sustaining agricultural production in Pennsylvania.

WAYS TO ENHANCE WILD BEES

We can conserve and attract wild bee species to Pennsylvania by increasing the amount of floral resources in the area, conserving natural habitats in the landscape, providing access to clean water, creating or conserving nesting sites, and reducing bee exposure to pesticides.



Bumble bee on a tomato flower at Penn State's community garden.

Conserve Natural Habitats

Many studies have shown that wild bee diversity increases as the proportion of natural habitat in the surrounding landscape increases. Forests, meadows, and wetlands provide wild bees with nesting sites and floral resources, especially early in the spring when flowers may be scarce. Fortunately, community groups can work with nonprofit organizations, conservation land trusts, and local municipalities to acquire and protect natural lands through grant programs like the Community Conservation Partnership Program (C2P2), managed by Pennsylvania's Department of Conservation and Natural Resources (DCNR). Land managers can also conserve natural habitats on their properties by maintaining flowering plants in their field margins.

Plant Flowers

Bees need pollen and nectar (together called floral resources) to survive and reproduce. To provide wild bees with food throughout the growing season, plant a variety of flowering plants with overlapping bloom periods. Land managers can increase access to floral resources for wild bees by:

- Planting flowering herbs or ornamentals within the crop field.
- Setting aside marginal land for bee habitat by establishing hedgerows of flowering woody plants or native perennial plants.
- Harvesting flowering crops, like alfalfa, in strips rather than all at once.
- Allowing a portion of leafy crops to bolt (produce flowers).

OUCH, THAT STINGS!

Bees have a reputation for producing painful stings, partly because of stings inflicted by hornets, yellow jackets, and other wasps. However, most wild bees are not aggressive because they are solitary nesters and thus do not have large colonies to defend. The risk of getting stung by a wild bee is low.

Provide Access to Water

Bees need water for survival. It is especially important to provide water to bees during the summer months when water resources in the landscape can be limiting. On-site water sources should be clean and free of pesticides and may include:

- Drainage ditches
- Irrigation ponds
- Birdbaths
- Puddles

Preserve or Build Nesting Sites

The majority of wild bees are solitary nesters—females create individual nests in soil, plant material, or abandoned nests of other animals. Natural bee nests can be protected by not tilling the area or exposing it to broad-spectrum pesticides. Maintaining a diversity of natural and artificial nesting areas can increase the likelihood that wild bees will nest on site. Nesting sites may include:

- Well-drained soil mounds
- Snags or old logs
- Undisturbed grassy areas
- Bee boxes for wood nesters

Reduce Bee Exposure to Pesticides

Bees may be poisoned or killed when they come into contact with pesticides found on leaves and flowers on which they forage or the soil where they nest. When chemical controls are necessary, take special care by:

- Choosing products that target the pest organism.
- Choosing the least harmful formulations to pollinators.
- Treating plants when their flowers are not blooming.
- Applying chemicals in the evening when bees are not active and many flower buds are closed.
- Preventing pesticide drift onto flowering crops or natural areas.



Constructed nest boxes can be used for wood nesters like the blue orchard bee.

RESOURCES

Center for Pollinator Research (Penn State): ento.psu.edu/pollinators

Delaplane, Keith S., and Daniel F. Mayer. *Crop Pollination by Bees*. New York: CAB, 2000.

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Rhoads, A. F., and T.A. Block. *The Plants of Pennsylvania: An Illustrated Manual*. Philadelphia: University of Pennsylvania, 2007.

U.S. Fish and Wildlife Service: www.fws.gov/Pollinators/PollinatorPages/YourHelp.html

Winfree, R., N. M. Williams, H. Gaines, J. S. Ascher, and Kremen, C. Wild bee pollinators provide the majority of crop visitation across land-use gradients in New Jersey and Pennsylvania, USA. *Journal of Applied Ecology* 45 (2008):793–802. www.xerces.org

CONSERVING WILD BEES FOR PENNSYLVANIA

Plants for Pollination

When crops are not in bloom, the vegetation surrounding fields can provide vital food resources for pollinators. Wildflowers, shrubs, and even large trees can supply bees with important sources of pollen and nectar.

When selecting plants to add to your landscape, consider the following characteristics:

- **Time of flowering:** Select plants that flower at different times of the season to support a diverse community of wild bees.
- **Shape and color of flowers:** Disk-shaped flowers with accessible nectar and pollen attract a diversity of bees, while tubular flowers are pollinated by long-tongued and small bees. Bees are generally attracted to blue, violet, yellow, and white flowers.
- **Plant growth requirements:** Perennial plants will grow best in regions where they are well adapted. Ecoregional planting guides are useful tools for finding appropriate plants for your area (see Resources).

Planting Cover Crops

Cover crops are plants grown in agricultural fields and gardens for a number of reasons, including reducing erosion, increasing soil fertility, and suppressing weeds. If allowed to bloom, some cover crops can also help support bee populations. However, take care to terminate the cover crop before it sets seed to avoid any potential weed problems.

Examples of flowering cover crop species:



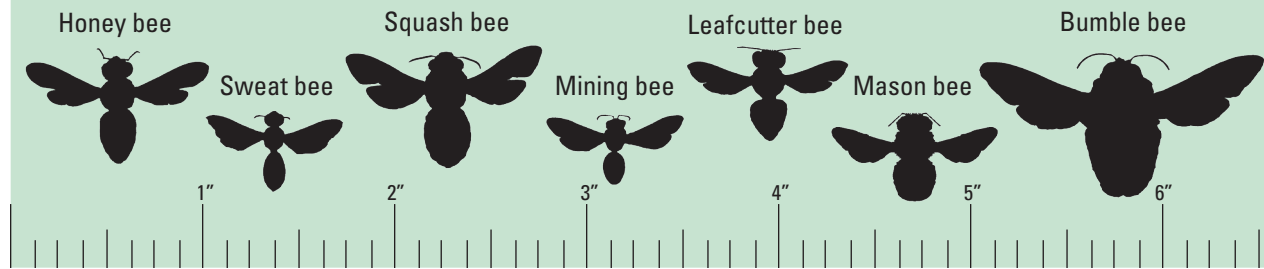
Buckwheat

Hairy Vetch

Clover

BEE SHAPE AND SIZE COMPARISONS

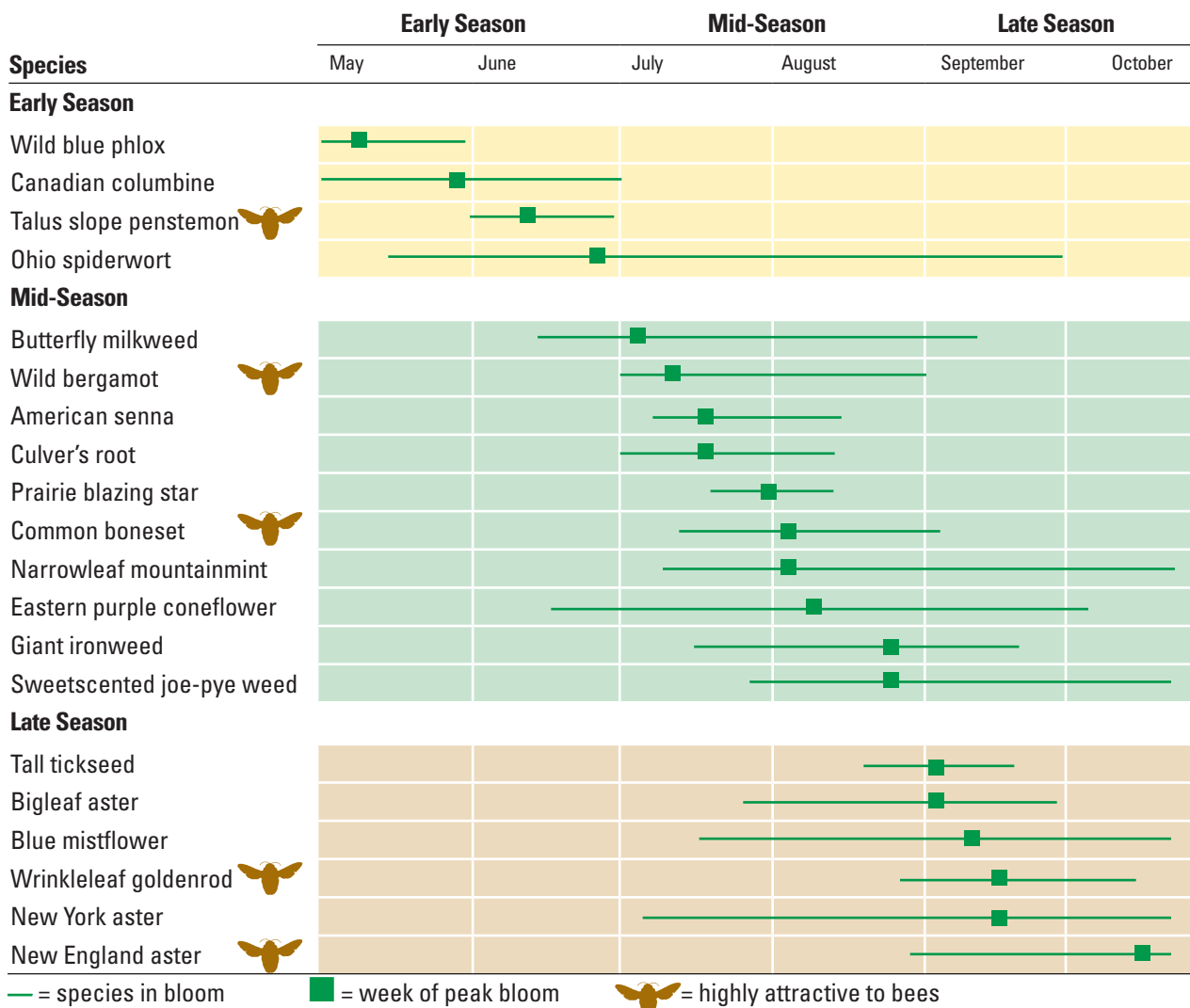
Bees come in many different shapes and sizes. Some are covered with hairs while others are almost completely bald. It is also common for males and females of the same species to look very different. Below are silhouettes of representative species from each of the bee groups discussed here.



LANDSCAPING WITH NATIVE PLANTS

Native plants are well adapted to the local weather and soil conditions. They have co-evolved with the insect communities in our region, and they are less likely to become a nuisance in agricultural settings compared to exotic plants, which may become invasive or weedy. For more information, see the Pennsylvania Department of Conservation and Natural Resources "Landscaping with Native Plants" web page, www.dcnr.state.pa.us/forestry/plants/nativeplants.

Weekly bloom chart for twenty native perennial plants in central Pennsylvania. Dates may vary in other locations.



BEES IMPORTANT TO PENNSYLVANIA AGRICULTURE

Approximately 4,000 described bee species exist in North America. More than 300 species occur in Pennsylvania.

Bumble bees (Bombus spp.)

These hairy, large-bodied, mostly long-tongued bees are considered the second most important pollinators after the honey bee. With their ability to buzz pollinate (vibrate pollen off anthers), bumble bees are efficient pollinators of crops that are not frequented by honey bees. Colonies are established each spring by a single queen.



Crops visited: blueberries, cane berries, orchard crops, peppers, tomatoes, and others

Sweat bees (Halictus spp.)

This group of small, short-tongued bees range in color from metallic blue and green to brown and black. Most species are solitary, and a few are attracted to the salts in human sweat.



Crops visited: alfalfa, cane berries, onion

Leafcutter bees (Megachile spp.)

These solitary bees are black with white, silver, or orange hairs. Females frequently nest in rotting wood and line the interior with small pieces of leaves. Unlike most bees that carry pollen on their hind legs, leafcutter bees transfer pollen on the underside of their abdomens.



Crops visited: alfalfa, melon

Squash bees

(*Peponapis pruinosa*)

The squash bee is an efficient pollinator of squash plants and related crops. This solitary, ground-nesting species will visit flowers at temperatures and under light conditions that are unsuitable for most other pollinators.



Crops visited: cucumber, melon, pumpkin, squash

European honey bees

(*Apis mellifera*)

Large portable colonies, a broad diet, and copious honey production make this species highly desirable as a managed pollinator. Unfortunately, colony numbers are on the decline in North America and other parts of the globe.



Crops visited: orchard crops, squash, melon, soybeans, sunflower, alfalfa, and others

Mason bees (Osmia spp.)

Mason bees are prized for their efficient pollination of orchard crops in spring. Both native and introduced species have been successfully managed by providing nesting boxes or tubes that can be stored in a sheltered location over the winter.



Crops visited: cane berries, orchard crops

Mining bees (Andrena spp.)

These solitary, mostly short-tongued bees are rightfully termed "mining bees" for their habit of excavating pencil-thin nests in the ground. These are among the first bees to emerge in the spring.



Crops visited: blueberries, orchard crops



Ohio spiderwort

Wild bergamot

Culver's root

Common boneset

Purple coneflower

Sweetscented joe-pye weed

Narrowleaf mountainmint

Wrinkleleaf goldenrod

New England aster

Butterfly milkweed