



## *Creating a Buzz for* **Native Bee Pollinators**

The important role of native bees comes into focus as insect populations continue to decline

**WRITTEN BY GABRIELA GARRISON & PHOTOGRAPHED BY MELISSA McGAW**

**I**t has been a little over a year since news of the “Insect Apocalypse” hit mainstream media. If you missed it, a *New York Times* article discussed the stark decline of insect populations worldwide. It included an explanation of the “windshield phenomenon,” which if you’re able to think back at least 30 years, you might recall your windshield coated with insects after driving to the store. If you played in the backyard, you may have accidentally swallowed a bug while you were laughing. That is rarely the case today.

There has been substantial research and attention surrounding the honey bee (*Apis mellifera*). Although honey bees are not native to North America, they have helped illustrate the pivotal role that pollinating insects play in daily life. According to the U.S. Department of Agriculture, honey bees and native bees pollinate approximately 75 percent of all vegetables, fruits and nuts grown in the United States. Without these free ecosystem services, our diet would be far less diverse and terribly unhealthy.



Compared to honey bees, this common Eastern bumble bee (*Bombus impatiens*) is a very efficient pollinator. It is capable of carrying hefty amounts of pollen while visiting flowers in cool and adverse weather conditions.

Sadly, native bees are afforded less appreciation and concern despite their significant economic and ecological value. Some native bee populations have decreased significantly due to habitat loss, fragmentation and pesticide use. In North Carolina, there are over 500 species of native bees. In the United States, there are more than 4,000 native bee species. They occur in an assortment of sizes, shapes and colors, have different seasons of activity and carry pollen in various places on their body.

Most of our native bees are solitary, nesting in the ground, hollow stems or secluded areas that allow for secrecy. However, there are species that are social and form colonies. Interestingly, bees are descended from wasps, insects that are primarily carnivorous. At some point on the evolutionary tree, certain wasps discovered the highly nutritive value of pollen for their brood and switched their forage preference, creating the first line of bees.

### Meet the Natives

Mason and leafcutter bees (family Megachilidae) are commonly found across North Carolina. They are solitary bees that nest in hollow stems or rotting wood. The term, Megachile, means large-lipped and likely references their hefty mandibles. Leafcutter bees need strong jaws to clip leaves that will eventually line their multi-chambered nests. In the summer, females will lay one egg per

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chamber, laboriously create and deposit a “pollen ball” made from pollen and nectar, then seal the chamber with chewed up leaves. The developing young will feast on the protein and carbohydrate-rich pollen ball for several weeks, then overwinter as prepupae inside their cocoons. In the spring, they will rapidly complete development and emerge from their individual chambers.

Mason bees fashion similar nests but use mud or leaf-pulp walls to separate each chamber. Both leafcutter and mason bees have pollen-carrying hairs on their abdomen, allowing an effective spread of pollen from flower to flower. Even though solitary bees have separate nest sites, they are often in proximity to other bees. If you pay attention, you’ll notice how quickly bees enter and exit their nest. I used to wonder: How do they recognize their nest when they’re moving so quickly? Each female secretes a unique scent at the entrance of the tunnel that helps her find the corresponding entrance.

On the flip side, mining bees (family Andrenidae) nest in the ground. Some nest an inch below the surface, while others dig down a foot. In the western part of the country, there is a record for a mining bee that dug 9 feet underground. Entomologists are still scratching their heads about that one. Like other solitary bees, the female will create a chamber, lay an egg on a pollen ball and seal the chamber. Interestingly, all female bees in this family produce a waterproof secretion to line their nests. This protects the developing larvae from moisture and bacteria present in the soil.

Although they are solitary nesters, mining bees may form large aggregations in the spring. Some species in this family share the same nest entrance but will use their own individual tunnel. Mining bees are often the first to emerge on warm days in early spring.

If you are walking along sandy or sparsely vegetated ground and notice a large group of flying insects hovering

near the surface, don’t be alarmed. It’s likely your neighborhood mining bees emerging from their winter slumber.

Another common bee in North Carolina is the sweat bee (family Halictidae). While many of these striking bees are metallic green, some can also be black or brown in coloration. There are many species in this family known to land on people and sip



their sweat, presumably to gather salts or other needed minerals.

Last summer, sweat and carder bees (family Megachilidae) landed on my arm while I was in the woods. I was not alarmed, but there is a common misconception that all bees are aggressive and sting. If a bee stings, it is likely doing so in defense of its hive or colony. Since most of our native bees are solitary, there is nothing to defend. Furthermore, only females can sting. The stinger is historically thought to have been an apparatus for laying eggs, but through the scale of evolution, its function has changed. I’ve spent endless hours in the woods, exploring flowers and bushes looking for bees. In countless (futile) attempts to take decent pictures, I’ve been extremely close to many species of bees and have not been stung yet.

Bumble bees (family Apidae) are truly social insects that are opportunistic nesters. Each spring, a bumble bee queen will emerge from winter hibernation and begin her search



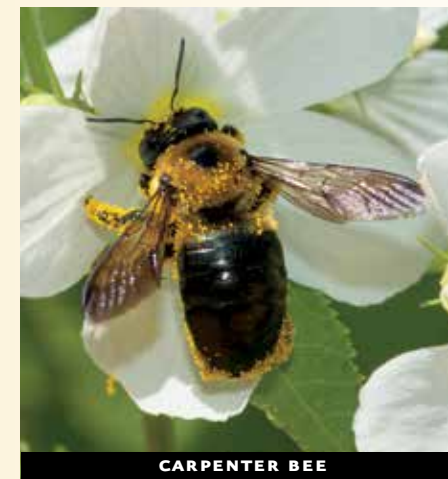
Top: A sweat bee (*Halictus ligatus*) pollinates a black-eyed Susan. Above: Evidence that a leafcutter bee has visited this plant. Left: And here is the culprit: a male leafcutter.



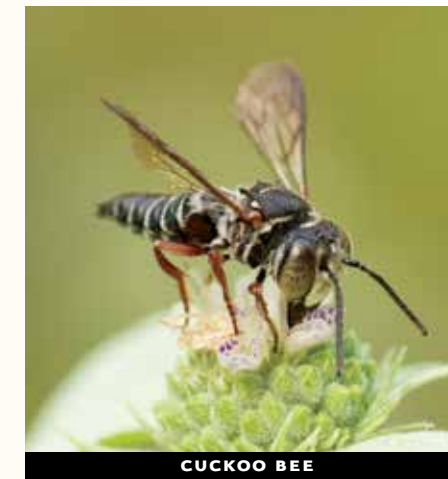
The author samples bees as part of her research at Sandhills Game Land.



BUMBLE BEE



CARPENTER BEE



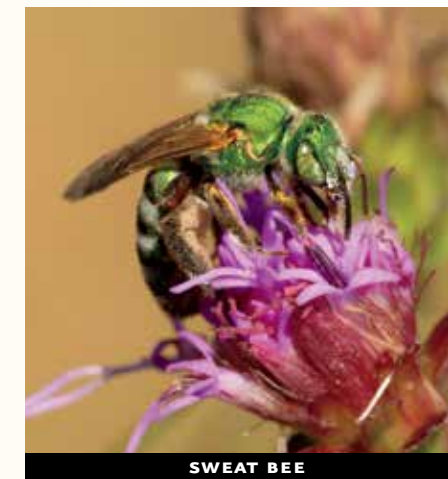
CUCKOO BEE



LEAFCUTTER BEE



SUNFLOWER BEE



SWEAT BEE

for a suitable nesting site. This may include an abandoned rodent burrow, a hollow log or an unoccupied bird house. I recently found an American bumble bee (*Bombus pensylvanicus*) colony in the foundation of a trailer at my office site.

Once a site is chosen, the queen bumble bee will collect pollen and nectar that will sustain the colony she is about to create. Having already mated the previous fall, she will lay eggs on pollen balls. After four to five weeks, these eggs will become the first generation of workers. They will collect resources while the queen remains in the colony and continues laying eggs. Colonies can range from 50 to several hundred bees. At the end of the summer, a new queen will leave the colony, mate, overwinter and then emerge the following spring to start the cycle again. Each colony will perish at summer's end, leaving the queen to carry on future generations.

Carpenter bees (*Xylocopa virginica*) are also in the Apidae family. However, despite their similar appearance, they are not bumble bees. The most obvious difference is their black, shiny abdomen, which is a stark contrast to a bumble bee's hairy abdomen. They do not nest in traditional colonies, but instead drill tunnels into wooden structures. Historically, they nested in dead branches or trees, but the presence of homes and associated infrastructure has expanded their horizons.

The nesting cycle for carpenter bees is interesting because it differs from other bees. I have discussed species that overwinter as developing larvae as well as those represented solely by an overwintering queen. Carpenter bees enter their overwintering refuge as adults and emerge in the spring to search for forage and a mate. Once the female carpenter bee has mated, she will collect resources, create a nesting site and

lay eggs. Like leafcutter bees, she will create one chamber and pollen ball for each egg. Instead of leaves or mud, she will use chewed up wood to construct the dividing wall. The males are likely to die in late spring, but the females will persist into the summer. They are less active during this time and are sometimes found guarding their nest. By late summer, the next generation of bees will emerge and collect resources to sustain themselves for hibernation through the winter.

Because of the damage they cause, carpenter bees are not a welcome sight in some neighborhoods. I can sympathize: My kids have a cedar swing set that has been decimated by carpenter bees. To add insult to injury, pileated woodpeckers have furthered the destruction by creating cavernous holes in attempts to get the larvae. Having said that, I am still excited to see carpenter bees around my house. They are generalist feeders that visit many types of flowers. Because of

their large bodies, they can carry copious amounts of pollen, making them potentially good pollinators.

Dr. Elsa Youngsteadt, professor in the Department of Applied Ecology at N.C. State University (NCSU), studies carpenter bees in her lab. She is working to find answers for people who worry that carpenter bees will destroy their homes. She is also investigating how their habits may be changing as they adapt to living in man-made structures. She has partnered with the NCSU College of Veterinary Medicine to X-ray nests so she can study their behavior without inhibiting their activity.

### Studying for the Future

In another ongoing project, the N.C. Wildlife Resources Commission has partnered with Dr. Youngsteadt to learn more about native bee diversity across the state. Last summer, biologists from the Commission and the

The author sets out a bee bowl to help capture bees and gain a better understanding of bee populations.

U.S. Fish & Wildlife Service collected bees at four game lands to determine species presence: Sandy Mush (Mountains), Butner-Falls of Neuse (Piedmont), Sandhills (Sandhills) and Holly Shelter (Coastal Plain). Three sites with different burn prescriptions were selected at each game land, totaling 12 sites.

From June to October, once every two weeks, biologists placed 30 bee bowls at each site and actively netted for bees throughout the day. Dr. Youngsteadt and members of her lab are pinning and identifying the specimens that were collected. We hope to continue this work for the next three to five years to determine baseline diversity and impacts from fire. This information could guide conservation





How Do Bumble Bees and Blueberry Bees Reproduce?  
See Nature's Ways, page 43.

and management recommendations to combat the bee decline we have seen in recent years.

As a wildlife biologist, my inclination and priority are to conserve native species. Honey bees are not native but provide a valuable service. They were brought here in the 1600s by European colonists. They are social bees that live in hives, numbering in the thousands. Bumble bees are also social but have much smaller colonies that do not survive from year to year, save for the queen. Honey bees are generalists that are widely used in agriculture because they are transportable and easily managed. In recent research, it has been suggested that honey bees may outcompete native bees for floral resources and expose them to disease. There have been assertions that honey bees further the spread of invasive plant species by pollinating them. However,

more studies are needed to definitively support or refute those claims. It is relatively easy to study honey bees. Studying wild bees is the opposite.

I spent last summer collecting bees at Sandhills Game Land and questioned myself throughout the study. What if certain bees aren't lured by bee bowls? What if I didn't notice a small bee on a flower? What if two days per month isn't enough to capture diversity? We don't have a solid baseline of what was present 30 years ago, so it's hard to know what we've lost.

I recently spoke with Dr. David Tarpy, an apiculture professor and honey bee expert at NCSU. He said that honey bees are not necessarily important for conservation but quite significant for pollination. He suggests working toward stability and sustainability in both worlds, not necessarily choosing one species over the other.

Because they are easy to transport and provide value in a farming landscape, honey bees are suitable pollinators for the agricultural industry. This is especially important in areas where there is limited habitat that provides refuge for native bees. Conversely, it seems prudent to leave natural areas such as state parks or game lands for native bees, especially if there is potential for rare or declining populations. At the end of the day, finding a suitable niche for honey bees and native bees seems to be the best compromise.

It is challenging to write an article that accurately describes the spectacular bee diversity we have in North Carolina. I've barely scratched the surface. I've left out entire families (Colletidae and Melittidae) and haven't even mentioned the wily, parasitic bees that sneak into nests of other species to lay their eggs. I haven't discussed

buzz pollination, the incredible technique where some species grasp a flower, rapidly move their flight muscles and dislodge pollen from inside the flower. Not only are native bees fascinating and incredibly diverse, they also provide important pollination services. They are our superhero bees, busy foraging and pollinating when it's sunny, cool, rainy or overcast and always getting the job done.

### We Can All Help

It is my hope that this article will inspire you to learn more and go outside to look for bees. Most importantly, if you want to conserve bees, there are many things you can do to get involved. First and foremost, create habitat and plant native. There are a host of local nurseries that sell native plants. The N.C. Native Plant Society has a list of local growers on their website ([ncwildflower.org/native\\_plants/nurseries](http://ncwildflower.org/native_plants/nurseries)).

The N.C. Botanical Garden (in addition to other organizations) has native plant sales in the spring and fall. Research has shown that even small urban pollinator gardens can provide valuable foraging pit stops. They also provide nesting habitat, shelter and overwintering refuge. If you are a landowner with a large landscape, biologists from the Commission can offer free technical assistance.

Practice pesticide stewardship by minimizing or avoiding pesticide use altogether; if you use pesticides, make sure you are following label instructions. Be a spokesperson for bees. Many people don't understand the value and importance of native bees. A little education goes a long way. By taking small steps, we can make large strides toward bolstering insect populations and reversing the "windshield phenomenon." It would please me greatly if my kids swallow a few bugs when they are running around outside. ♡

*Gabriela Garrison is the Eastern Piedmont habitat conservation coordinator for the North Carolina Wildlife Resources Commission. This is her first article for Wildlife in North Carolina.*



## Build a Bee Hotel

**You're not alone if the term bee habitat conjures up images of a hive filled with buzzing bees. We've all seen the exhibits at a museum or zoo: a hive enclosed in glass with honey bees coming or going through a tube leading outdoors. "Where's the queen?" you wonder as you investigate each cell.**

However, not all bees live in colonies. In fact, roughly a third of the bees native to North Carolina are solitary, cavity-nesting bees. Several of these species are described in the accompanying article and share the trait of female bees occupying a small nest in anything from a hollow plant stem to an abandoned hole left by a wood-burrowing beetle. This is where the female bee nurtures her eggs in a series of individual cells.

These solitary bees face increasing challenges in urban areas, including loss of habitat due to development and manicured lawns. One way to help combat this issue is by building bee hotels, single-occupancy dwellings for solitary bees that come in all shapes and sizes. Bee hotels can be as simple as a bundle of plant stems to blocks of wood that feature various-sized drilled holes to attract different species of bees. Bee hotels can also be purchased assembled or in do-it-yourself kits.

Recently, three bee hotels were built on the campus of North Carolina State University by Sara June Giacomini, a research technician at the campus' Irwin Lab, and her husband Jonathan Giacomini, a Ph.D student in Applied Ecology. The couple's project was supported by a research grant from the university's Sustainability Fund. Each hotel features a copper-rimmed roof and hundreds of reeds and drilled holes that serve as nesting spots for solitary bees. "If we give the bees the opportunity, they will come," Sara June said via an N.C. State press release.

Commission Biologist Gabriela Garrison says to clean or replace nesting structures and materials annually. "Bee hotels are great," Garrison said, "but they can also become a breeding ground for parasites and bacteria due to the concentrated number of bees in a small area."

**More information on bee hotels can be found online, including: [irwinlab.weebly.com](http://irwinlab.weebly.com) and [pollinators.msu.edu](http://pollinators.msu.edu).**

