

The New York Forest Owner

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For people caring about New York's trees and forests

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Member Profile: Carol and Gerry McDonald

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**THE NEW YORK
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COVER: Front cover. Gerry and Carol enjoy their woodlands and are active in producing a variety of benefits, from mushrooms to lumber. For member profile see page 21. All photos courtesy of the McDonalds.

Wild Bees Amidst the Trees

KASS URBAN-MEAD

Who counts as a “bee?”

If I say “bees,” do you imagine bucolic hives, dripping honey, and admirably industrious workers waggle-dancing away? If so, you’re not alone. The European honey bee has captured the public imagination—and mine! Beekeeping connects many of us to the magic of insect communication, sociality, and pollination habits.

Yet, there is a vibrant buzzing world beyond our familiar honey-making friends. In fact, there are 20,000 fuzzy, pollen-eating *species* of bees abundant in our world. Four thousand species live in the US, and 417 in New York alone. Bees are unique from their wasp and hornet cousins because their larvae must eat pollen and nectar. Bees have special branched hairs to collect pollen. In contrast, wasps aren’t fuzzy and they eat “meat”—spiders and insects.

Wild bees come in lots of colors, shapes, and sizes, and need similarly diverse nesting habitats. Multi-species bee communities play a crucial role pollinating wild plants, fruits, nuts, and vegetables [1, 2]. While honey bees arrived on this continent in the 1620s, wild species have relationships with local plant communities going back thousands of years. Due to this



Figure 1. A “Cellophane bee” in the genus *Colletes* gathering pollen from a male red maple tree. Photo by author.



Figure 2. Common eastern bumble bee visiting an apple flower. Unlike carpenter bees, bumblebees have small faces and their abdomen is fuzzy, not shiny. Photo by C. Kitchen.

long history, some bees are specialized to only visit a single plant species, or only a single plant family which they need to survive.

Sadly, we know that just in NY, at least 53 of our 417 species are in decline. More must be done. Hope lies in evidence that providing flowers and nest resources supports populations (Figure 1). Farms and other properties with natural areas nearby usually have vibrant ecosystems abundant with wild species [3, 4].

Common forest bees and where to find them

So, maybe now you’re on board that not all bees are honey bees. But, you say, I thought bee habitat was wildflowers, gardens, and meadows? It can be! Yet, when they head home from foraging on a meadow flower, many bees nest in the forest. And bees will also visit both understory and canopy flowers. In some studies, a higher amount of nearby forest is associated with more abundant bee species [3]!

Once your eyes are trained, you’ll find a grand abundance of wild bees in your forest insect menagerie. And you can help them thrive! First, let’s get to know a few bees.

Bumble bees

Bumble bees are some of our most familiar wild bees (Figure 2). Unlike honey bee colonies, only the bumble bee queen survives the long cold months. Queens mate in the fall, then lay their eggs the next spring after a winter-long hibernation underground. In March and April, keep an eye out for queens searching for new nests along the forest floor. Look for them along sloping streambanks and other well-drained soil with good leaf cover. Abandoned rodent burrows make perfect cozy spots. During these searches, queen bumble bees also stock up on nectar and pollen from ephemeral flowers and spring-blooming trees. Once the nest is established, though, you won’t see the queen again—she’ll stay busy inside laying eggs all summer while the smaller female workers take over the



Figure 3. A male mining bee resting on a flower petal. Males of the genus are very commonly encountered in forests in early spring, while many females are fruit pollinators later in spring. Photo by C. Kitchen.

job of foraging. A single colony can have hundreds of busy workers!

Mining bees & their parasitoids

Expert fruit tree pollinators, mining bees in the genus *Andrena* are unsung orchard heroes [5] (Figure 3). In the woods, some specialize on spring ephemerals such as spring beauty, *Claytonia virginiana*, and

are only active for a few short weeks each year. Their nests are in hidden underground tunnels, where they live “solitarily.” This means one female alone provides pollen for her baby bee larvae—with no help from any worker bees. She provides each new egg with a giant ball of carefully gathered pollen in its own tiny soil “room” along the underground tunnels. The egg develops into



Figure 4. Easily mistaken for wasps, parasitoid bees have hardened exoskeletons. This makes sense; they may need to fight their way out if they are discovered by a mining bee female while parasitizing her nest. Photo by C. Kitchen.

an adult on just that ball of pollen, and then waits many months underground to emerge the next spring.

Andrena nests are notoriously hard to find. One of the best ways to check the population level is instead to look out for their parasitoid in the genus *Nomada*. It’s a red or yellow toughly armored bee (Figure 4). Instead of gathering pollen, parasitoids usurp other bees’ nests by sneaking inside and laying an egg on the pollen ball. The egg hatches and the parasitoid larva takes over. Quite sneaky. In the spring you may find parasitoid bees weaving slowly across the forest floor, searching for other bees’ nests. Seeing these parasitoid bees is actually a good sign—abundant parasitoids are a clue that suggests an abundant host population!

Masons and leaf cutters: the fuzzy-belly bees

Keep an eye out for these stocky-bodied fast flyers. This family is unique from other bees; they carry their pollen in special thick hairs on the underside of their abdomens, instead of on their legs (Figure 5). The most famous is the mason bee. You may have heard of people putting “bee hotels” made of tubes of cardboard or sometimes from correctly-sized stems and stalks, such as *Phragmites*.

A female begins her nest from the back of each tube in the hotel—or in a hollow stem, or abandoned tunnel in a tree or log. Like the mining bee, she takes many trips to flowers and builds up a large ball of pollen—again, enough to feed a bee to adulthood. Then she lays an egg on the pile of pollen and builds a small wall of mud to protect it before beginning again. Eventually, the tube fills up with a row of pollen balls with eggs on top, to become a row of bees that will emerge the next spring.

While mason bees are named for their use of mud, their “leaf-cutter” cousins instead build the walls between their baby bees with perfectly round circles of leaves. If you see an endearingly perfect circle cut from a rose petal or redbud *Cercis* leaf, a leaf cutter likely took it for her nest.

Sweat bees

Often mistaken for flies, small sweat bees occasionally prove themselves a nuisance while sipping on your body’s

Continued on page 14

Wild Bees (continued)



Figure 5. You can recognize the family of mason bees and leaf-cutter bees by the pollen-collecting hairs on the underside of their abdomen! Can you see the dense hairs carrying pollen on this mason bee's belly? Photo by C. Kitchen.

salts. Most of the time they're quite busy enough stocking up on pollen at flowers. Interestingly, the most brightly colored iridescent species in this group are the species that live in the forest (Figure 6). They nest in rotting logs and other punky wood (Figure 7). These bees are mostly social, living in busy colonies.

During my research, I have found dead oak branches high in the canopy where shiny green bees flit in and out of small burrows in the punky wood.

And beyond....

This is just an introduction to the common groups of bees in our area. Another bee that loves to visit maple trees is the Cellophane bee, *Colletes inaequalis* (Figure 1). A soil-nesting bee, the female "paints" a special cellophane-like secretion on her nest's walls to keep out mold, and is only active in the trees for a few weeks in early spring. There are also miniature carpenter bees in the genus *Ceratina*, which nest in hollow stems like Sumac and raspberries. These bluish-green bees chew out the pith of the plant with their strong

jaws and are easily recognized by the small yellow patch on their faces. Each has its favorite flowers, and special place in the local ecosystem.

What's a forest owner to do?

Excitingly, many ecological forest management and wildlife habitat strategies are likely to *also* support your pollinator populations. For example:

1. Try uneven-aged management. Maximize niches! Light-filled gaps created by single-tree, patch selection, or shelterwood harvests will fill to the brim with flowers. Bee foraging activity is often highest in forest openings; common growth at this stage of succession include plants like raspberries, whose stems are habitat for stem-nesting species. Slash may create nesting habitat and protection. Niche diversity in multi-aged stands generates homes for rodents whose burrows can later be bumble bee homes, and (non-pest) beetles whose tunnels support tunnel-nesting bees.

2. Keep coarse woody debris & standing deadwood. Coarse woody debris and standing deadwood provide habitat. In a recent paper, researchers reminded us "[s]aproxylic bees and wasps are

endangered due to the loss of old trees, as well as due to the removal of dead wood" [6]. As described above, bees in the fuzzy-belly family that nest in tunnels and preexisting cavities such as those in snags, while shiny green and blue-black sweat bee colonies are housed in punky and decomposing wood.

3. Manage for tree diversity. Tree species diversity overlaps with the above management goals, but I emphasize it again now for bee health and nutrition. Bees collect saps and resins to help waterproof their nests, and as anti-microbials, and even as self-medication when challenged by parasites (e.g. from *Populus* [7]). Different compounds may be needed from different species, and a diversity of species means more consistently available saps and resins.

There is also increasing evidence that canopy flowers are often used by bees as a food source. Bees collect pollen not just from the well-known resources of willow, maple [8], and chestnut, but even the flowers of completely wind-pollinated species including oak, ash, hickory, beech, and fir [9]. I have seen oak trees in full bloom a-buzz with at least 12 species in just one day. Abundant pollen means abundant protein for baby bees! Trees bloom at



Figure 6. This shiny green sweat bee displays an interesting characteristic of many forest insects: it is iridescent! Entomologists guess that a high proportion of forest-associated insects are iridescent because the light reflections confuse predators as they flit between patches of shade and sun [10]. Photo by C. Kitchen.

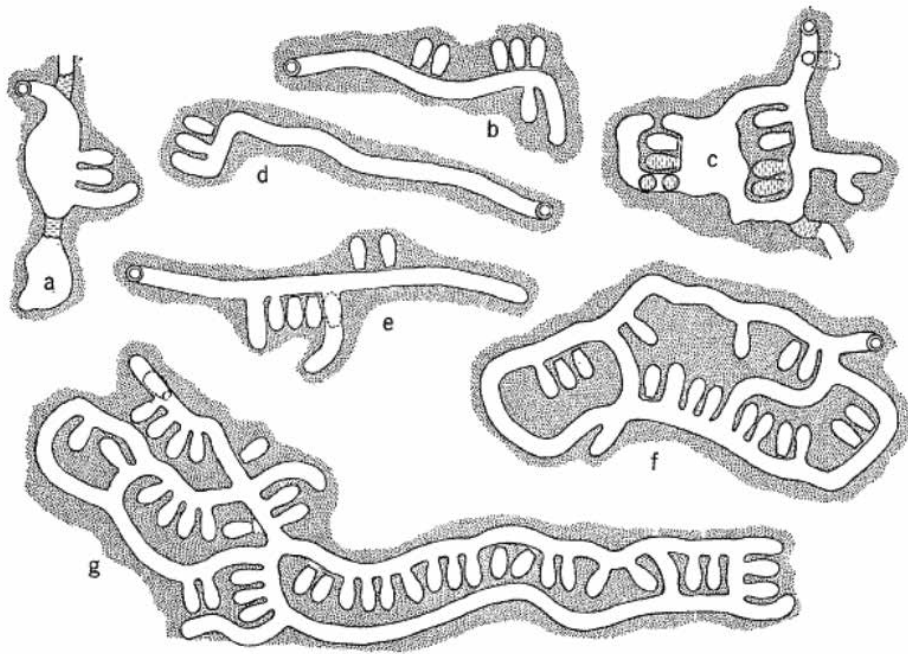


Figure 7. Diagram of nests excavated by the shiny blue sweat bee *Lasioglossum coeruleum* inside rotting logs on the forest floor. Tunnels into the nest were sealed with sawdust plugs. The small cells each hold a single pollen provision and egg to grow into a new bee. Figure from Stockhammer 1967 [11].

different times and mast in different years, so multiple species are important for consistent pollen availability.

4. Manage for vertical diversity. Bees are small, so small habitat changes can mean big changes in niche availability. Multi-age and -size trees generate a matrix of environments. These may be contrasting light levels, leaf types and textures, nearby shrubs or understory communities, different bark textures, and beetle communities who leave behind different sizes and shapes of abandoned burrows. As mentioned above, while tree-climbing to observe bee behavior in the canopy, I've found mini-carpenter bee and shiny green sweat bee nests in dead branches at 60 feet high! Niche diversity is vertical, too.

5. Consider bees in any pesticide applications. As described above, bees visit forest tree blooms for food. For targeted sprays or trunk injections, consider if it would be possible to wait until bloom is over. The concentration of the pesticide expressed in pollen or nectar should be quite low by the time the tree blooms again another year. Bees also visit understory shrubs and spring ephemerals, which could be impacted by soil drenches of insecticides able to translocate and be taken up by nearby roots.

6. Start by supporting the bee diversity you have. Generally, adding new managed bees is not the best way to encourage wild bee health. Sometimes they compete with wild species and can even carry pests and pathogens. Instead, prioritize keeping your yard messy with habitat, your flowers abundant for nutrition, and think about bees in your forest management as described above. The bees in your trees will thank you.

All in all, bees are wildlife too

Of course, not all of these actions may be appropriate for each forest or woodlot's age, history, soil type, tree composition, or land-use goals. Ask your forester to help you figure out how best to make your wildlife management plan work for pollinator diversity. Remember, there are 417 species just in New York State alone, part of the 20,000 species in the world beyond our beloved honey bee. The bees are beautiful, their life cycles are complicated, and their behavior is crucial for the plants we love and the food we eat! 🐝

Contact me: Feel free to reach out to me at kru4@cornell.edu. Bees in forests aren't as well-studied as other ecosystems, so I'm always excited to learn and share new natural history observations. I am also

available for talks and outreach events with advance notice.

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