

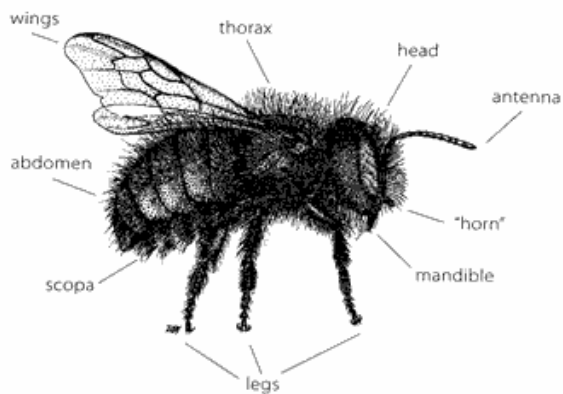
Putting Horn Face Bees Into Your Orchard

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Background Information

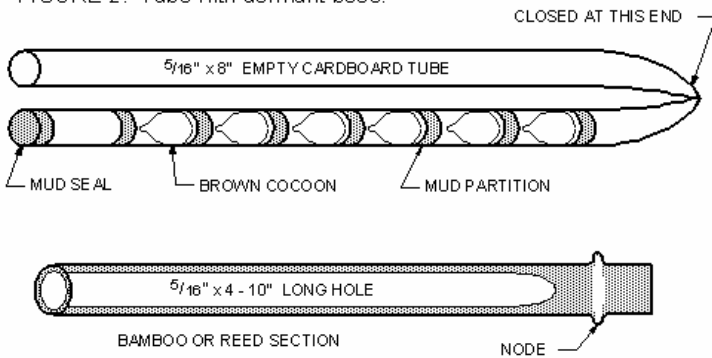
A pollinating bee species *Osmia cornifrons*, horn-faced bee, has found its way to northern Michigan. This bee is native to Japan and is similar to behavior to that of other closely related species, such as the blue orchard bee or ‘mason bee’. These bee species have been used extensively in orchards in the western U.S. due to their exceptional pollination traits. They are extremely efficient pollinators and prefer to forage on fruit tree flowers. *Osmia* species also fly under cool and cloudy weather, which makes them a desirable pollinator under cool spring conditions. Because fruit growers can mimic *Osmia* nesting sites and because these insects are excellent pollinators, we are very interested in investigating their use in northwest orchards.

These bees have many different attributes from our traditional honeybees. *O. cornifrons* nesting habits are not social—they do not have queens and workers. Instead, each female bee is fertile and lays her own eggs and provisions her own nests. Males do not help with nest provisioning, but they do visit flowers for nectar; therefore, they do contribute to pollination in this way. Females collect pollen for themselves and for their brood, so they are able to pollinate many flowers. *O. cornifrons* carry dry pollen on a scopa, a brush of long hairs on the abdomen, rather than pasting the pollen to their hind legs as a honeybee would do (Figure 1).



Osmia cornifrons become active in early spring, close to the time of cherry bloom. Males emerge first, followed by the females 1-3 days later. Once a female is mated, she feeds for 1-2 days, and then she begins the nest building process. She chooses nest sites with her preferred dimensions, a tube 5/16 inch diameter and 6 inches in length. She ultimately divides the tube into five cavities, which are separated by a mud partition (Figure 2). In each cavity, she lays an egg. She also creates a nectar/pollen packet inside each cavity for the larva once it hatches. The most inner two cavities of the tube usually contain two females and the outer three cavities house male offspring; the entire tube is sealed off with a thicker mud partition. In the spring, the adult bees must chew through the mud wall to emerge.

FIGURE 2. Tube with dormant bees.



Osmia cornifrons takes several months to complete its life cycle, and they only produce one generation per year. After the adult bees emerge in spring, they mate, and females lay eggs in nesting tubes. In about one week, the eggs hatch, but the first instar remains in the egg and feeds on the egg's fluids. Three larval stages follow, and these stages of the bee feed on the healthy provision left by their mother. At the fifth instar stage, the larva spins a silk cocoon where it remains in this 'prepupa' stage during a summer dormant period. By late summer, the prepupa molts, then molts again into the adult stage after one month. Adult bees remain in the cavity throughout the winter; this species needs an obligatory cold period during overwintering to successfully emerge in the spring.

The reason we are so excited about *O. cornifrons* is their potential for pollination. They show a preference for fruit tree flowers when they are available. Females collect both nectar and pollen concurrently. This behavior forces the bee to really dive inside the corolla to find the nectar while they attempt to gather pollen on their rudimentary scopa. The result is complete contact between stigmas and anthers for the bulk of flower visits. These bees also move readily from tree to tree and row to row; this foraging technique facilitates cross pollination. These bees are also more apt to fly under cloudy skies and at cooler temperatures more readily than honeybees.

Nesting Site Protocol

First, record the number of buckets you received. Secondly, you must first determine the numbers of bees in each bucket. This number can be achieved by counting the numbers of full tubes. A tube is considered 'full' when the outer portion of the tube is sealed with a complete cover of mud; you can approximate the number of full tubes. Chose a representative area of the tubes in the bucket (i.e. if the bucket looks 50% 'full', then chose 1/4 of the total area that has 50% capped tubes). Count the number of capped tubes in that area, then multiple by that area to make one total bucket. For example, if you count the full tubes in 1/4 of the bucket, then multiple by 4 to find the total number of full tubes in the bucket. Repeat this process for each bucket.

Solid Wooden Blocks

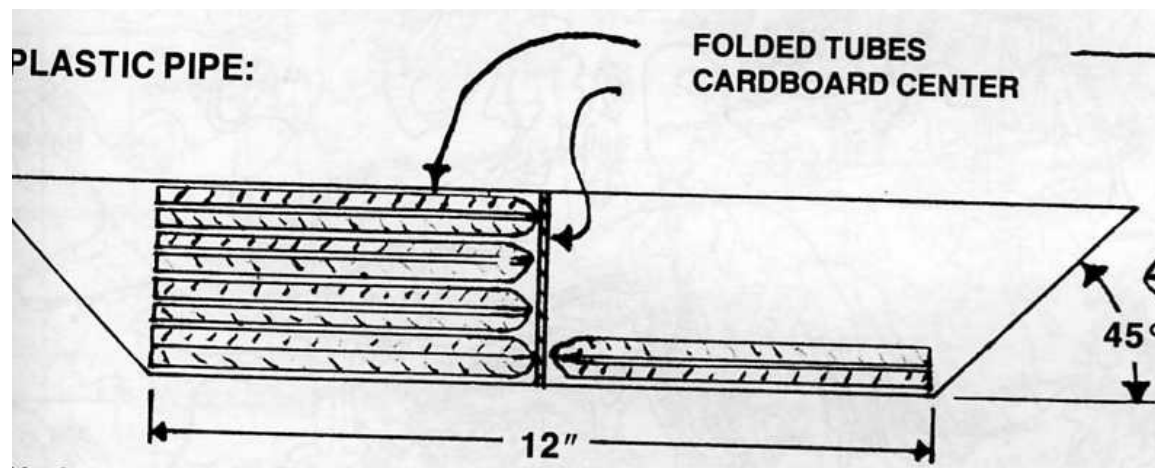
From the literature, other *Osmia* species prefer wooden block nesting sites as this type of site is similar to their nesting sites in the wild. Drill 3/8" holes (with a sharp drill bit) into the block of untreated wood; be sure to drill across the grain, rather than with it so you can easily extract the inner cardboard tubes. The holes should be 6 inches long. Some literature suggests drilling

completely through the block of wood so you can extract the inner tubing from either side. If you do drill the blocks completely through, then you must fasten some type of backing over the holes of one side (adhesive aluminum foil is suggested, but make sure it does not face the sun). The holes should be placed $\frac{1}{2}$ - $\frac{3}{4}$ " apart. Inside each hole, place a $\frac{5}{16}$ inch diameter cardboard straw.

Block dimensions should be around 8 inch x 8 inch. Make sure the block is 6 inches in depth to accommodate the tubes. These blocks should all be placed together, and some type of shingle should be placed on top of the wood to keep water from soaking the wood. Placing these blocks on an upside down apple box may be sufficient.

Plastic Pipes

Cut a light colored 3 inch diameter PVC pipe to 12 inches. Cut both ends at a 45° angle—the top part of the pipe should hang over the bottom (Figure 3). Divide the pipe in half with a cardboard center. Fit each side of the pipe with 30 cardboard straws ($\frac{5}{16}$ " diameter, 6" length). These pipes can be bound together by roping.



Place all four pipes in a similar area; we recommend attaching them to the side of a tipped up apple box.

Plastic Buckets

Make sure to approximate the numbers of empty cells prior to setting out these bees (so you will know how many you have the following year!) One nesting bucket should be placed in the orchard per acre. Try and choose a bucket that has half of its cells empty (~250 empty cells). Also, try to choose the bucket with the cleanest empty straws. *O. cornifrons* buckets should be hung in an apple box tipped on their sides, such that the buckets can be hung from the side slats of the wooden apple box. The bees prefer to come in at a horizontal level, so make sure to just tilt the bucket slightly downward.