



Pennsylvania Pollinator Series



3.3. Manmade Bee Nests

For thousands of years humans have robbed honeybees, until they eventually deciphered ways to house and more efficiently exploit them. Research shows that most bee species are opportunistic when choosing nesting sites. Honeybee swarms prefer trees but will take any cavity, including in walls or other manmade structures. For successful colony development, the cavity must shelter the brood and its food from predators and the elements: temperature, pressure, moisture, wind, and direct sun.



When building a bee nest for bumblebees or solitary wood-nesting bees, untreated wood (usually pine) is cheapest and safest. Although plastic or treated wood lasts longer without cracking and warping, these materials are less porous, creating excessive moisture in nests, and contain toxic compounds harmful to bees. Plywood is hard to clean and can host parasites and mold, especially after aging (Xerces Society, 2007).

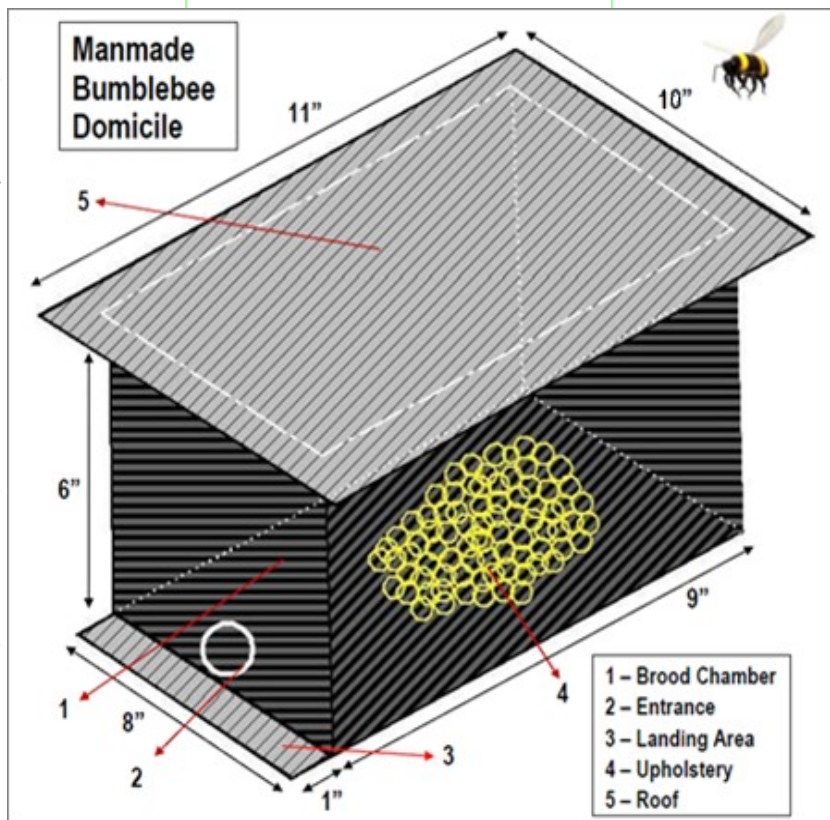
Lumber used for building nests should be dry and free of notches or cracks. Once the nest is built, paint or varnish only the surfaces exposed to sun and water, but not the areas that bees will touch. To allow fumes to dissipate, complete construction well before setting out the nests. To make them last longer, place nests, especially bumblebee boxes, in a sheltered space over the winter.

Bumblebee Nests

Habitat destruction has caused several bumblebee species to decline; some are close to extinction (Xerces Society, 2009). Unlike honeybees, bumblebee colonies have only several hundred individuals. In the spring the queens will nest in small cavities, such as disused mice nests. When such sites are unavailable, queens can nest in upside-down flowerpots, wood or compost piles, walls, grass patches, etc. In Pennsylvania, bee surveys have identified 17 different bumblebee species (Donovall & vanEngelsdorp, In Press); the Common Eastern Bumblebees (*Bombus impatiens*) is most prevalent (Plath, 1934).

Bumblebee queens can take weeks to find a suitable nest. Often, a good nesting site will be fought over by several queens. Once a queen settles for a nest, she builds a wax pot to store nectar, gathers pollen, and lays her

first eggs, which will become sterile female workers. They help build the comb, gather resources, and nurture the brood. The queen then lays more eggs. Usually at the end of the summer, at the peak of colony, queens produce eggs that will become males and new queens. Once fertilized, the new queens will begin fattening up for overwinter dormancy. They burrow into the ground before the first frost, but the rest of the colony will die. In mid-March, as willows bloom, new queens emerge and begin the cycle anew.



Locate nest sites away from areas of intense human activity. To prevent the site from being claimed by unwanted inhabitants, monitoring is necessary. Yellowjackets, for example, like to nest in similar sites; because of their

diameter ventilation holes on two lateral sides, and have a 5/8" entrance hole. To keep rainwater out, the roof should overhang about an inch on each side. Provide a landing area by cutting the bottom board of the box one inch longer. Line the bottom of the box

with insulating material, and weatherproof the nest by caulking all joints. Nests should be set outside in an undisturbed, shady, dry spot (e.g., hedgerow).

Colonization rates are low (30%) (Munn,

The simplest way to house bumblebees in your yard is to dig a hole between 1/8 cubic foot (6"x 6"x 5") and 1/4 cubic foot (9"x 8"x 6") (Fye & Medler, 1954). Line the bottom of the hole with insulating material, such as upholsterer's cotton, wool, moss, or dry grass. Cover the hole with a paving

scavenger habits, yellowjackets are undesirable.

By building a wooden nest box with similar dimensions, you can provide habitat in places where digging is not feasible; over the years, you can test sites for success in different locations. The nest box should have small-

1998), but can increase over the years, and success is correlated with the site, year, and experience in placing the nests (Fussell & Corbet, 1992). If by late July the box hasn't been colonized, it can be removed from the field and stored (Xerces Society, 2007). When colonized, the box

should be removed and cleaned after the workers, males, and old queen die. This usually happens in strong colonies after the first frost. Common unwanted nest inhabitants are ants, spiders, social and solitary wasps, earwigs, and field mice (Fye & Medler, 1954).

Solitary Bee Nests

Except for honeybees, bumblebees, and some sweat bees, U.S. bee species are solitary; they take over preexistent tunnels or excavate their own. About 30% of solitary bees are wood nesters; the rest are ground nesters. Solitary bees do not have female castes, and each fertilized female will secure or excavate a burrow, line the cells, gather provisions, and lay eggs. Next year, males and females will emerge, mate, and females will start the process again. Small carpenter bees (*Ceratina spp.*) use dead, dry twigs, branches, stems or flower stalks (McIntosh, 1996), while leafcutter bees (*Megachile spp.*) and mason bees (*Osmia spp.*) nest in preexistent tunnels in wood, some created by emerging beetles. Carpenter bees (*Xylocopa virginica*) usually bur-

row tunnels in soft dead wood: poplar, redwood, cottonwood, and willows. Few U.S. gardens provide adequate habitats for wood-nesting bees (snags, dead tree limbs or pile of brush), but homemade bee nests are simple solutions when liability concerns exist.

Because many solitary bee species nest in wood tunnels, presenting bees with an abundant number of burrows will increase their population. In early spring, bunches of fresh twigs of various diameters, especially bramble and sambucus, should be fastened horizontally on low-hanging tree or shrub branches. Most solitary bees like early morning-sun locations. Bamboo canes with exposed hollow piths or drinking straws set up in similar conditions offer nesting habitat to bees that need preexistent cavities.

Group and secure twigs, canes, or straws in various containers set sideways; this helps protect against rain and parasitic wasps. Another option is drilling holes of various diameters and lengths in leftover blocks of wood, old standing posts, or trunks and limbs from dead trees. Mason

bees (excellent pollinators) will nest in tunnels about ¼"-3/8" wide and 4-6", deep spaced at ¾" (Greer, 1999). These blocks can be re-drilled and cleaned with a bleach solution every spring after the bees emerge.

Most backyards, especially if overly manicured, lack suitable nesting habitats. Homeowners interested in increasing bee diversity and abundance in the backyard have many options. Start with creating piles of brush; do not remove snags or dead tree branches; build simple solitary bee or bumblebee nests — you will create backyard nesting heavens.

Bibliography

- Donovall, L. R., & vanEngelsdorp, D. (In Press). A Checklist of the Bees (Hymenoptera: Apoidea) of Pennsylvania. *In Press*.
- Fussell, M., & Corbet, S. (1992). The nesting places of some british bumble bees. *Journal of apicultural research & bee world*, 32-41.
- Fye, R., & Medler, J. (1954). Field Domiciles for Bumblebees. *Journal of economic entomology*, 672-676.
- Greer, L. (1999). *Alternative Pollinators: Native Bees*. Retrieved July 15, 2009, from National Sustainable Agriculture Information Service: <http://attra.ncat.org/attra-pub/nativebee.html>
- McIntosh, M. (1996). Nest-substrate preferences of the twig-nesters *Ceratina acantha*, *Ceratina nanula* (Apidae) and *Pemphredon lethifer* (Sphecidae).

Journal of the Kansas Entomological Society , 216-231.

Munn, P. (1998). Helping bumblebees with *Bombus* nest boxes. *Bee World* , 44-48.

Plath, O. E. (1934). *Bumblebees and their ways*. New York: The Macmillan Company.

Xerces Society. (2009). *Bumblebees in decline*. Retrieved July 23, 2009, from The Xerces Society for Invertebrate Conservation: <http://www.xerces.org/bumblebees/>

Xerces Society. (2007). Nests for bumble bees. *Backyard Conservation Series #3* . Oregon, United States of America: The Xerces Society.

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Prepared 7-09