Reducing 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.

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
- Bird baths
- 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

Conserving 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 gardens 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 (CP2), 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).

CONSERVING IN PRACTICE

Conserving Wild Bees in Pennsylvania

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.

CONSERVATION PARTNERSHIP PROGRAMS

The Pennsylvania Department of Conservation and Natural Resources provides financial assistance for creating and protecting natural habitats through the Conservation Priority Program. Additional technical and funding assistance for creating and protecting natural habitats can be found in the following resources:

- Pennsylvania IPM Program: paipm.cas.psu.edu
- 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 gradients in New Jersey and Pennsylvania, USA.
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).

**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 “So What Exactly Is a Native Plant?” Web page, www.dcnr.state.pa.us/forestry/wildplant/nativeplant.aspx.

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

**Species**

- **Early Season**
  - Wild blue phlox
  - Canadian columbine
  - Talus slope penstemon
  - Ohio spiderwort

- **Mid-Season**
  - Butterfly milkweed
  - Wild bergamot
  - American senna
  - Culver’s root
  - Prairie blazing star
  - Common boneset
  - Narrowleaf mountainmint
  - Eastern purple coneflower
  - Giant ironweed
  - Sweetscented joe-pye weed

- **Late Season**
  - Tall tickseed
  - Bigleaf aster
  - Blue mistflower
  - Wrinkleaf goldenrod
  - New York aster
  - New England aster

**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

**Squash bees** *(Melissodes 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, squash bees transfer pollen on the underside of their abdomens.

Crops visited: alfalfa, melon

**European honey bees** *(Apis mellifica)*

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