

How to Identify and Enhance Ohio's Wild Bees in Your Landscape

MaLisa R. Spring, State Coordinator of the Ohio Dragonfly Survey, Evolution, Ecology, and Organismal Biology, The Ohio State University

Mary M. Gardiner, Professor and Graduate Studies Chair, Department of Entomology, The Ohio State University

When asked where bees live, a human-constructed hive teeming with honey bees is typically the first thing that comes to mind (Image 1). However, the European honey bee, *Apis mellifera*, is just one of 400+ species of bees found in Ohio! These pollinators exhibit a wide range of nesting strategies. Our wild bees can be grouped as cavity nesters or ground nesters. Ground nesting bees make up a surprising percent of the bee diversity—70 percent of the 20,000 species of bees worldwide! The remaining 30 percent of bees are considered cavity nesters. Cavity nesting bees construct their nests in a variety of locations including stems and branches, stumps, fence posts, siding, rock crevices, and even snail shells!



Photo: MaLisa Spring

Image 1: Honey bees (*Apis mellifera*) are a single species native to Europe. Honey bees are typically managed using Langstroth hives, pictured here.

Biology of Ground Nesting Bees

Most people think of bees as social animals where a queen and many workers reside in a hive. However, most bees are actually solitary or semi-social. Solitary bees live alone, with each female building her own nest and acquiring the resources needed to raise her young. Solitary bees can also nest in aggregations where many nests are found close to one another, but each bee maintains and provisions its own nest, similar to human apartment complexes. There is large variation in nesting strategy in how bees cultivate the underground nest, but many

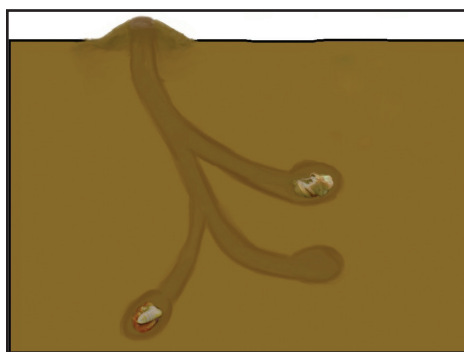


Diagram: MaLisa Spring

Image 2: Ground nesting bees dig into the soil to excavate tunnels for reproduction. Some create a single tunnel for each offspring. Other species of bees make a single main entrance with many branching tunnels.

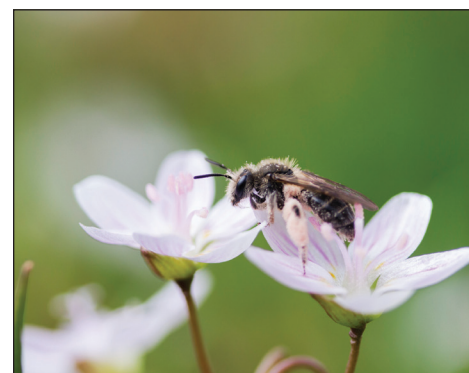


Photo: MaLisa Spring

Image 3: *Andrena erigeniae* is a common, specialist bee found mainly foraging on spring beauties (*Claytonia virginica*).



Biology of Ground Nesting Bees (cont'd)

create single tunnels for each egg or can make a main tunnel with many branches for each egg (Image 2).

Semi-social bees might use the same nest or tunnel, but do not have the same division of labor found in normal social colonies. Semi-social ground nesting bees can often be found living communally where several bees share a common nest entrance but provision their own individual tunnel. Many of the ground nesting bees only have one generation a year, though some may have multiple generations.

Many ground nesting bees are specialists on certain groups of plants. Some are so specialized that they only forage for pollen on one or two species of flowering plants. For example, the mining bee, *Andrena erigeniae*, is a specialist on spring beauties (*Claytonia* spp.) that will visit other spring ephemerals when spring beauties are not as abundant (Image 3). Squash bees, another soil nester, are specialists on plants in the genus *Cucurbita*. These include agricultural crops such as pumpkin, zucchini, and squash.

Identifying Ground Nesting Bees



Photo: MaLisa Spring

Image 4: Bees in the genus *Andrena* can be distinguished by their “armpit” hair, which allows them to collect pollen further up on their hind leg.



Photo: Sam Droege, USGS Bee Monitoring and Inventory Lab

Image 5: Facial fovea are distinct for bees in the family Andrenidae. These are distinct grooves on the face, noticeable on the right of the antennae.

Mining bees (*Andrena* spp.)

Size and Color: Small to medium sized (8-17 mm). Black or brown with grey, tan, or brown hairs.

Key Character(s): Characteristic “hairy armpits” allow females to carry pollen on all parts of their legs (Image 4). Distinctive region on face called facial fovea (small depressions filled with pale hairs along inner margin of eyes) not found on other bees (Image 5). Length and width of the fovea are important for species identification.

Occurrence: The highest diversity found in April through May, but some present all summer.

Nesting: Some species form large nesting aggregations, where large populations can persist for several years. Others live in individual soil tunnels, which are much more challenging to locate in the wild.

Management: Leave open, undisturbed patches of soil within the garden. Do not disturb nesting aggregations; bees are only active for a few weeks a year. They spend most of their life underground as larvae and pupae. Tillage or soil-applied insecticides could harm the spring-active adults and/or the developing offspring later in the summer and fall.



Photo: MaLisa Spring

Image 6: *Colletes* are a genus of ground nesting bees that sometimes form dense aggregations. These are dark brown bees with heart-shaped heads.

Polyester bees (*Colletes* spp.)

Size and Color: Normally slightly larger than both mining and honey bees. They are normally grey or black coloration.

Key Character(s): Rounded, heart-shaped head similar to honey bee, but black in coloration. Polyester bees have no hairy armpits or facial fovea.

Occurrence: Found mainly April through June, but some species found much later in the season.

Nesting: These are solitary bees, but they tend to nest in large soil aggregations. They often also have other parasitic bees patrolling the area, looking for a chance to take over.

Management: Leave open, undisturbed patches of soil within the garden. Do not disturb nesting aggregations; bees are only active for a few weeks a year. They spend most of their life underground as larvae and pupae. Tillage or soil-applied insecticides could harm the spring-active adults and/or the developing offspring later in the summer and fall.

Shiny green bees (*Augochlora pura*, *Augochlorella aurata*, *Augochloropsis* spp., and *Agapostemon* spp.)

Size and Color: Distinctive in their bright green coloration, often called racecar green (Image 7). Range in size, but the largest (*Agapostemon*) are smaller than honey bees (5-11 mm).

Key Character(s): Bright metallic green coloration.

Occurrence: Common throughout the spring, summer, and fall. Easily found throughout Ohio.

Nesting: Bees in the genus *Augochlora* nest in soft wood, and prefer to live in rotten wood that is nearly soil-like in consistency. Other genera of bright green bees are thought to nest mainly in the ground within soft, nutrient rich soils.

Management: If your property includes wooded areas, leave downed wood. Logs can also be added to a wooded habitat to provide a nesting resource.



Photo: MaLisa Spring

Image 7: Racecar green bees are eye catching. Their distinct coloration makes identification much easier.



Photo: MaLisa Spring

Image 8: Dull green sweat bees (*Lasioglossum* spp.) are often overlooked, but relatively common. They are some of the most abundant species found in urban areas.



Photo: MaLisa Spring

Image 9: This sweat bee is actively lapping up sweat. As long as they are not disturbed, they are unlikely to sting their mineral rich hosts.

Dull green sweat bees (*Lasioglossum* (*Dialictus*) spp.)

Size and Color: Very common and small in size (3-9 mm). Dull metallic green color.

Key Character(s): Dull coloration and small size (Image 8). Occasionally land on people during especially hot days to lap up minerals exuded in sweat (Image 9).

Occurrence: Very common year round. One of the bee groups you are most likely to find.

Nesting: Can range from completely solitary to nesting in semi-social nesting aggregations. Nest in a variety of soils, with different species preferring different soil types.

Management: No easy way to propagate, but ubiquitous in all habitats. Avoid mulching all areas of your garden, leaving bare soil patches to encourage nesting.



Photo: MaLisa Spring

Image 10: Squash bees (*Peponapis pruinosa*) are extremely important for squash and pumpkin production. These are often mistaken for honey bees but are slightly larger in size. Interestingly, the males can be found sleeping in flowers overnight!

Squash bees (*Peponapis pruinosa*)

Size and Color: Similar in color to a honey bee, but larger, hairier, and more robust (11-14 mm).

Key Character(s): Look very similar to honey bees, but slightly larger body, longer antennae, and protruding faces. Males have a distinct yellow patch on their face (Image 10).

Occurrence: Common in squash fields. Can be found resting in the flowers throughout the day.

Nesting: Can nest up to 18 inches deep in the soil. Often nest directly under the squash plants, many times hidden from view by the large plant leaves.

Management: Deep tillage can disrupt the nests and destroy the overwintering pupae. Avoid deep tillage, or at least leave part of a field or garden untilled.

Biology of Cavity Nesting Bees

Social

Bumble bees are considered cavity nesters, often using abandoned mouse nests or other underground holes for their homes. Given proper shelter, some bumble bees will also nest on the soil surface. Commercial bumble bee hives are also available, which come prepackaged with their own queen, a few workers, and some bedding (below). However, these commercial bumble bee nests are best for greenhouses where bees are not already present.



Commercial bumble bee nests of the Common Eastern bumble bee (*Bombus impatiens*) are available.



Commercial hives include a queen, and 50-200 workers within a plastic frame nest filled with cotton.



Photos: MaLisa Spring

After spending all summer gathering resources, the colony can get quite large with up to a thousand workers, though normally fewer.



Photo: MaLisa Spring

Image 12: There are various ways to support cavity nesting bees. Cardboard or paper straws (but not plastic) are readily utilized by bees and masons wasps. After a year of having a nest in your garden, you will find several of your tubes filled (Top). Paper straws can be purchased online and assembled in various tubes as a fun DIY project (Bottom).

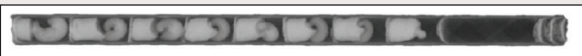


Photo: Katie Todd

Image 13: The straws of cavity nesting bees are partitioned for each offspring. This is an X-ray of bees collected in a nesting straw in Cleveland, Ohio. The female bee collects enough pollen to make a large pollen ball. She then deposits a single egg on the ball and seals off the individual cell.

Solitary

Our most common solitary cavity nesting bees include leafcutter bees, orchard bees, small carpenter bees, and large carpenter bees. Most people are familiar with the large carpenter bees, which can be considered pests of wooden structures. The large carpenter bees will nest in many different wooden structures including barns, railings, and benches. However, it is key to remember that they are useful pollinators, visiting a variety of ornamental and agricultural plants.

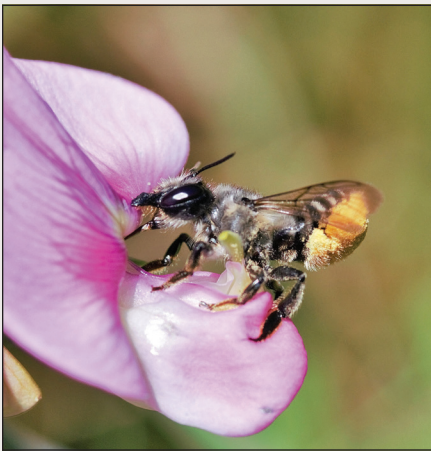
Leafcutter and orchard bees will readily nest in small circular cavities and are easily propagated in nesting straws (Image 12). These bees partition the nest cavity, add a pollen ball for food, lay the egg, and then seal that partition (Image 13).

A majority of the leafcutter and orchard bees are found in the early spring when fruit trees are blooming, but there are some species that forage throughout the summer and fall. Leafcutter bees are aptly named because they line their nests with circular leaves that they cut from nearby plants (Image 14). Sometimes they even line their nests with flower petals! However, they rarely use enough plant matter to cause significant plant damage to a backyard garden. Leafcutter bees are important pollinators of legumes, most notably alfalfa and other plants with flowers similar to pea plants (Image 15).

Recently, the resin bee (*Megachile sculpturalis*) was detected in Ohio. This exotic bee species lines its nests with plant resins instead of leaves. Resin bees are known to be opportunistic with nesting habitats and are often found overtaking the nests of large carpenter bees. Sometimes you can even find large carpenter bees covered with resin where the resin bee took over the nest.



Image 14: Leafcutting bees use their large mandibles to cut leaves to line their nest. This is an observation cavity nest—individual leaves are pieced together by a female bee.



Photos: MaLisa Spring

Image 15: Leafcutting bees (*Megachile* spp.) prefer legume plants. The pollen collection basket on this female is visible on the abdomen.

Orchard bees, sometimes called mason bees, are also aptly named because they use damp mud to sculpt their nest within the cavity. You can occasionally find them in muddy areas collecting mud for their nests. These are important pollinators of orchard crops such as apples, peaches, and blueberries.

Identifying Cavity Nesting Bees

Leafcutter bees

(*Megachile* spp.)

Size and Color: Black bodies and varying coloration of hair. Similar in size or slightly smaller than honey bees (most 7-12 mm, some 12+ mm) (Image 16).

Key Character(s): Triangular abdomens. Females have dense pollen collection hairs (scopa) on the underside.

Occurrence: Can be found throughout the growing season (April-October).

Nesting: Cavity nesters, seek pre-existing holes above ground.

Management: Can nest in manufactured nesting straws, though different diameters of straws will be used by different species (Image 17). Holes drilled in logs can also provide nesting habitat. Diameters ranging from 3/32–3/8 of an inch will be colonized.

Image 17: Nesting straws are readily utilized by both leafcutting bees (*Megachile* spp.) and mason bees (*Osmia* spp.).



Image 16: Female leafcutting bees (*Megachile* spp.) have a distinct triangular abdomen with pollen collecting hairs on the underside.



Photos: MaLisa Spring

Orchard or mason bees

(*Osmia* spp.)

Size and Color: Often a dull metallic body, but this can be obscured by hair. Two main color forms in Ohio: green/blue metallic and dark metallic obscured by tan hairs (Image 18). Slightly smaller than honey bees (9-11 mm).

Key Character(s): Similar to leafcutting bees, they collect pollen on the underside of their abdomen, however their abdomen is NOT triangular in shape.

Occurrence: Mainly in spring and early summer when apples and blueberries bloom. Can be found in very high numbers during this time.

Nesting: Cavity nesters, often found in beetle holes or other borings in wood.

Management: Cardboard nesting tubes with straws can be purchased online or at local farm and garden stores (Image 12). These bees normally fly in the spring and early summer, so place nests in your garden by April/May to get the highest recruitment. Place small boxes with damp soil near the nesting boxes for nest partition resources. The damp soil is used to line the walls for each bee larvae and pollen provision.



Photo: MaLisa Spring

Image 18: A brown mason bee (*Osmia* spp.) foraging on spring beauty (*Claytonia virginica*).

Bumble bees (*Bombus* spp.)

Size and Color: Easily identifiable bees that are robust and fuzzy. Often have dense yellow hairs on thorax and a variation of yellow and black on the abdomen depending on species (Image 19) (12-26 mm).

Key Character(s): Large bee with variable amounts of black and yellow hairs. Distinguished from carpenter bees by the dense patches of hairs on the abdomen (lacking in carpenter bees).

Occurrence: Found throughout the year. Only the queen overwinters and in the early spring can be found foraging and establishing her nest. Colonies can have several dozen to several hundred bees by late fall.

Nesting: Will nest in underground cavities, abandoned mouse nests, in tree holes, or on the soil surface provided there is proper coverage.

Management: Bumble bees will likely find natural nesting places within landscapes. Adding features such as upturned pots or using other methods to create underground cavities may attract queens seeking a nesting site. Commercial bumble bee hives are also available; these mainly support the common eastern bumble bee (*Bombus impatiens*).



Photo: MaLisa Spring

Image 19: Bumble bees (*Bombus* spp.) are opportunistic foragers and will utilize many overlooked plants. This *Bombus impatiens* is foraging on narrow leaf plantain (*Plantago lanceolata*).



Image 20: Carpenter bees (*Xylocopa virginica*) are Ohio's largest bees. They are similar to bumble bees, but lack hair on their abdomen.



Photos: MaLisa Spring

Image 21: Ohio's only species of carpenter bee (*Xylocopa virginica*) can be distinguished from bumble bees by their shiny abdomen.

Large Carpenter bees (*Xylocopa virginica*)

Size and Color: One of Ohio's largest bees ranging from 19-23 mm. Large black body and yellow hairs (19-23mm) (Image 20).

Key Character(s): Distinguished from bumble bees by their shiny, mainly hairless, abdomen (Image 21).

Occurrence: Found year round, often around wooden structures.

Nesting: In wooden structures.

Management: Provide large wooden structures with untreated and unpainted wood. Drill large diameter holes into the wood to facilitate their nests.



Photos: MaLisa Spring

Image 22: Small carpenter bees (*Ceratina* spp.) are in the same family as the large carpenter bees (*Apidae*), but are distinctly smaller. These small, greenish bees nest in pithy stems of plants. They will remove the pithy area of stems to create a nest. The best way to support their populations is to cut back perennials several inches from their base in the fall.

Small carpenter bees

(*Ceratina* spp.)

Size and Color: Very small bees, with a dark green metallic coloration (5-8 mm).

Key Character(s): Most females and all males have distinct small white or yellow markings on their face (Image 22). Ohio has four recognized species that cannot be differentiated without the use of a microscope. Refer to the [Discoverlife.org](https://www.discoverlife.org) identification key on *Ceratina* for up-to-date identification characters.

Occurrence: A group of small bees that most people do not notice, even though they are one of the more common bees. They can be found throughout the year.

Nesting: Pithy stems of plants.

Management: Cut back perennials several inches tall instead of to ground level. Small carpenter bees have a preference for plants with pithy stems such as *Rubus* spp., *Sambucus* spp., and those pictured in Image 22. Alternatively, cut plants with pithy stems and tie them in bundles to hang around your garden.

Masked bees (*Hylaeus* spp.)

Size and Color: Very small, similar in size to the small carpenter bees (Image 23). All black with occasional patch of yellow right behind the head and on the face (5-9 mm).

Key Character(s): Small, wasp-like bees that store pollen internally in their crop instead of pollen collecting hairs on the outside of their bodies. Yellow markings on the face are distinctive for this genus; males have a larger yellow patch and females have two smaller yellow triangles (Image 24).

Occurrence: Common in Ohio throughout the season, but often overlooked due to size and wasp-like appearance.

Nesting: Varied nesting strategy. Most are cavity nesters living in hollow twigs or in cavities in wood, but some nest in the ground.

Management: Very thin straws, small open twigs, or bee blocks drilled with very narrow diameters (<9mm). Place out of the rain, but in a sturdy location to avoid movement in the wind. Horizontal orientation is preferred, but several bees will also nest in vertical straws.



Photo: Sam Droege, USGS Bee Monitoring and Inventory Lab

Image 24: Male yellow faced bees (*Hylaeus* spp.) have a larger triangle of yellow on their face compared to female which normally have two small triangles of yellow next to their compound eyes.

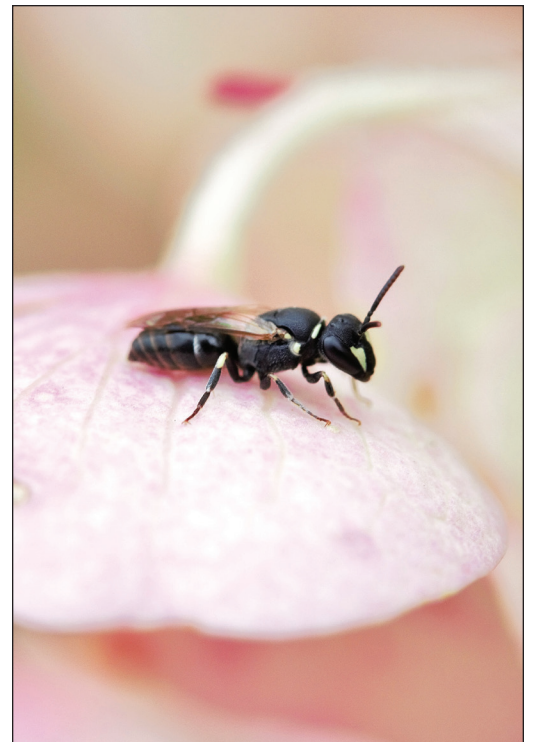


Photo: MaLisa Spring

Image 23: Yellow faced bees (*Hylaeus* spp.) are small, wasp-like bees. Females store pollen in their crop and do not have special pollen collecting baskets on their legs.

Additional Recommended Resources and References

- J.H. Cane, T. Griswold, and F.D. Parker. 2007. Substrate and materials used for nesting by North American *Osmia* bees (Hymenoptera: Apiformes: Megachilidae). *Annals of the Entomological Society of America*. 100(3):350-358.
- H.V. Danks. 1971. Biology of some stem-nesting aculeate Hymenoptera. *Economic Entomology*. 122(11): 323-395.
- S. Droege. 2012. The very handy manual: how to catch and identify bees and manage a collection. USGS Native Bee Inventory and Monitoring Lab.
- S. Droege, R. Jean, and M. Orr. 2013. Discover Life ID nature guide (draft): bee genera of Eastern North America (Hymenoptera: Apoidea: Anthophila). Available from www.discoverlife.org/mp/20q?search=Apoidea
- C.D. Michener. 2007. *The bees of the world*. Volume 2. JHU press. 992 p.
- C.D. Michener, R.J. McGinley, B.N. Danforth. 1994. *The bee genera of North and Central America (Hymenoptera: Apoidea)*. Smithsonian Institution Press, Washington. 304 p.
- T.B. Mitchell. 1960. Bees of the Eastern United States. Vol I. Technical bulletin. North Carolina Agricultural Experiment Station 141: 1-538.
- T.B. Mitchell. 1962. Bees of the Eastern United States. Vol II. Technical bulletin. North Carolina Agricultural Experiment Station 152: 1-557.
- L. Packer. 2014. *Keeping the bees*. Harper. 272 p.
- M. Shepherd, M. Vaughn. 2011. *Attracting native pollinators: protecting North America's bees and butterflies*. The Xerces Society Guide.
- J.S. Wilson, O.J. Messinger-Carril. 2015. *The bees in your backyard: a guide to North America's bees*. Princeton University Press. 288 p.