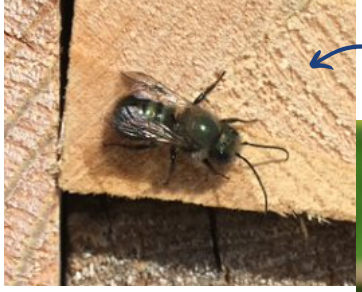
LANDSCAPING

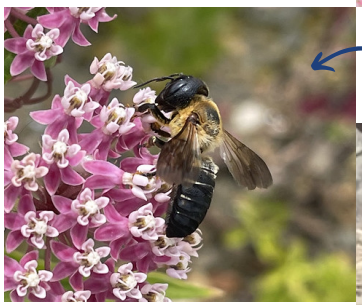
Additionally, bees need access to nesting material in proximity to bee hotels. The materials used for cell walls vary by species, including mud (Osmia spp.), pebbles (Hoplitis spp.), petals and leaves (Megachile spp.), plant resin (Heriades spp.), and wood pulp (Xylocopa spp.)[3]. Simply having some natural, exposed bare ground supports solitary bees. An area with a diversity of nesting resources will be able to support a more diverse population of bees.

A bee hotel should be a feature in the greater landscape in your backyard. In other words, a hotel in of itself is not sufficient habitat for solitary bees. For more information on creating a pollinator-friendly garden, visit **extension.psu.edu/planting-pollinator-friendly-gardens.**

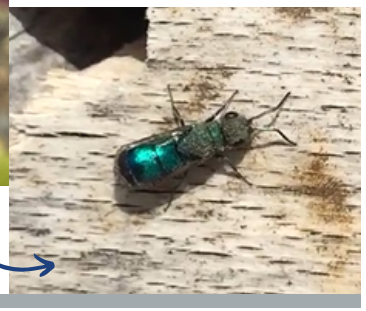


OSMIA BEE

CARPENTER BEE



RESIN BEE



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SOURCES

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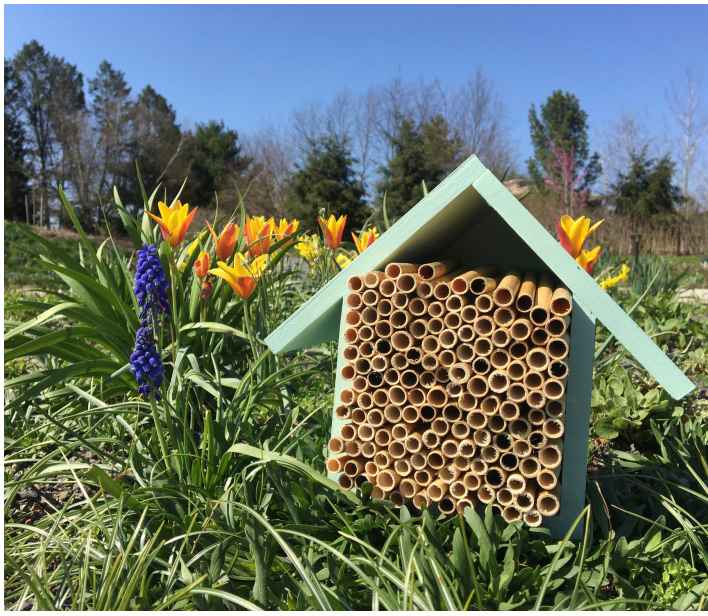
Managing your bee hotel

The native species of bees in our backyards are wild and do not require humans to provide food and shelter. However, human-caused threats such as climate change and habitat loss threaten bee survival[2]. In response, bee hotels have become a popular way to replicate nesting sites for cavity-nesting solitary bees. These hotels can support bee populations in urban places without adequate nest sites such as hollow stems and dead trees. However, they must be properly constructed and managed[4].



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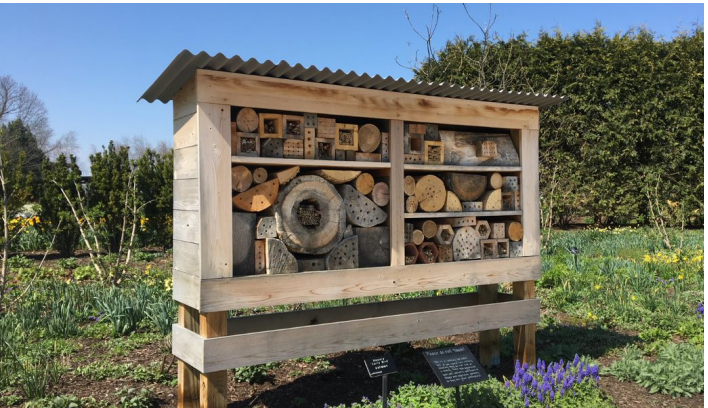
INTRODUCTION

Maintaining a standard of cleanliness in your bee hotels is essential for the health and longevity of your nesting bees. Bees are susceptible to numerous threats. **Parasitic insects** such as chrysidid and chalcid wasps lay their eggs inside of solitary bee nests. Upon hatching, wasp larvae consume undeveloped bees. Mice and birds infiltrate nests to eat bee larvae as well. **kleptoparasites** indirectly kill larval bees by consuming their food source upon hatching. These include cuckoo bees, sapygid wasps, and many beetle species. Disease can also kill nested bees, such as the fungal pathogen chalkbrood[4].

While it is natural to lose bees to these threats each year, bees are more susceptible when nesting in a hotel compared to nesting in a natural nest site[5]. Hotels encourage bees to nest at higher densities. As a result, it is more likely that disease will spread. Parasitism also increases with greater nest density, as parasites have a greater opportunity to find and infiltrate nests[6].



Threats can be mitigated by cleaning and replacing nesting material in order to increase reproductive success of cavity-nesting bees.

CLEANING

It is recommended by experts to clean or replace nesting material every other year. Before this can happen, nests need to be unoccupied. The challenge is allowing nested bees to leave while preventing new nests from being built. One form of management is to use an **emergence box–** a ventilated box with a small opening that bees can exit through.

In the late fall, take all nested tubes out of your hotel and place them in your emergence box. Keep the box in a dark, unheated, protected place such as a garage or shed. In March move the emergence box outside. When bees emerge from the tubes, the light coming through the small opening will lead them to the outside world. However, nesting females will not recognize it as a good place to nest and will not enter to lay eggs. You will know that a nest is empty when the plug at the end of the tunnel is broken.

Frequently inspect your bee hotel for evidence of mice. You may need install a mesh screen so a bee can pass through but not a mouse.

Once bees have vacated their nests, you can:

- rotate materials so they are not in use for a year at a time. Store in a safe, dry place. Materials can be reused once or twice if they remain in good condition. Any materials with visible residue or damage should be discarded.
- scrub wooden blocks with a 10% diluted bleach solution. Allow wood to dry before replacing it in the hotel.
- simply throw away materials and replace.

To make cleaning a seamless process, have a second set of clean blocks and/or stems in storage. Nesting material can then be easily switched out.

LANDSCAPING

Solitary bees spend most of their life inside their nest, tucked away with a single pollen ball. Their only source of nutrition during development comes from that pollen provision. The proportion of carbohydrates, protein, fatty acids, and amino acids in pollen affects the survival rate of wild bees[1]. Therefore, access to a diversity of flowers is essential for producing healthy bees[2]. Floral resources should be near bee hotels as it takes a female many trips to and from her nest to create a single pollen ball. For example, Osmia lignaria may take 35 trips to gather pollen for just one egg[3].