

Artificial DOMICILES

What We Know About Bumble Bee Nests

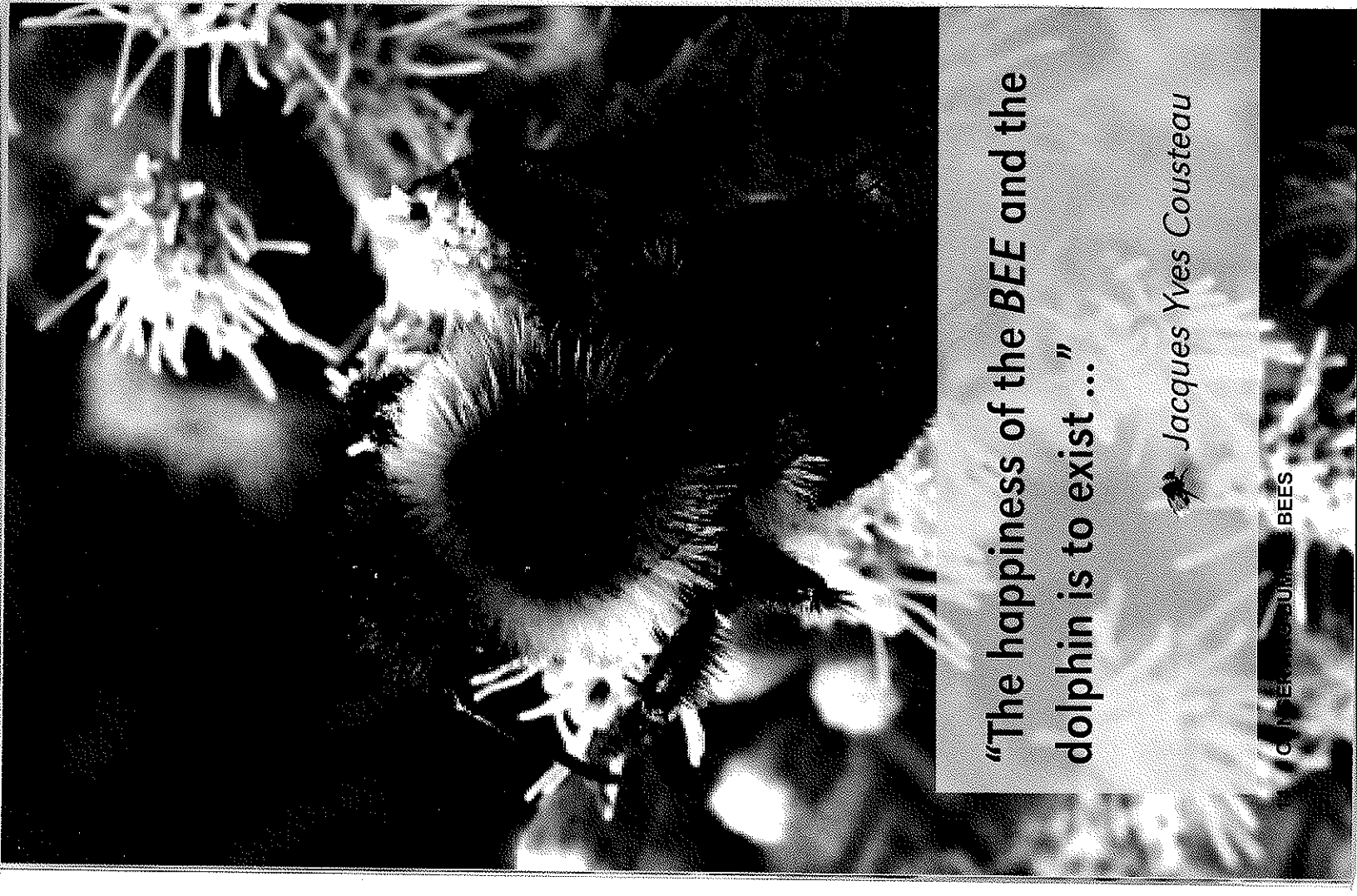
Bumble bees establish nests in diverse places. Nest requirements are believed to vary by species^{6,16}. Some bumble bee species will nest aboveground in tree cavities, squirrel dreys, old bird nests, birdhouses, and other artificial cavities. Others will nest at or just aboveground level in a tussock of grass or dense vegetation. Some species, known as subterranean nesters, will nest belowground in preexisting holes such as abandoned rodent nests^{10,17,21}. The availability of these natural habitats has been found to limit bumble bee abundance¹⁸.

Bumble bees do not excavate or expand the size of their nests²⁰. They rely on insulating nest materials found in the nesting site, such as vegetation, feathers, hair, or man-made fibers. This insulating material helps the bumble bee queens and workers regulate nest temperature and aids in development of immature bees^{18,20}.

Research shows that bumble bee nests often are found near previously established bumble bee nests. Researchers speculate that the odor of old bumble bee nests stimulates an investigatory response from nest-searching queens²².

Use of Artificial Domiciles for Promoting Bumble Bee Populations

For decades, scientists, naturalists, and commercial bumble bee suppliers have attempted to create an artificial domicile that would consistently attract wild, nest-searching bumble bee queens. Despite many efforts, most designs have had low success rates.



**“The happiness of the BEE and the
dolphin is to exist ...”**

 *Jacques Yves Cousteau*

A highly attractive artificial domicile can:

- boost local bumble bee populations and improve pollination services in home and garden landscapes;
- provide a more affordable option for greenhouse pollination compared to buying commercially reared colonies²³;
- create nesting habitat where it is scarce, thus promoting bumble bee abundance and diversity; and
- provide opportunities for naturalists of all ages to rear bumble bees for observation and experimentation.

Domicile Design

Depending on the species, bumble bees will nest high above, at, or below ground in a small insulated cavity (approximately 4 by 4 by 8 inches, though this will vary by species). Artificial domiciles can be made of any waterproof material that has little or no scent. Artificial bumble bee domiciles are frequently made of wood due to availability and ease of construction and manipulation (Figure 1).

Bumble bee queens may establish a subterranean colony in the nests of shrews, mice, voles, hedgehogs²⁰, or in artificial domiciles like this one.

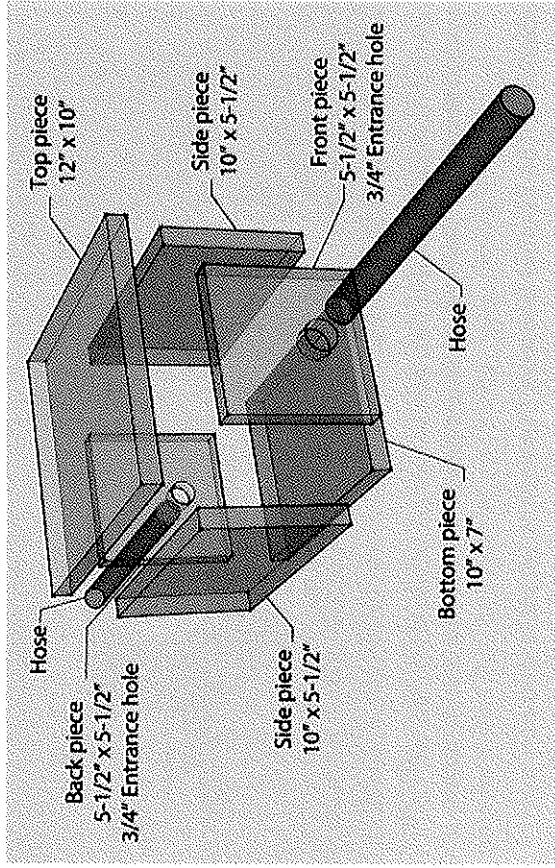


Figure 1. The Bumble Boosters Domicile design can be constructed from untreated, low odor 1-by-6-inch, 1-by-8-inch, and 1-by-10-inch lumber. Pieces should be secured with wood glue and weather-resistant screws.

Bumble bees are believed to prefer a mixture of insulating materials mimicking those found in rodent dens. An inner ball of soft materials such as kapok fibers from the tropical tree, *Ceiba pentandra*, is recommended. The bumble bee queen will envelop her nest with these soft fibers. Insulating material such as straw, compost, or shredded cotton cloth should surround the inner soft layer. This loosely packed outer filler layer should take up most of the inner cavity of the artificial domicile (Figure 2). Synthetic fibers should not be used in domiciles as they may become entangled in the tarsi (feet) of the bees.

Artificial domiciles need ventilation to prevent condensation. Flooding and excessive moisture can destroy nests or cause them to be abandoned^{24,25}. A small, screened vent hole will allow airflow and keep out predators and parasites.

The Bumble Boosters Domicile design (Figure 1) incorporates the best features of artificial domiciles developed by research and citizen

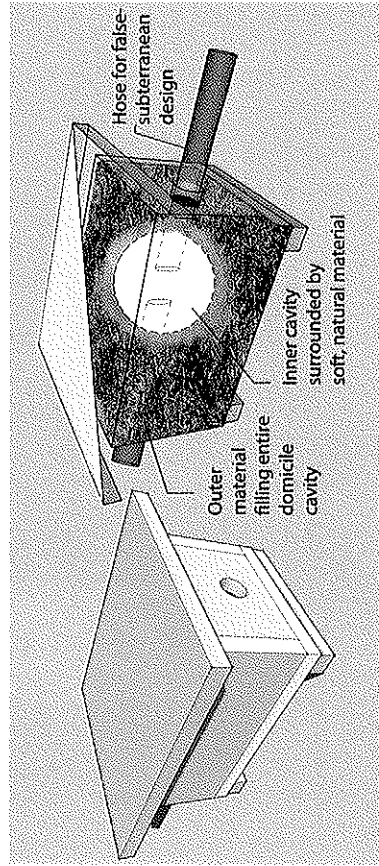


Figure 2. Assembled domicile (left) with an example of insulating material arrangement (right). Domicile lids should be held in place with a heavy object.

scientists. The Bumble Boosters Domicile is versatile and can be placed aboveground, at ground level, or in a false-subterranean shelter. The Bumble Boosters Domicile can be easily built with a few tools and lumber readily available at hardware stores.

The Bumble Boosters Domicile should be placed according to which group of bumble bees you would like to target. (See bumbleboosters.unl.edu for nesting preferences by species.)

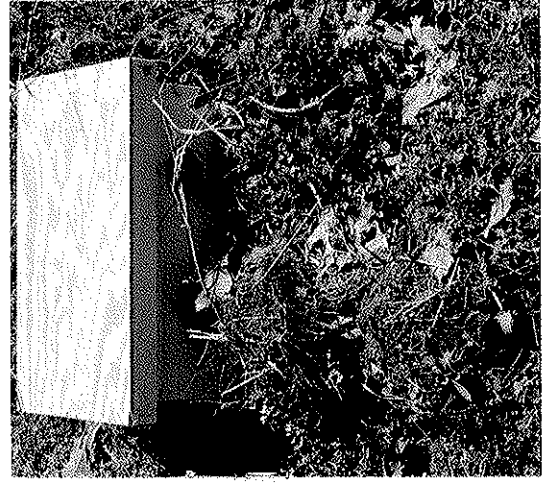
- **Aboveground (high).** Fasten the domicile about 4 to 6 feet high in a tree, much like a birdhouse, to attract aboveground nesting bumble bees. Similarly, you can attach it to an erect piece of 2-by-4-inch lumber or a pipe flange and pole.
- **Ground level.** Simply place your domicile out in the yard on solid ground, protected from standing water. Research suggests that bumble bees are attracted to fence lines, hedgerows, and other man-made or natural landmarks. Consider placing domiciles near these landmarks.

- **False-subterranean.** Place the domicile on the ground and fasten a hose or a piece of PVC pipe to the entrance. Pile up soil, leaves, and other natural materials over the hose, leaving the entrance hole exposed. You also may cover the domicile with this material. This will make the entrance appear as though it leads to a subterranean cavity and may help attract subterranean nesting species.

Placing Your Domicile

Domicile placement is believed to be one of the most important factors in queen acceptance. To increase the chances of a bumble bee queen locating and selecting your domicile, take the following considerations into account when placing your domicile.

- Place your domicile outside at the end of winter, before hibernating queens search for nest sites²⁴. Guides for emergence dates are found on the Bumble Boosters website.
- Continual sunlight can stress bumble bee colonies. Place bumble bee domiciles where they get morning sunlight but are protected from the heat of the day (especially in hot climates). Bumble bee queens expend a lot of energy keeping their developing offspring warm. A warm, but not too hot, location will aid colony development.



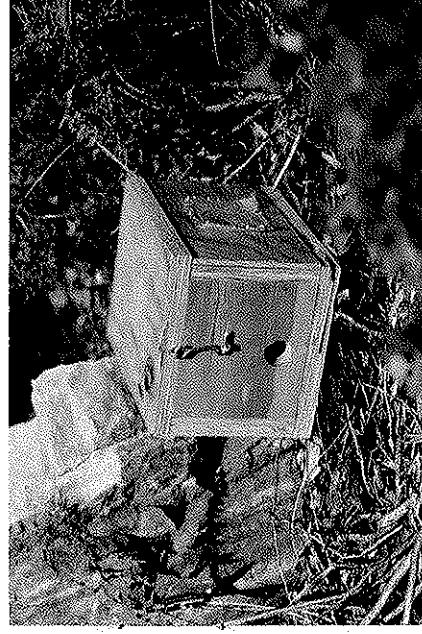
A false-subterranean domicile. The blue entrance tube is covered in soil, mimicking an underground tunnel.

- Research supports that artificial domiciles tend to be more successful when left in the same place for a number of years, especially if previously inhabited by bumble bees^{12,22,24,26,27}. If your domicile is not accepted by bumble bees the first year, do not be discouraged. Leave it out for successive years.
- Place your domicile by a landscape feature like a tree, fence post, hedgerow, or garden's edge. Visual aids help bees orient themselves and quickly locate their nest²².
- Place your domicile where it will not become waterlogged. Sites with a high water table are not suitable for most bumble bee species.
- Private gardens attract bumble bees²⁶. High success rates may be achieved by placing your domicile in an undisturbed site near a season-long succession of flowers²². A diversity of nectar-rich flowers also may increase chances of occupancy¹². Gardens, hedgerows, fence lines, and woodland edges have been found to support a high density of bumble bee nests^{18,28}.
- Place your domicile where you have seen bumble bees, especially where you have observed early spring bumble bee queens hovering above the ground, searching for a nest. Research shows that domiciles placed in such areas have higher occupancy rates^{26,29,30}.
- Occasionally, small mammals take up residence in bumble bee domiciles and may destroy established colonies^{12,24-26}. Rodent invasion can be avoided by placing the domicile in the spring, after rodents have left their winter homes.

Other Attractants

Over the years, bumble bee domiciles have been designed with numerous features and attractants. Consider trying some of these ideas in your box design:

- **Color attractants.** Bumble bees are attracted to blue and yellow objects^{23,27}. Try placing objects of these colors near your domicile to see if they attract a bumble bee queen. You also may want to paint a blue or yellow bull's-eye around the domicile entrance.
- **Paint your domicile for protection and visual appeal.** Domiciles made of wood are subject to weathering by the elements. Paint your domicile to make it more resistant to the natural elements. Use low VOC paints to reduce unnatural vapors. While it is not known whether any one color is appealing or unappealing to nest-searching bumble bees, color contrasts may increase the likelihood that a searching queen will see your domicile²³. Bumble bees see near ultraviolet (UV) light. Consider using UV paints on your box. If using an aboveground domicile, try painting the front of the domicile one color and painting a contrasting color around the entrance hole.



This domicile is placed on the edge of a wooded lot.

- **Rodent attractants.** Bumble bees nest in abandoned rodent burrows. Try adding used pet mouse bedding or acetamide tablets to your domicile to mimic rodent smells. Do not collect or use wild rodent waste and nesting materials as these can expose you to disease.
- **Scents.** Applying a small drop of ammonia to the inside of your domicile may increase the likelihood that a bumble bee queen will take up residence there³¹.
- **Build and host multiple domiciles.** Replication is a necessary part of scientific experimentation. Having more than one domicile also will increase the likelihood that the bumble bee queen will find one in your landscape.

Observing Domicile Activity

To learn if bumble bees have accepted your domicile, follow these steps:

- Observe the entrance of the domicile at a distance. (We recommend at least 6 feet.)

Bumble bee queens will investigate many locations before choosing the perfect nest site. Do not be discouraged if they do not initially choose your artificial domicile. This Bombus pennsylvanicus queen is bringing pollen back to a location — a clear indication that she has established a nest.



- Count the number of bumble bees entering and leaving the nest during a 10-minute period. Observations should be made on warm days, once each in the late spring (late May), early summer (mid-June), and late summer (late July).
- If, after 10 minutes of observation, you do not see bumble bees, it is highly unlikely that bees are present. If you do not see bumble bees after the July observation, bumble bees did not nest in your domicile this year.
- If bumble bees do take up residence, try to identify the species. To collect and identify a bumble bee:

- 1) Get an aerial insect net and collect one of the bumble bees coming or going from the nest.
- 2) Once in the net, ease the bumble bee into a lidded jar. The collected sample bumble bee (enclosed in the jar) should be placed in a refrigerator for an hour until it does not move. This will not kill the bee. It will revive after it warms.
- 3) Identify the species by taking the chilled and unmoving specimen out of the jar and comparing it to color charts of species found in your area. Charts are available on these websites:

- bumbleboosters.unl.edu
- www.nhm.ac.uk/research-curation/research/projects/bombus
- www.discoverlife.org

- 4) Release the chilled bee near the location where it was collected.
- Report the results of your findings to the community through the Bumble Boosters website at bumbleboosters.unl.edu.