



*Somerset County  
Park Commission*



# Which Native Bee Can You Find in the Discovery Garden?

Environmental Education Center  
Basking Ridge, New Jersey



A Rutgers Environmental  
Stewards Project  
with support from the Somerset  
County Park Commission

**RUTGERS**

New Jersey Agricultural  
Experiment Station

COOPERATIVE EXTENSION  
ENVIRONMENTAL STEWARDS PROGRAM



## ABOUT THE NATIVE BEE GARDEN

The Native Bee Garden project was conducted as part of a Rutgers Environmental Steward\* program internship completed by Ellen Locker and Shona Erlenborn, in cooperation with the Environmental Education Center (EEC), Basking Ridge, New Jersey, Somerset County Park Commission. It is based on the premise that much scientific and public attention is paid to the plight of the non-native honey bee including the detrimental effects colony collapse disorder plays in hive deaths resulting in reduced pollination of commercial crops. Less attention is paid to native bees which play a vital role in pollination of native plants, contributing to biodiversity. Consistent with the mission of the EEC, the internship goal is to develop a native pollinator plant garden designed to attract native bees, which will provide educational opportunities to park visitors about the biology, biodiversity and habitat of native bees.

\* The Rutgers Environmental Steward program trains volunteers in the important environmental issues affecting New Jersey, and works to solve local, community problems. For more information, visit: <https://envirostewards.rutgers.edu/about.html>



## **NATIVE BEE GARDEN**

When you think about bees, you probably think about honey bees – the industrious pollinators that live in beehives and make honey. Did you know that honey bees are actually not native to North America but were imported by European settlers to support pollination of agricultural products like fruit and vegetables?

On the other hand, native bees were present in North America before people of European descent settled here in the 17<sup>th</sup> century. There are over 4,000 species of bees native to North America. New Jersey boasts around 300 species. These bees are also critical pollinators. With few exceptions, rather than living in hives, native bees are solitary nesters who build their nests in the ground or hollow cavities of plant stems.

**LOOK AROUND THE GARDEN – DO YOU SEE ANY NESTING SPOTS FOR OUR  
NATIVE BEES?**

## WHERE NATIVE BEES LIVE

The majority of native bees (70%) build their nests in the ground, digging tunnels through loose soil between inches to a couple of feet below ground. These tunnels provide resting spots for the bees during the heat of the day while also being used as nesting areas when female bees are ready to reproduce. On the **left below**, you see an illustration of what a native bee tunnel looks like. At the end of each segment of the tunnel, you see orange pollen and nectar which the female bee collects and places at the end of the tunnel before she lays her egg. This pollen is used by bee larva as a food source to encourage growth. On the **right below** is a photo of the Bee Spiral which can be found in the **EEC Discovery Garden!**

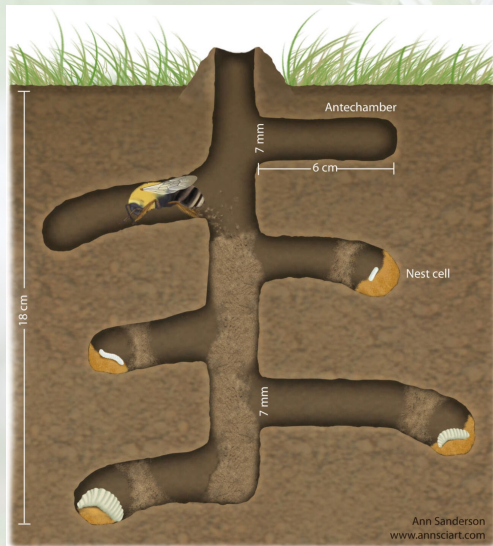


Illustration of native squash bee tunnel

Notice the **Bee Spiral** in the garden. This structure was constructed of stone and filled with soil to support bees who dig tunnels. Look carefully at the spiral and you may see little holes which are tunnel entrances. You may also see holes in the ground around plantings in the garden.





## WHERE NATIVE BEES LIVE

About 30% of native bees are considered solitary, cavity nesters. They build their nests in hollow or pithy plant stems, holes in dead wood, rock crevices or other materials such as brush piles or in pre-existing spaces such as rodent tunnels or bird nests. On the left below, you see a photo showing how female bees hollow out pithy plant stems and create individual compartments in which they place pollen and nectar as a food source for larva, lay eggs and seal each compartment with leaves or pith. As the weather warms in early spring, the larva complete their maturation and break out of their compartments to fly free. On the right below is a photo of the Bee House which can be found in the **EEC Discovery Garden!**



Cavity nesting bees in a hollow stem  
(Xerces Society-Katharina Ullman)

Notice the **Bee House** in the garden. This structure features hollow tubes and tree branches providing nesting spots for cavity nesting bees. If you look closely, you will see that some of the holes are plugged with mud or plant material. It is in these cylinders that the female bee has laid her eggs.



**PLEASE DO NOT DISTURB!**



## WHERE NATIVE BEES LIVE

An exception to the solitary native bee is the bumble bee. Bumble bees are the only bees native to North America that are truly social. They live in colonies, have different divisions of labor, and have overlapping generations, usually with multiple broods throughout the spring, summer, and fall. They nest in rodent holes, under plant debris or thatch at ground level, or in other sites that provide insulation such as bird nest boxes, sheds, or barns. On the left below, you see a colony of wax cocoons in which the queen has placed a large pollen ball moistened with nectar, laid her eggs and sealed the cocoon with wax. In cool weather, the queen perches on the top of the pollen ball to incubate the eggs. On the right below is a photo of the Bee Palace which can be found in the **EEC Discovery Garden!**



Mossy, grassy nest of the common carder bumble bee showing wax cocoons

[BuzzAboutBees.Net](http://BuzzAboutBees.Net)

The Wonderful World Of Bees

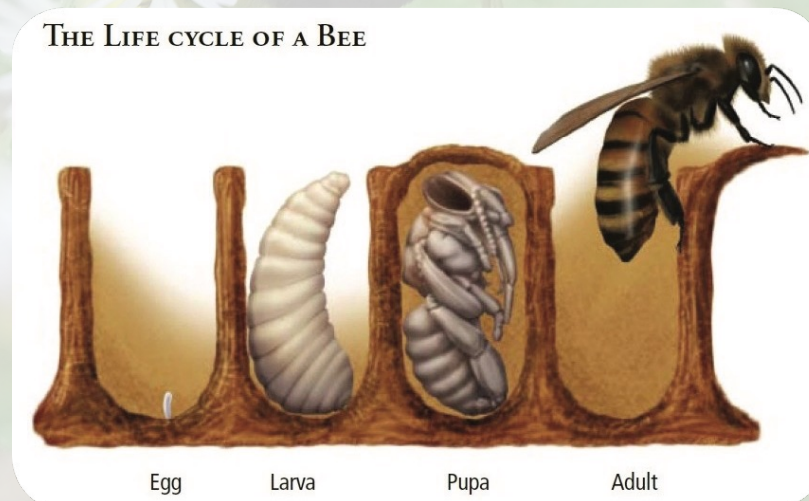
Notice the **Bee Palace** in the garden. If this looks like a pile of leaves and plant debris, it is! Many native bees, especially bumble bees, lay their eggs under the plant debris for overwintering. Maintaining a leaf pile in your home garden encourages local native bee population growth.





## HOW NATIVE BEES REPRODUCE

The life cycle of a bee is fascinating! Most solitary bees live for about a year in four life stages: egg, larva, pupa and adult. The active adult phase typically lasts 3 – 6 weeks. The male adults emerge first in spring or summer. After mating, it is then the adult female's duty to find a nesting area and build and provision a nest where she can lay her eggs. She sets out to find suitable habitat for her nest, whether in the ground or a cavity, and builds it out. She then starts collecting "provisions" for the nest which include nectar and pollen from flowers that she forms into a small loaf or "bee bread". Pollen provides the egg with essential vitamins and protein needed to nourish growth, while the nectar contains sugars for energy. An egg is laid on the bee bread and when it hatches the larva consumes it. The larva grows quickly then changes into a pupa and stays this way for months, frequently overwintering, before finally becoming an adult.



## NATIVE BEES IN THE GARDEN

Most bees can be separated into two categories of female pollen preferences, either specialists or generalists.

- **Specialist** bees have evolved a specific relationship with a few or even just one plant species. Some specialist bees forage for pollen that can only be found on one plant species. These specialist bees emerge from their nests at the same time their host plant begins to flower. The host flower sometimes depends on pollination from one specific bee species and the bee depends on pollen from their specific flower species. This mutualistic relationship can be found all over the world.
- On the other side of the spectrum, **generalist** bees are not too picky about the flowers they visit, and often visit a wide range of flower types and species when seeking out pollen.

Many of the plants in the Native Bee Garden have been selected to attract specialist bees. The next few pages highlight native bees you may be able to find in the garden and the plants they may be visiting.

**LOOK AROUND THE GARDEN – DO YOU SEE ANY OF THESE NATIVE BEES?**



# The solitary, ground nesting **Mining Bee** (*Andrena erigeniae*) on Spring Beauty (*Claytonia virginica*)



**Status:** Common

**Nesting habit:** Ground

**Social behavior:** Solitary

**Host Plant Bloom Time:** April – June

**Conservation status:** declining in Northeast

## Fun Facts about *Andrena erigeniae*

- Known to be a pollinator for several plant species, including Harbinger-of-Spring (*Erigenia bulbosa*), and Eastern Spring Beauty (*Claytonia virginica*).
- One of the first bee species to emerge in the spring, often coinciding with the blooming of its preferred plant. This timing is so precise that researchers suggest the bee may detect the volatile compounds released by the plant and use them as a cue to emerge from hibernation.
- They have unique behavior where they "sleep" in the flowers of their host plant at night.
- Excavates tunnels in the soil to create nests. These nests can sometimes be found in large aggregations, with many individual bees sharing a communal entrance.



# The solitary, ground nesting **Mining Bee** (*Andrena ziziae*) on Golden Alexander (*Zizia aurea*)



**Status:** Common - Uncommon

**Nesting habit:** Ground

**Social behavior:** Solitary

**Host Plant Bloom Time:** April – June

**Conservation status:** endangered

## **Fun Facts about *Andrena ziziae***

- The scientific name is derived from the genus *Andrena*, which is a large and diverse group of bees, and the species name *ziziae*, which refers to the bee's close association with the Golden Alexander plant, *Zizia aurea*.
- An important pollinator for the Golden Alexander plant.
- A solitary bee species, meaning that each female bee builds and provisions her own individual nest.
- One of several bee species being monitored in the Rusty Patched Bumble Bee Recovery Program, which aims to protect and conserve endangered pollinators in the United States.



# The solitary, ground nesting **Metallic Green Sweat Bee** (*Halictidae augochlora*) on Large-Leaved Aster (*Eurybia macrophylla*)



Photo by Heather Holm

**Status:** Common

**Nesting habit:** Ground

**Social behavior:** Solitary

**Host Plant Bloom Time:** April – October

**Conservation status:** species of concern

## Fun Facts about *Halictidae augochlora*

- The genus name *Augochlora* is derived from the Greek words "augo" meaning "to shine" and "chloros" meaning "green", referring to the bright, metallic green coloration of the bee's exoskeleton.
- Their coloration is caused by iridescence which is created by the way that microscopic ridges on the bee's exoskeleton interact with light, causing different wavelengths to reflect and refract in different ways.
- According to research conducted by the Bee Sensory and Behavioral Ecology Lab at the University of Toronto, the *Augochlora* sweat bee has been observed learning and remembering unique human facial features, allowing them to distinguish one person from another – amazing!



# The social, cavity nesting **Bumble Bee** (*Bombus sp.*) on Beardtongue (*Penstemon digitalis*)



**Status:** Common

**Nesting habit:** Cavity

**Social behavior:** Social

**Host Plant Bloom Time:** no specific host

**Conservation status:** declining

## **Fun Facts about *Bombus sp.***

- The scientific name is derived from a Latin word meaning booming, buzzing, or humming.
- Bumble bees can “buzz pollinate,” a technique where they vibrate their wings at a specific frequency to release pollen from flowers that other pollinators cannot access. This ability makes them especially effective at pollinating crops like tomatoes, blueberries and cranberries.
- Bumble bees can regulate their own body temperature. According to the Bumblebee Conservation Trust, bumble bees can generate heat by vibrating their flight muscles. This allows them to maintain a stable body temperature even in cooler environments.
- A bumble bee is capable of producing a waxy substance to build nests and protect their eggs.



# The solitary, ground nesting **Mining Bee** (*Andrena hirticincta*) on Showy Goldenrod (*Solidago speciosa*)



**Status:** Common

**Nesting habit:** Ground

**Social behavior:** Solitary

**Host Plant Bloom Time:** July - October

**Conservation status:** declining

## **Fun Facts about *Andrena hirticincta***

- The scientific species name, *hirticincta*, is derived from a Latin word meaning "hirtus" which means "hairy" and "cinctus" which means "banded" or "encircled." Therefore, "*hirticincta*" means "hairy-banded" or "encircled with hair" which refers to the distinctive bands of hair on the abdomen of this species.
- These bees are active in early spring and can often be seen flying low to the ground in search of flowers.
- Male *Andrena hirticincta* bees have longer antennae than females. They use these antennae to locate potential mates.
- *Andrena hirticincta* bees have been found to exhibit nest site fidelity, meaning they return to the same location to nest each year.



# The solitary, ground nesting **Mining Bee** (*Peponapis pruinose*) on a Squash plant flower



Photo by Heather Holm

**Status:** Common

**Nesting habit:** Ground

**Social behavior:** Solitary

**Host Plant Bloom Time:** June - August

**Conservation status:** uncharacterized

## **Fun Facts about *Peponapis pruinose***

- The scientific genus name, *Peponapis* is derived from the Greek words "pepon" which means "melon" or "gourd", and "apis" which means "bee". This name refers to the bee's close association with the Cucurbitaceae family, which includes melons, gourds and squash.
- Squash bees are important pollinators for many varieties of squash and pumpkin and are more efficient pollinators of these plants than other bees.
- Squash bees are early risers and active before dawn, making them one of the earliest bees to start pollinating in the morning.
- Female squash bees collect pollen exclusively from the flowers of squash plants and store it in their specially adapted leg hairs. Female bees construct their own nest in the soil near a squash plant.



## HOW TO HELP NATIVE BEES

Bees are sometimes feared, but virtually all native bee species are nonaggressive, and many do not sting. In fact, humans are usually a greater danger to bees than vice versa! Here are some ways you can support native bee populations.

- **Plant native plants.** Native plants co-evolved with native bees and offer the best nutrition and habitat. Group several plants of the same species in clusters and provide a diversity of species in your garden. Those features (color, fragrance) that attract bees are often attractive to humans as well so enjoy!
- **Avoid pesticides.** Look to integrated pest management methods to discourage pests, rather than using chemicals that kill indiscriminately.
- **Offer nesting options.** Logs, dead branches, and woodpiles provide natural habitat. You can also buy or build nesting blocks.
- **Reduce soil disturbance.** Set aside at least one area of the garden where you will not cultivate soil, allowing bees a place to construct underground tunnels and nests.
- **Educate your neighbors.** Teach your friends, students, or community gardeners about the importance of pollinators and native bees.

## WANT TO LEARN MORE ABOUT NATIVE BEES?

- *Bees: An Identification and Native Plant Forage Guide*, Heather Holm, 2017
- *Common Native Bees of the Eastern United States*, Heather Holm, 2022
- *Conserving Native Bees on Farmland*, Rufus Isaacs and Julianna Tuell, Department of Entomology, Michigan State University, May 2007
- *Creating a pollinator garden for native specialist bees of New York and the Northeast*, Maria van Dyke, Kristine Boys, Rosemarie Parker, Robert Wesley, Bryan Danforth
- *Michigan Bees: Honey, Native, Wild, Invasive or Wannabees*, Jason Gibbs, Department of Entomology, Michigan State University
- *Native Bee Benefits*, Bryn Mawr College and Rutgers University, May 2009
- *Nesting & Overwintering Habitat for Pollinators & Other Beneficial Insects*, Xerces Society, 2020
- *The Pollinator Victory Garden*, Kim Eierman, 2020