**HOW TO MAKE NATIVE BEE HOUSES**

**Good online websites:**

1. <https://extensionpublications.unl.edu/assets/pdf/g2256.pdf>
2. <https://pollinators.msu.edu/publications/building-and-managing-bee-hotels-for-wild-bees/>
3. <https://www.fs.fed.us/wildflowers/kids/activities/beebox.shtml>
4. <https://www.foxleas.com/make-a-bee-hotel.asp>
5. <https://www.gardeningknowhow.com/garden-how-to/beneficial/diy-bee-nest-ideas.htm>

**Guidelines for all methods: Provide shelter, food, and safety**

1. **Place them out** in early spring (early March to mid-April) but better late than not at all. The mason bees will complete nesting by mid-June, whereas most leafcutter bees will complete nesting in July and August. Don’t move the nesting box, or you’ll risk killing the larvae. In late November, move them to shelter them from cold wet conditions. They can handle cold but not cold-wet.
2. **Provide a mud supply**. Leave an open patch of unamended clay soil nearby; keep it moist and muddy so they have mud for creating cell chambers and capping off tubes.
3. **Give bees up to a year to find your new nesting site.** Place it near flower sources, since many types of bees do not travel more than a few hundred feet or yards in their entire lives. Provide at least some native plants (they prefer natives four times as much as non-natives). To ensure they have a steady food supply, choose a large number of varieties, making sure that these will overlap in their bloom time of early spring to fall. To see when Colorado native plants bloom check out <https://conps.org/wp-content/uploads/2016/04/NativeGarden-Front-Range-4-11-2016.pdf>

Once mason bees have found and begun using the nesting blocks, help increase their numbers by placing more nesting blocks nearby — that gives the female more tunnels for her brood. Each female will need four to six tunnels (females mark their offspring with a scent to tell others that that particular nook is spoken for). The bees will move from unclaimed tunnel to tunnel, filling them with eggs, pollen and mud or leaves.

1. **Protect the dwelling from**:
   1. **Movement:** Fasten securely to protect from wind. Do not disturb once in use!
   2. **Rain and soaking moisture:** Put on an overhanging roof. Place the houses far enough off the ground that they do not get soaked by melting snow.
   3. **Insect and bird predators:**
      1. Insects: Keep it off the ground 3’ or more to keep ants at bay. Consider making many small rather than one huge house since large habitations invite predators to set up housekeeping too. If you see little holes chewed into a mud covering, then a parasitic fly has usurped the nest. Destroy these. NOTE: Many beneficial native wasps will also make homes in pithy stems; these are “good guys” and will not bother bees.
      2. Birds: To deter birds, you can cover the front with narrow gauge wire mesh. Make sure that the tubes have an opening only at one end, to protect them from both insect and bird predators (and the weather).
   4. **Disease**
      1. Change out used nesting tubes yearly, after the adults have emerged in late spring. Bleach wooden blocks after bees have emerged for re-use. Or, put fresh paper straws or hollow stems in each drilled (wood) hole every year to keep clean. If using holes drilled into wood without inserted tubes, replace the entire house every two years to prevent disease from predators, bacteria, and fungus.
      2. Bigger houses allow diseases to spread quickly. Instead, spread a number of smaller ones throughout the garden.
   5. **Pesticides**: Avoid using any chemical fertilizer, herbicide or insecticide on your lawn or garden which can kill native bees nesting in the ground as well as above ground (including Roundup!) It doesn’t make sense to create habitat for pollinators and potentially poison them with pesticides.
2. **Monitor for Problems:** 
   1. Moisture getting into the nest box in summer or winter
   2. Ant infestations: they are attracted to the protein-rich pollen provisions  
      and developing bee larvae but can be prevented using sticky traps or  
      ant bait at the foundation of the bee house.
   3. Paper wasp nests; clean these out and fill spaces with twigs, straws or stems.
   4. Predatory birds; attach small gauge wire fencing to the front).
   5. Spider webs; their presence may indicate the nest location is too dark.
3. **Size of holes:** **The holes should be 3/32” to 3/8” in diameter (2.3mm-9.5mm) and at least 3-6” long.** As the hole diameter increases, the length of the tunnel should also increase (3-4” deep for under ¼” wide holes, and 5-6” or longer for anything larger). To preserve the integrity of the wood, drill at least ¾” apart. (Blue orchard bees prefer holes that are 5/16” wide and 6” long).
4. **Create smooth holes:** Bees will choose to use tubes/holes that are smooth and splinter-free inside and sawdust-free at the entrance; their wings are easily torn. Drill with a sharp bit and at a high speed and use a pipe cleaner to remove sawdust.
5. **Face the house or tube openings to the sun**: south and/or east where they get early morning sunlight but have protection from severe afternoon/early evening heat.
6. **But a back on the house** if the structure does not provide a backing.
7. **Color**: Native bees may prefer blue over yellow or red houses. They tend to like dark-colored houses. If painting, ONLY use water-based paints/finishes.
8. **Do not use pressure treated wood;** these can contain chemicals harmful to bees. Newer methods of treating wood may not use these chemicals; better safe than sorry!

## Potential Problems with Commercial Bee Houses (and some DIY designs)

Before choosing a DIY option, it helps to examine the flaws with some commercial or homemade bee houses to know what to avoid.

* **Open Back Side**

If the back of the bee house is open, parasites can enter from that direction. The tubes should have a wall on the back part of the bee house.

* **Containers that trap heat** like metal cans, glass, or clear plastic. If these are used, be sure to cover completely with a protective material/cloth. Test the temperature.
* **Unremovable Tubes and Blocks**

It’s likely a convenience for the maker of the bee house, but gluing the tubes prevents the owner of the bee house from removing them. When you cannot clean out the tubes efficiently, there will be an increase in parasites, fungi, and bacteria.  If you do need to seal the tubes into the back of the house to prevent them from falling out, make sure you replace them with fresh ones next year.

* **Poor Protection Against Water**

Tubes that are flush with the front of the bee house have no protection against rain. Bee houses, like your own, need overhangs to prevent the water from coming into the tubes. The tubes may need to slant slightly downward to protect from rain as well. Be especially careful when using paper tubes, as these are not designed to take repeated exposure to moisture. Bamboo has been found to become moldy in Colorado, so these also need protection from excessive moisture.

* **Holes That Are Splintery or Rough**

Bees are just like us in that they like to have a nice, comfortable place to live. Splintery holes and unsanded bamboo will tear bees’ wings. The insides of the tubes must be smooth.

* **Blocked or Insufficiently Sized Tubes**

Bamboo makes for a picturesque bee house. Too often, bamboo is not prepared well. Sometimes, the bamboo nodes—those knuckles that give bamboo its characteristic look—are insufficiently sized or may even be blocked by the nodes.

**Providing Housing for Native Bees (in order of simplicity)**

**Simplest methods:**

1. **Provide bare soil for ground-nesting native bees:** 70% of native bees dig tunnels in the bare earth, so a simple bare spot here and there (no mulch or grass, no weed barrier, no Round-Up used, just bare soil) may be enough for an aggregation of hard-working soil nesting native bees. Some bees dig homes just fine in clay; many prefer soft and sandy soil. If you turn over grass turf, leave it for the grass to die, and native bees may use it.
2. **Drilling holes in dead trees, stumps, old posts, or standing logs**: These are important nesting habitats for 30% of our native bees. If you cannot tolerate a dead tree on your property, consider keeping a stump or a standing log, and use it as an attractive planter. Perhaps it will, in turn, provide housing space for bees.
3. **Bundling #1:** <https://www.youtube.com/watch?v=LyE32Xy6zUA>.
   1. Bundle 6-9” lengths of various widths of bamboo (not paper or cardboard) and secure somewhere above ground, like under a limb or in the crotch of a tree.
   2. Make sure that one end is closed naturally, or by closing with clay, caulking or glue.
   3. Provide additional protection by wrapping the bundles in protective cloth.
   4. Do not allow these to stay unprotected in snow season, but in November, bring under a shelter (like a cold garage or refrigerator!) where they are protected from the weather, but cold enough to stay in hibernation/dormancy.
4. **Bundling #2:** OR, bundle 6-9” long hollow plant stems together and pack into a 7-10” deep container with spout end cut off. Examples: 2-liter soda bottle, aseptic containers (like those that hold plant milks) It may be helpful to have no odor (I found no data on this).
5. **Leave hollow stems/stalks in the garden as nesting tubes:** Leave these in the garden in the fall for native bees to use as potential nesting sites next spring. Trim them, leaving 8”-24”. The following spring, when temperatures reach the 50’s, after any adults have emerged, compost them, or chop them up and drop for a natural mulch! If you must cut them down in the fall or early spring, save and store them upright in a protected place for bees to use, or if already used, for the adults to emerge early to late spring. Some, like sunflower stems, may be used the second year, so keep these around if you can!

**Some common plants that have hollow or pithy stalks**

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| Sedum (i.e. Autumn Joy) | Lovage, fennel, dill | Asters with large stems |
| Elderberry | Bee Balm | Tall grass flower stalks |
| Decorative onion | Lettuce flower stalks | Honeysuckle |
| Garlic chives | Catnip | Sumac |
| Raspberries, blackberries | Sunflowers | Wild Rose |
| Hollyhocks | Joe Pyeweed | Larkspur/Delphinium |

**Guide For Building a Bundle Bee House** adapted from <https://www.thespruce.com/build-a-diy-bee-house-5112611>

You can make a simple, inexpensive, and safe bee house using just a beverage bottle, clay, and natural tubes such stems of last year’s plants or paper straws. **Do not use plastic straws**! Denver Botanic Gardens advises against using bamboo; they found it to become moldy.

### Materials

* 1-2 liter soda bottle or quart or half gallon sized waxed beverage container
* Tubes: Dried hollow flower stems and/or paper straws. May also use drilled wood (see following models for instructions on drilling holes in wood.)
* Modeling clay or glue or caulking
* Cloth (blue or blue and white seem to be preferred by bees according to one study)
* Twine or shoelace

### Tools

* Hand saw
* Utility knife
* Scissors or garden clippers
* Measuring tape or ruler
* Sandpaper (may not be needed)

### Instructions

1. With the utility knife, slice off the spout end of the soda bottle or similar container. Thoroughly wash out the container. Ideally, aim for at least 7-8” in length.
2. Cut or sand off sharp ends of the bottle’s edges.
3. Measure the length of the container.
4. Cut off the straws or stalks to 2” less than the length of the container to protect the tubes from rain. Make sure any tubes ¼” or wider are at least 5-6”. Any stems less than 14” can be 3-4” in length. Different lengths are good, as the differences help the bees identify their nesting cavities more easily.
5. Carefully trim away or sand any splinters until smooth. Discard any stems with nodes that block the bees’ access.
6. Form a disk of modeling clay about 1-inch thick and press it into the back side of the cylinder. Or squeeze a light layer of glue into the bottom of the container.
7. Pack the cylinder with the straws or stems, gently pushing them into the modeling clay or glue to hold them in place. Fill empty spaces with twigs or grass.
8. Using twine or shoelace (or other method), solidly mount the bee house to a post, fence, or wall so that it does not move around in the wind. Do not move any tubes once in use or capped, as this may kill developing larvae.

**Next Simplest Method: Drilled Wooden Nests**

**Materials and Tools**

* Old drawer, or any untreated wood or old tree stump, standing snag, or logs at least 4” thick
* Drill
* Drill bits of various diameters, from 1/8” to ½”. Any drill bits ¼” or more must be long enough to drill 5-6” holes (these are not standard length).
* Rain protection
* Wire mesh to protect from predators (if needed)
* Latex paint (optional)

### Instructions

On one side, drill a series of holes of varying diameters to attract a range of bee species from tiny to large. The holes should be between 3/32” and 3/8” in diameter and 3” to 6” deep. (Blue orchard bees prefer holes that are 5/16” wide and 6” long). Holes equal to or smaller than 1/4” can be 3-4” long and anything over ¼” need to be at least 5-6” long. As the hole diameter increases, the length of the tunnel should also increase. Smaller drill bits create thinner and shorter holes that can be used by small bees that nest successively in numerous small holes.

Separate the holes by at least ¾”to ensure the integrity of the wood block. Since bees need a closed-end tunnel, do not drill completely through the block. If holes are drilled all the way through, attach an opaque backboard. Drill with a sharp bit and at a high speed as bees avoid rough interiors that would damage their wings.

Decorating your bee hotel with latex paint on the outside can help attract bees from long distances to the nesting tubes and protect the structure from rain. Bees may prefer blue and dark colors to light and bright colors; there is limited research on this topic.

**Least simple method: Birdhouse-like Structure**

See: <https://www.youtube.com/watch?v=LS_5rntNexo> 3:39 minutes. Note: This demonstration does not adequately allow for the needed 6” tubes for the larger-sized bees. Make sure that the depth of the house is at least 7-8” deep in order to fit at least 5-6” long tubes or drilled branches into the structure!

1. A bee house can look much like an open-faced birdhouse. You can use a combination of drilled wood blocks and many smaller reeds or cardboard tubes or paper straws (NO PLASTIC or PLASTIC-LIKE CORN-BASED STRAWS!) that allow the bees to nest. The box should provide sufficient protection from the weather; bees can stand cold but not soaking wet. Protection from melting snow is a must!
2. To pack the structure with nesting material, use:
   1. Paper straws and various widths of dry hollow stems, to attract various types of bees. Use paper straws and stalks/stems cut to 5-6”; narrower ones can be shorter, from 3-4”. Alternatively, you can buy 6” cardboard tubes for leafcutter/mason bees online.
   2. UNTREATED dry wood (including branches sawed to fit in), or various widths of blocks of untreated wood (i.e. 4x4” and 4x6”) at least 7” long.
      1. Bore with various sizes of drills using a variety of hole diameters from 1/8”-3/8”.
      2. Again, make sure the length of the wood is 2” (or at least 1”) shorter than the structure to provide some shelter from rain/snow.
      3. Do not drill all the way through; leave at least ¾” of solid wood at the back to protect from predatory wasps.
   3. To provide habitat for ladybugs as well, wrap cardboard and tie it into tubes.