

# Creating Native Bee Habitat for Gardens in Montana and the Rocky Mountain Region

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This publication includes simple and practical steps gardeners can take to protect and add much-needed pollinator habitat to home landscapes. By making intentional decisions to provide resources, gardeners can create a safe and vibrant haven for these important insects for years to come.

**THE UNITED STATES ROCKY MOUNTAIN REGION**, from Montana, west to Idaho and south to New Mexico, is home to many pollinators, especially wild, native bees. Hundreds of native bee species can be found in the mountains, valleys, plains, forests, agricultural lands, and urban ecosystems across the region. These native bees play vital roles in pollination of crops and of many trees, shrubs, and wildflowers, helping to sustain native plant diversity and ecosystem functions.

Habitat loss and fragmentation due to agricultural intensification, urban development, and detrimental home and garden landscape practices such as meticulously maintained expanses of weed-free lawns all contribute to reducing high-quality habitats available for native bees. Therefore, providing habitat is critical, especially in urbanized areas where bees likely have to fly farther to access the resources they need to survive.

Bee habitat consists of nesting sites, nesting materials, floral resources (i.e., pollen and nectar), and safe environments free from landscape chemicals such as pesticides. Because bees are central-place foragers (i.e., they can only travel a certain distance from their nests), it is also very important that resources are available within each species' flight range, which can vary from only a few hundred feet to several miles.

## Native Bees

Most native bees are solitary, meaning a single female is responsible for finding or creating a suitable nesting site, collecting pollen and nectar to feed her offspring, and laying eggs. In general, solitary bees do not meet their offspring since they do not emerge as adults until the following year.

Their lifestyle is very different compared to social bees, like the non-native European honey bee (*Apis mellifera*), in which there is a queen and thousands of workers with overlapping generations that live and work together in a large colony that persists from year to year. Some of our native bees, like bumble bees (*Bombus*), are also social but they vary from honey bees in that their colonies are small, with only dozens to hundreds of workers, and their colonies do not persist from year to year, dying each fall and needing to start fresh the following spring from new queen bumble bees that have overwintered (see *Bumble Bees in Montana* for more information). Solitary bees can sometimes nest in aggregations (e.g., mining bees in the genus *Andrena*; **Figure 1**) with dozens to hundreds of nests close together, giving the impression they are social, but a single female occupies each nest. Solitary bees may also nest communally (e.g., green metallic sweat bees in the genus *Agapostemon*), where several bees share one nest entrance, but once inside, each female creates her own nest.



**Figure 1.** An aggregation of ground-nesting bees in the genus *Andrena*. Photo: Casey M. Delphia, Montana State University.

Approximately 70% of native bee species are ground nesters, meaning they build nests belowground by digging tunnels in soil or utilizing existing holes in the ground like old rodent burrows (in the case of many bumble bees). Sweat bees (e.g., *Halictus* spp. and *Lasioglossum* spp.), mining bees (*Andrena* spp.), digger bees (*Anthophora* spp.), and long-horned bees (*Melissodes* spp.) are some of the most common ground-nesting bee species found in our home landscapes.

Approximately 30% of native bee species are cavity nesters, meaning they build nests aboveground in existing tunnels or excavate tunnels in various types of plant material. Naturally occurring nesting sites include old insect burrows in trees or stumps, dead or rotting wood, hollow or pithy stems of grasses and herbaceous plants, and twigs of woody plants. Mason bees (*Osmia* spp.), leafcutting bees (*Megachile* spp.), and resin bees (*Heriades* spp.) are some of the most common cavity-nesting (also referred to as tunnel-nesting or stem-nesting) bee species found in our home landscapes.

## Nesting Sites

### GROUND-NESTING BEES

For most bee species, we know very little about their nesting site preferences, including location, soil type and texture, moisture content, depth, exposure, aspect, and amount of ground cover. However, there are steps home gardeners can take to create safe nesting habitats for these bees.

Since most species excavate nests in which to lay their eggs, access to undisturbed, bare soil is considered one of the most important factors for creating nesting habitat (**Figure 2**). Strategically leaving areas of bare soil in a variety of places within the landscape (including behind and under



**Figure 2.** A female ground-nesting bee excavating her nest in sandy soil. Leaving areas of bare soil in and around home gardens allows places for ground-nesting bees to build nests. Photo: Abiya Saeed, Montana State University.

hedges and shrubs, within garden beds, and around ornamental grasses and other landscape plants) can provide native bees with options for suitable locations for nesting. It is also important to protect these areas from heavy foot traffic and landscape chemical use (all of which can pose potential hazards and limit the function of this habitat for bees).

Although mulch is an excellent tool gardeners use for water conservation and weed suppression, some mulches can create a barrier, preventing bees from accessing soil in the landscape. Therefore, intentionally leaving certain areas in the garden mulch free is beneficial. These unmulched areas don't need to be large or unsightly; they can be tucked out of the way and bees will still find them. If mulch is necessary, gardeners can consider different types of mulch, opting for thin layers of compost or shredded leaves and avoiding the use of hard mulches such as wood, plastic, and rocks, which can be virtually impenetrable for most bees. Other barriers that limit access to bare soil (such as landscape fabric) should also be avoided.

Another great practice that can go a long way to encourage ground-nesting bees is to be an observant gardener. Take notice of any nests already in the landscape and protect them or create similar nesting conditions to those the bees are using. For example, consider flagging off areas with nests to protect them from foot traffic or other disturbances until the bees have completed nesting activities for the season (usually a few weeks). If bees are seen nesting in bare patches of lawn, consider leaving those areas bare rather than reseeding. By observing where bees are already nesting, you can better understand their individual preferences and use the information to help guide how to manage garden activities. Let the bees tell you what they need!

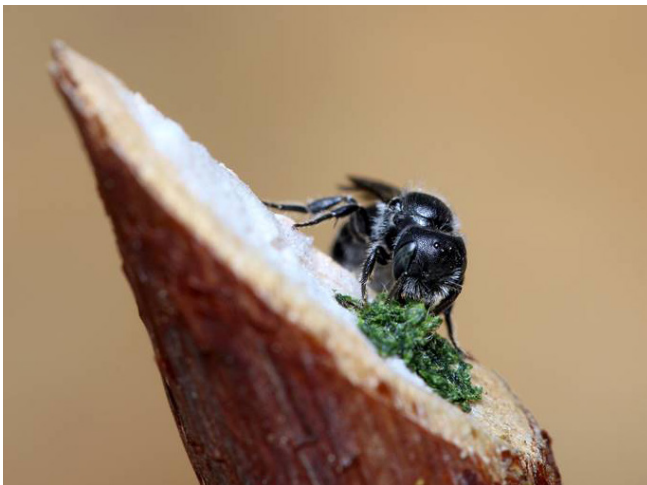
### CAVITY-NESTING BEES

With increasing urban development, naturally occurring aboveground cavities are fewer and farther between, making them both scarce and difficult to find. In this situation, artificial man-made nest boxes can be a simple and effective solution for providing nesting sites (**Figure 3**). Nest boxes for cavity-nesting bees (sometimes referred to as trap nests, nest blocks, bee hotels, bee boxes, and bee houses) can be just as diverse as the landscapes in which they are placed.

Nest boxes can be easily built utilizing common materials and simple household tools. By drilling holes of varying sizes (between 3/32 and 3/8 inches in diameter) and depths (minimum 4-6 inches; the larger the hole diameter the longer/deeper the hole should be) into untreated wood blocks or old



**Figure 3.** A bee nest box at the Montana State University Pollinator Garden filled with a mix of wood blocks with holes drilled into them, bundles of cardboard tubes, and hollow plant stems for cavity-nesting bees. Photo: Casey M. Delphia, Montana State University.



**Figure 4.** A female mason bee (*Hoplitis* sp.) using chewed leaves to seal the entrance of her nest inside a raspberry cane (*Rubus* sp.). Photo: Casey M. Delphia, Montana State University.

tree stumps/logs, gardeners can attract a variety of solitary, cavity-nesting bee species. Holes should be spaced  $\frac{3}{4}$  inches apart to maintain the structural integrity of the wood and should only be drilled partway through the wood to leave one end of the hole closed. Alternatively, gardeners can create bundles of bamboo reeds, cardboard tubes, or various types of plant material (e.g., hollow or pithy plant stems like raspberry canes; **Figure 4**) of varying sizes and depths, as mentioned above. These bundles should be placed into a container with one closed end to provide backing for the reeds, tubes, or stems and to protect the nests from weather and parasites.

Gardeners can also purchase pre-built nest boxes, but make sure that any purchased nesting boxes also meet previously mentioned specifications, as many available nest boxes are not ideal for most cavity-nesting bees. For example, too shallow a tunnel (3 inches or less) means fewer female offspring will be produced the following year, which can affect bee populations.

It is also important to consider proper placement of nest boxes. Bees are cold-blooded and need external heat sources to become active, though some species including bumble bees can generate heat by vibrating their wing muscles. Secure nest boxes at a height of 4-6 feet (around eye level) with holes facing south or southeast to provide access to early morning sun. This will allow nesting bees to begin foraging activities as early as possible after they have warmed up enough for flight. Protect nest boxes from pests and scavengers, like birds and rodents, by keeping them away from bird feeders. Keep them sheltered from harsh weather (such as excessive afternoon sun, wind, and moisture) by attaching them to the sides of existing structures such as sheds, houses, and sturdy fence posts.

Building and placing nest boxes in a garden is only the first step when caring for the habitat needs of cavity-nesting bees. Because nest boxes can concentrate unnaturally large numbers of bees together in a single location, regular inspections and annual sanitation are required to prevent pest and disease problems and keep these structures a safe environment for our native cavity-nesting bees for years to come. A note of caution is that improper management of nest boxes can cause more harm to native bees than good, so be sure there is time to commit to this worthwhile endeavor. For more information on building and maintaining nest boxes for native bees, see the additional resources.

Another, more natural option for creating nesting sites for bees is to utilize the dead flower stalks and stems of annuals, perennials, and grasses already in the garden. Rather than completely removing dead flower stalks from the previous



**Figure 5.** A) Cut stems of Joe-Pye weed (*Eupatorium* sp.) left in the garden for stem-nesting bees. B) A male yellow-faced bee (*Hylaeus* sp.) peeking out from inside a hollow plant stem. C) A completed bee nest capped with chewed leaf pieces in a cut stem of basin wild rye (*Leymus cinereus*). Photos: Casey M. Delphia, Montana State University.

year and composting them or bundling them together to place in bee nest boxes, stalks can be cut back in early spring to varying heights, providing hollow or pithy stems of varying diameters depending on the plant species (**Figure 5 A-C**). Female bees searching for nest sites in the spring and summer will find these stems and begin creating nests filled with their offspring. The following year, the offspring will emerge from these stems as adult bees searching for new nesting sites and the cycle will start over. The old stems will naturally break down over time. This approach more closely mimics what happens in nature compared to nest boxes and also avoids building up large densities of bees in a single area, potentially reducing pest and disease problems.

### Nesting Materials

Nesting materials that bees use to construct and partition their nesting chambers include plant fibers, leaves, flower petals, mud/clay, sand, small pebbles, woody and green plant debris, and plant resins. Different types of bees use different materials, therefore a good bee habitat should incorporate a variety of nesting resources. For example, mason bees, like the Blue Orchard Mason bee (*Osmia lignaria*), use mud to create separate compartments for their offspring and even have specialized “horns” on their faces for carrying balls of mud (**Figure 6**). Wool-carder bees (*Anthidium* spp.) use plants with “hairy” leaves and stems (i.e., plant trichomes) to partition individual offspring (**Figure 7**), and resin bees (e.g., *Heriades* spp.) use plant resins, like pine tree sap, and small pebbles and/or sand. Leaving some bare clay and sand sources in the garden and incorporating a variety of plant types, including those with “hairy” foliage such as Rosy

pussytoes (*Antennaria rosea*) or Lamb's ears (*Stachys byzantina*) and those with leaves of the preferred texture such as Wood's rose (*Rosa woodsii*), can provide bees easier access to some of their nesting needs.

### Floral Resources

Floral resources are another critical component of native bee habitat (and pollinator habitat in general) and should be placed in close proximity to nesting sites where bees can easily access them. Several regional plant lists are available for home gardeners to select a palette of flowers that will provide food for bees and an appealing aesthetic for gardeners. Extension offices, conservation districts, and NRCS offices are also great sources of local and regional plant lists. Use these resources to select diverse flowering plants, including trees, shrubs, and herbaceous annuals and perennials, comprising varying colors, textures, sizes, shapes, and bloom times, which will create a smorgasbord of nectar and pollen sources for a variety of native bees. Although native plants are a great addition to any landscape for many reasons (e.g., locally adapted, ecologically sound), pollinator plants don't need to be native to be useful and beneficial for native bees. One of the most important considerations is to have flowering plants in bloom throughout the growing season because different bee species are active during different times of the season. Plants that bloom in early spring and late summer/fall are especially vital because there are limited food sources available during these critical times compared to mid-summer.

### Water

Water is just as important for bees as it is for humans. Although bees mostly get their moisture from nectar sources, bees also use water to create mud for their nests. Placing a shallow water source in the landscape, such as a small dish or bird bath filled with pebbles/marbles, is an easy way to provide this moisture source for bees. Ensure any water source stays clean and pesticide-free by emptying and cleaning it out regularly. Pools of stagnant water can also serve as habitat for mosquito larvae, so minimize those risks with appropriate mosquito control methods.

### Native Bees Are Less Likely to Sting

The thought of having bees in home landscapes may bring uneasiness to some because of the fear of stings. However, most insect stings in urban landscapes are caused by a few species of social wasps, even though bees usually get the blame. Most native bees are solitary. Because each female is a single



**Figure 6.** A female blue orchard mason bee, *Osmia lignaria*. Notice the “horns” on her face for carrying balls of mud to her nest. Photo: Casey M. Delphia, Montana State University.



**Figure 7.** A female wool-carder bee (*Anthidium manicatum*) collecting plant “hairs” (i.e., trichomes) from the stem of Rosy pussytoes (*Antennaria rosea*) for her nest.

**Note:** This is a non-native species that occurs in Montana and across the country, but our native *Anthidium* species look and behave similarly. Photo: Casey M. Delphia, Montana State University.

mom and they do not have large nests filled with offspring and honey stores to protect, solitary bees are not aggressive and are less likely to sting. Adults are usually active for a limited time (several weeks) and are focused on collecting nectar and pollen, building nests, and laying eggs. They are not interested in interacting, since their death would mean the end of their ability to produce offspring, and will go about their daily activities without interfering with yours.

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## Additional Resources

### POLLINATOR-FRIENDLY NATIVE PLANT LISTS

- [pollinator.org/guides](https://pollinator.org/guides)
- [xerces.org/pollinator-conservation/pollinator-friendly-plant-lists](https://xerces.org/pollinator-conservation/pollinator-friendly-plant-lists)
- [nrcs.usda.gov/plantmaterials/mtpmcbr11694.pdf](https://nrcs.usda.gov/plantmaterials/mtpmcbr11694.pdf)

**MontGuide MT201611AG “Bumble Bees in Montana”**  
[store.msuextension.org/Products/Bumble-Bees-in-Montana-MT201611AG\\_\\_MT201611AG.aspx](https://store.msuextension.org/Products/Bumble-Bees-in-Montana-MT201611AG__MT201611AG.aspx)

**“Gardening for Native Bees in Utah and Beyond”**  
[extension.usu.edu/pdfs/sustainability/files/Gardening-for-Native-Bees-in-Utah-and-Beyond.pdf](https://extension.usu.edu/pdfs/sustainability/files/Gardening-for-Native-Bees-in-Utah-and-Beyond.pdf)

**“Creating Pollinator Habitat”**  
[extension.colostate.edu/topic-areas/insects/creating-pollinator-habitat-5-616/](https://extension.colostate.edu/topic-areas/insects/creating-pollinator-habitat-5-616/)

**“Creating a Solitary Bee Hotel”**  
[extensionpublications.unl.edu/assets/pdf/g2256.pdf](https://extensionpublications.unl.edu/assets/pdf/g2256.pdf)

**“Building and Managing Bee Hotels for Wild Bees”**  
[canr.msu.edu/resources/building\\_and\\_managing\\_bee\\_hotels\\_for\\_wild\\_bees\\_e3337](https://canr.msu.edu/resources/building_and_managing_bee_hotels_for_wild_bees_e3337)

**“Nesting & Overwintering Habitat for Pollinators & other Beneficial Insects”**  
[xerces.org/publications/fact-sheets/nesting-overwintering-habitat](https://xerces.org/publications/fact-sheets/nesting-overwintering-habitat)

**“How to Create Habitat for Stem-Nesting Bees”**  
[drive.google.com/file/d/1PUNONY2PiLyhVfCO3PUfvDiy1jhE9M/view](https://drive.google.com/file/d/1PUNONY2PiLyhVfCO3PUfvDiy1jhE9M/view)

**Montana Bee Identification Guide**  
[urbanipm.montana.edu/resources/mt-bee-id.html](https://urbanipm.montana.edu/resources/mt-bee-id.html)



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