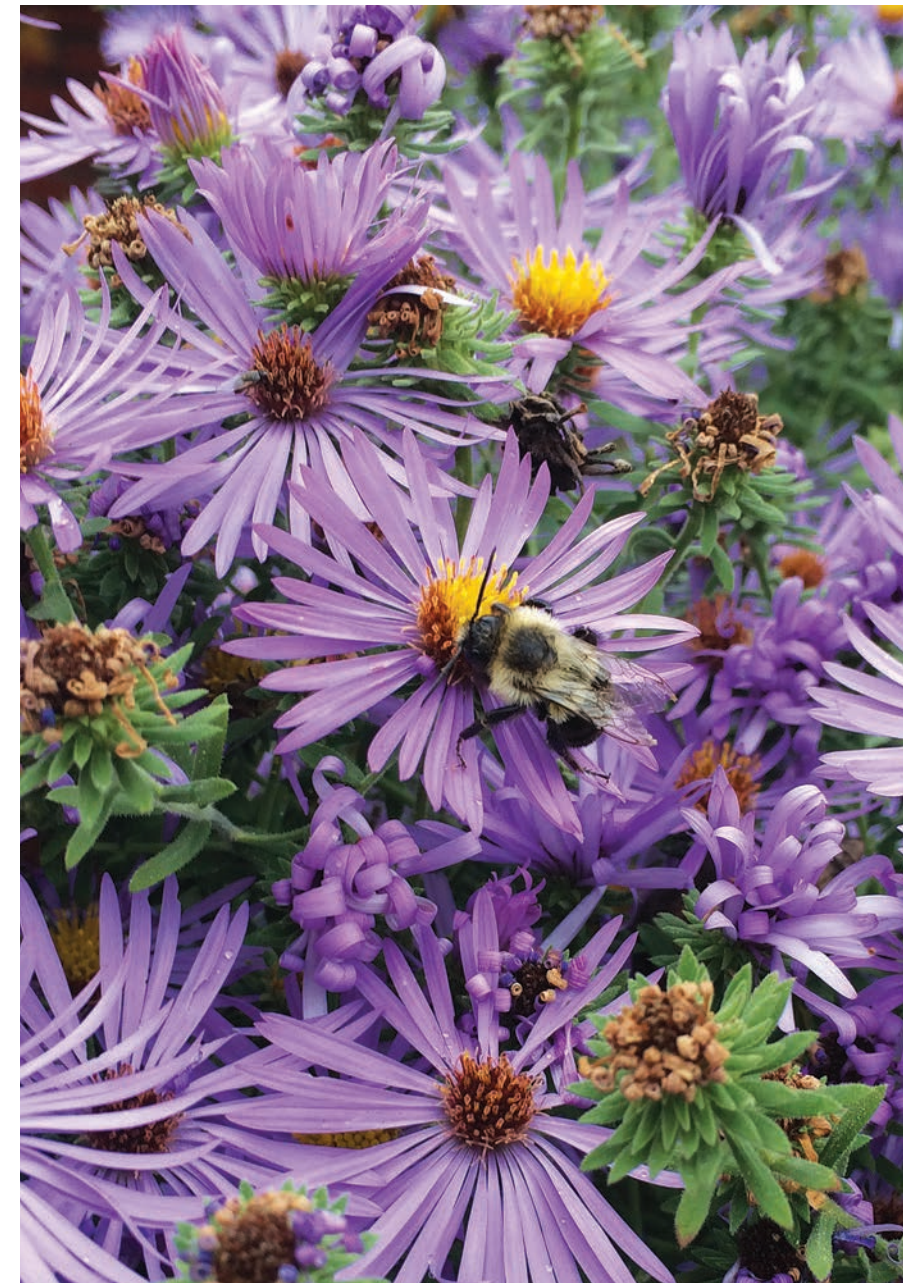


gardening for Native Bees

North America's native bees are under threat from habitat loss, pesticides, and climate change. Here's what gardeners can do to help.

BY JESSIE KEITH

Bees like this eastern carpenter bee (*Xylocopa virginica*), here taking a shortcut to nectar by slicing through the side of a hosta flower, are among hundreds of bee species native to North America.



spread pesticide use, and climate change all have an impact, but gardeners can help.

APPRECIATING DIVERSITY

American bee species “come in a jewel box of different colors—from metallic green to bottle blue, gold, brown, and glossy black,” says Scott Hoffman Black, the executive director of the Xerces Society, an organization dedicated to invertebrate conservation. Sizes vary from the enormous one-inch valley carpenter bee (*Xylocopa varipuncta*) to one of the world's smallest bees, *Perdita minima*, which is under two millimeters long. Throw in different shapes, hair types, tongue lengths, and other characteristics, and their diversity is staggering.

When it comes to nesting, about 90 percent of these species are solitary,



Left: Fall-blooming plants such as this aster (*Symphyotrichum* sp.) provide nectar to many species of native bees as they prepare to hibernate over the winter. Above: Specialized hairs on the underside of this female leafcutter bee's (*Megachile* sp.) abdomen hold the pollen she collects for feeding her young.

HONEY BEES (*Apis mellifera*) may garner more of the limelight, but North America is also home to approximately 4,000 known native bee species that are just as agriculturally, horticulturally, and ecologically important. While they don't form large, honey-making colonies like their better known but non-native counterparts, these indigenous bees are among the most essential pollinators in our natural areas, farm fields, and gardens.

Some North American species even appear to do a better job of pollinating crops than honey bees. For example, researchers have found that blue orchard mason bees

(*Osmia lignaria*) are far more effective pollinators of cherry orchards, resulting in over twice the fruit yields of honey bee pollinated orchards. This is not surprising given that many native bees are often more tolerant of cool or moist conditions and have longer foraging times—giving them the pollination edge.

However, like honey bees, native bee populations have been declining over the last several years. This decline “speaks towards land use and the lack of diversity of our vegetation,” says Deborah Delaney, bee specialist and assistant professor of entomology at the University of Delaware in Newark. Factors such as habitat loss, wide-

while the rest are social and hive-forming. Nests may be underground or above ground in cavities; depending on the species, nests may be constructed from mud (mason and plasterer bees), plants (leafcutter bees), earth (mining bees), or excavated wood (carpenter bees). Solitary bees tend to produce few young (often one to 10) in underground nests, while some bumble bees and sweat bees nest in aboveground crevices and produce small colonies.

There is a direct correlation between bee size and flight distances, larger species like bumble bees can fly up to a mile or more when foraging, while medium to small bees

may only forage a couple hundred feet from their nests. Most native bees are polylectic, which means they pollinate a wide variety of plant species. Others may be oligolectic (pollinating a few, closely-related plant species) or specialized even further to be monolectic (pollinating one plant species).

NURTURING NATIVES

With these basic facts in mind, there are several things gardeners can do to support native bees. “If every gardener tried to create a haven for bees, it would increase habitat exponentially,” notes Black. Protecting and providing nesting areas and food sources are key. Equally important



A spacious, artificial hive, right, may appeal to honey bees, but a modest piece of wood drilled with numerous holes like the one above provides many native solitary bees with ideal nesting sites.

is safeguarding bees from pesticides. All broad-spectrum pesticides can kill bees, but research shows that neonicotinoid pesticides used in agriculture and horticulture—such as clothianidin, thiamethoxam, and imidacloprid—are the most harmful. Because neonicotinoids maintain residues in pollen, they can poison pollinators long after application.

To encourage native ground-dwelling bees to nest, avoid disturbing areas of bare, friable earth around plants as much as possible, and avoid applying bark mulch. Choose



compost or leaf mold instead. If this is not feasible for you, try doing this in just a small area of your yard that you leave “wild.”

For above-ground nesters, you can create artificial nest sites. For example, layers of clay-mud blocks may encourage certain southwestern bee species adapted to arid conditions to nest in the cool cracks between blocks. “Nest blocks,” either purchased or homemade from wooden blocks drilled with holes, appeal to tunnel-nesting species. Bundles of hollow stems cut and positioned cross-wise are also attractive to tunnel-nest-

ing bees; bamboo, teasel, and reeds all work well for making these nest bundles.

Most essential to healthy bee habitat is a variety of plants to ensure a steady supply of nectar and pollen. Nectar is a bee’s main energy source. Nutritious pollen, rich in protein, nutrients, and oils, is primarily used by bees to feed developing larvae. Solitary females typically roll the pollen into nectar-infused balls of “bee bread” and lay a single egg on each ball. The pollen is all the food larvae need to develop and mature into adult bees. Different bee species

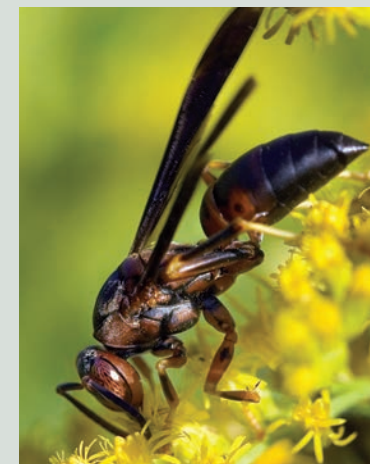
BASIC BEE CHARACTERISTICS

Bees are closely related to wasps, so share several features such as large compound eyes on the sides of their heads and two pairs of wings. However, a number of characteristics distinguish the two insects. Physically, the most obvious difference between the two is that bees tend to be much hairier than wasps. These soft hairs are feathered or branched, whereas any wasp hairs are straight. While most wasps are carnivorous, all bees are vegetarians.

Wasps do not collect pollen, and only female bees collect and transport pollen to nests to feed their young. For this purpose, they often have specific structures on their hind legs or abdomen adapted for carrying

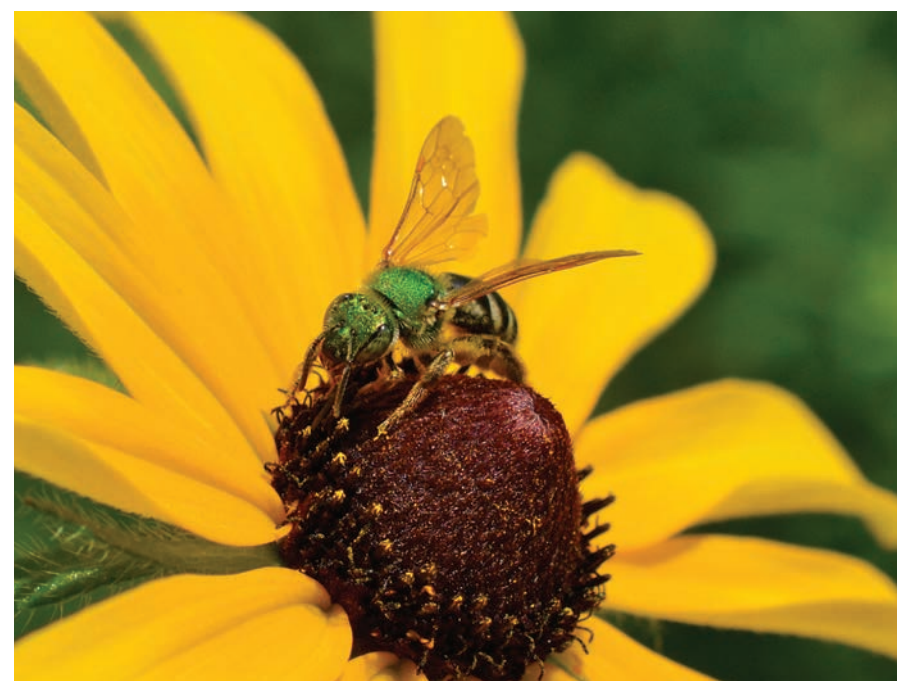


Hairiness is one conspicuous characteristic that differentiates bees like this mining bee (*Andrena dunningi*), left, from wasp cousins like this paper wasp (*Polistes* sp.)



pollen. These structures are either corbiculae (“pollen baskets”) consisting of a smooth concave area with fringes of curved long hairs) that hold pollen, or scopae (patches of stiff hairs) to which pollen can adhere.

Some wasps—such as yellow jackets or bald-faced hornets—can be aggressive when defending themselves, but there is little to fear from native bees in general. “Most solitary bees don’t or can’t sting,” says Scott Hoffman Black, executive director of the Xerces Society, a nonprofit organization dedicated to invertebrate conservation. “Bumble bees can sting but they rarely do,” he adds. Male bees do not have stingers at all. —J.K.



Sweat bees, like the one here visiting a black-eyed Susan, are efficient pollinators.

produce young at different times, so ideally your planting scheme should ensure that something is in bloom during all the seasons, even winter.

“I recommend planting three good bee plants for spring, three for summer, and

three for fall,” says Black, “so there is a buffet of flowers throughout the growing season.”

Gordon Frankie, professor of urban entomology at the University of California, Berkeley and director of the Urban Bee Lab, concurs with this strategy. He

suggests that gardeners aim for at least 20 different plant species overall to bring the bees, based on bee population sampling he has conducted around California. No matter the season, Frankie found the richest diversity of bee species in Berkeley and Santa Cruz. By contrast, he found “little in the way of bees in San Diego,” he says. He attributes the difference to the regional plant palettes—landscapes featuring a few plant species with limited wildlife value correlated with very low bee diversity and numbers in general. “The more bee-plant biodiversity you have, the more diverse the bees you will attract,” he notes.

PLANTS THAT ATTRACT BEES

As a general guideline for deciding which plants to include in your garden to attract native bees, it’s helpful to keep in mind that flowering plants that depend on bee pollinators to reproduce have specific suites of floral traits adapted to attract them. These traits include “landing pads” for bees to rest upon while collecting and feeding, sweet fragrance, and sugary nectar. The flowers tend to be shades of yellow, blue, or white with special markings that guide bees to nectar. Many are tubular with bilateral symme-

try, like salvia and snapdragon flowers, or in heads, as with daisies and sunflowers.

Because native bee and plant species evolved together, growing native flowering plants is a good way to attract local bee species to your garden. For example, the scented, golden flowers of vernal witchhazel (*Hamamelis vernalis*) will lure early-emerging native bees as will pussy willows (*Salix discolor*). Woodland wildflowers such as sharp-lobed hepatica (*Hepatica acutiloba*), violets (*Viola* spp.), and rue anemone (*Thalictrum thalictroides*) also draw spring-emerging solitary bees. Waves of spring beauties (*Claytonia virginica*) that appear in open woodlands and lawns are favored by a diminutive andrenid bee (*Andrena erigeniae*). The bright white flowers of bloodroot (*Sanguinaria canadensis*) are pollinated almost entirely by Carlin’s andrena bee (*Andrena carlini*).

Later in the spring, natives such as false indigos (*Baptisia* spp.), lupines (*Lupinus* spp.), and California poppies (*Eschscholzia* spp.) attract a variety of bees. Spring-blooming trees and shrubs, such as American linden (*Tilia americana*), serviceberries (*Amelanchier* spp.), eastern redbud (*Cercis canadensis*), and hawthorns (*Crataegus* spp.), are also essential nectar and pollen providers.

In summer, perennials such as blanketflowers (*Gaillardia* spp.), penstemons (*Penstemon* spp.), and coneflowers (*Echinacea* spp.) attract all sorts of different native bees. The violet-purple spikes of giant blue hyssop (*Agastache foeniculum*) are favored by bumble bees (*Bombus* spp.), digger bees (*Melissodes* spp.), and leaf-cutter bees (*Megachile* spp.). Summer and winter squash are sure to attract tiny squash bees (*Peponapis* spp.). Native roses (*Rosa* spp.) are almost exclusively bee pollinated, and though milkweeds are often associated with butterflies, several species are important to native bees as well—particularly showy milkweed (*Asclepias speciosa*) and common milkweed (*A. syriaca*).

Fall-blooming asters (*Symphyotrichum* spp.), perennial sunflowers (*Helianthus* spp.), goldenrods (*Solidago* spp.), and Joe Pye weeds (*Eutrochium* spp.) supply bees with the requisite food stores to overwinter.

The flowers of many non-native plants also can feed bees, including lavenders (*Lavandula* spp.) and other aromatic herbs. Fragrant, showy-flowered species that be-



Above: The nectar-rich flowers of American linden (*Tilia americana*) attract large numbers of native bees and other pollinators, as do the flowers of mint family members such as giant blue hyssop (*Agastache foeniculum*), left.

long to the mint (Lamiaceae), composite (Compositae), and rose (Rosaceae) families make good choices, too, and offer options that can be grown in most regions of the United States. If you opt to grow specific cultivars in these families, avoid those with double or non-fragrant flowers—their supplies of pollen and nectar have sometimes been unintentionally bred out of them.

THE BIG PICTURE

Awareness of pollinators and their vital agricultural and ecological roles is definitely increasing. As a result, more and more over-manicured, urban and sub-urban green spaces like parks, corporate

NATIVE PLANTS PROVIDE A SMORGASBORD FOR BEES

The following native plants attract a wide variety of native bee species and other pollinators throughout different seasons. They are also relatively easy to grow and adaptable across several regions. For many of the genera listed below, there are several other species that are good pollinator plants, too. See “Resources,” below, to find more extensive plant lists.

Common Name (Botanical Name)	Type	Height (feet)	Season of Bloom	USDA Hardiness, AHS Heat Zones
Basket flower (<i>Centaurea americana</i>)	annual	3–5	midsummer to early fall	0–0, 10–1
Blue camas (<i>Camassia quamash</i>)	bulb	1–3	late spring to early summer	4–11, 12–1
Blue sage (<i>Salvia azurea</i>)	perennial	3–5	midsummer to fall	5–9, 10–1
Common sunflower (<i>Helianthus annuus</i>)	annual	3–15	summer	0–0, 12–1
Giant ironweed (<i>Vernonia gigantea</i>)	perennial	5–10	mid- to late summer	4–8, 8–3
Great blue lobelia (<i>Lobelia siphilitica</i>)	perennial	2–4	mid- to late summer	4–8, 8–1
Lanceleaf coreopsis (<i>Coreopsis lanceolata</i>)	perennial	1–2	early to midsummer	4–9, 9–1
Lead plant (<i>Amorpha canescens</i>)	shrub	2–3	midsummer to early fall	2–8, 8–1
Prairie rose (<i>Rosa arkansana</i>)	shrub	1–3	summer	3–8, 8–3
Sassafras (<i>Sassafras albidum</i>)	tree	20–80	spring	4–8, 8–3
Smooth beardtongue (<i>Penstemon digitalis</i>)	perennial	3–4	spring to early summer	3–8, 8–1
Spotted geranium (<i>Geranium maculatum</i>)	perennial	1–2	spring	4–8, 8–1
Wild bergamot (<i>Monarda fistulosa</i>)	perennial	2–4	summer	3–9, 9–1



Males of the aptly named long-horned bees (*Melissodes* spp.) sport extra-long antennae.

parks, school yards, and golf courses are being converted into managed meadows and savannahs rich in plants for bees and other wildlife. Green roofs offer further opportunities for flowers to blossom in city spaces, as do “eco-lawns” planted with low-growing flowering plants for pollinators. And in rural areas, intentionally planted nectar- and pollen-rich wildflowers line a growing number of agricultural fields, old railways, highways, and roadsides.

All are steps in the right direction, but there’s still a lot to do, starting with your home garden. As Black puts it, “Plant a variety of native bee flowers, heirlooms, and vegetables. Avoid insecticides, cultivate your garden well, and let the bees come.”

Jessie Keith is a horticulturist, writer, photographer, and garden designer. She lives in Wilmington, Delaware, with her husband and two daughters.

Resources

Websites

- Native Bee Conservancy, www.nativebeeconservancy.org.
- Pollinator Partnership, www.pollinator.org.
- University of California–Berkeley Urban Bee Lab, www.helpabee.org.
- The Xerces Society, www.xerces.org.

Books

- Attracting Native Pollinators: Protecting North America’s Bees and Butterflies by Xerces Society. Storey Publishing, North Adams, MA, 2011.
- The Bee: A Natural History by Noah Wilson-Rich. Princeton University Press, Princeton, NJ, 2014.
- Bees of the World by Christopher O’Toole and Anthony Raw. Blandford, London, UK, 1991.
- Bees, Wasps, and Ants: The Indispensable Role of Hymenoptera in Gardens by Eric Grissell. Timber Press, Portland, OR, 2010.
- Bumble Bees of North America: An Identification Guide by Paul H. Williams et al. Princeton University Press, Princeton, NJ, 2014.