A close-up photograph of a rusty-patched bumblebee on a purple flower. The bee is positioned on the left side of the frame, facing right towards the flower. It has a black body with a prominent yellow patch on its thorax and a black abdomen. Its wings are dark and slightly translucent. The flower is a vibrant purple with many long, slender petals. The background is a soft, out-of-focus green, suggesting foliage.

A third of the world's plants are pollinated by bees. Native bumble bees, like the rusty-patched bumble bee shown here, are excellent pollinators of wildflowers, trees, shrubs and crops like squashes, berries and alfalfa.

# What's the buzz



## Simple steps can bolster native bees and hedge our bets against honey bee declines.

David L. Sperling

**A** sustained drop in honey bee populations nationwide has farmers and orchardists making backup plans to ensure their crops are adequately pollinated. Buried among the stories about colony collapse disorder and potential causes of bee die-offs — like stress, pesticides, pathogens and parasites — is some familiar advice. Just as a key to staving off invasive species is maintaining biological diversity, so too a key to keeping crops fruitful and flowers blooming is building up native bee populations.

The European honey bee (*Apis mellifera*) is a flying workhorse. Managed hives of honey bees are carted around the country to pollinate berries, vegetables, fruit trees, flowers and agricultural row crops worth roughly \$20 billion annually in North America, according to The Xerces Society for Invertebrate Conservation. This prodigious import was named the state insect in Wisconsin in 1977, even though it's a non-native species.

However, nearly 4,000 other wild bee species are native to the continent and fully 500 species are found in Wisconsin, many of which equal or surpass the honey bee's efficiency in pollinating crops and native plants. In

fact, The Xerces Society notes that research documented 51 native bee species visiting watermelon, sunflower and tomato

fields in western states;

more than 45 bee species pollinating berry crops in Maine and Massachusetts and 67 species of native bees pollinating blueberry crops.

Bumble bees, for instance, are con-

sidered the premier pollinators of many native plants and cranberries.

According to researchers at the University of Maine, on a bee-for-bee basis, bumble bee species are eight times more efficient than honey bees at pollinating some highly-valued crops like blueberries. The bumble bees are more effective because they will fly in cooler temperatures, damper conditions and lower light levels extending pollination by several hours each day.

They also perform a behavior called "buzz pollination," where the female bumble grabs the flower's pollen-producing stamens in her jaws and vibrates her wings to give the stamens a good shaking — dislodging pollen grains. This behavior is extremely effective in cross-pollinating berries, tomatoes and peppers. Larger fruits and more abundant tomato crops are attributed to plants pollinated by bumble bees. They are also critical pollinators of native plants whose seeds feed songbirds and game birds.

Unfortunately, some of the bumble bee species also are declining due to combined effects of diseases, altered habitat, pesticide use, invasive species, climate change and the international transport of commercially-raised bumble bees. Two such species once com-

about bees?

ERIC MADER  
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mon to the northeastern and midwestern states, the yellow-banded bumble bee (*Bombus terricola*) and the rusty-patched bumble bee (*B. affinis*), are largely absent from their traditional range. They are excellent pollinators of wildflowers, alfalfa, berries and other crops like cucumbers and pumpkins. Other bumble bee species may also be decreasing, though it is difficult to generalize if declining populations are localized or more widespread since native bee populations are typically only monitored in a handful of locations rather than throughout their natural range.

When R.P. Macfarlane, a New Zealand bumble bee researcher hired by Wisconsin's cranberry industry, surveyed bumble bee populations in northern Wisconsin in 1993, researchers reported that the yellow-banded bumble bee constituted about 93 percent of the bumble bees tallied; today they make up less than one percent of bumble bees in the region. Isolated populations of this bumble bee found in the towns of Mountain, Manitowish Waters and Two Rivers in 2007 and 2008 were the only recorded sightings of this species in the Midwest. Reasons for this decline are unclear. Bumble bee authorities believe European bee diseases were introduced to North America as European companies started to domesticate American bee species to manage crop pollination. Certainly habitat loss, habitat fragmentation and pesticide use contribute to the losses as well, says Eric Mader, National Pollinator Outreach Coordinator for The Xerces Society in Madison.

To bolster our knowledge about changes in native bee populations, both the yellow-banded and rusty-patched bumble bees are the first species of ants, bees and wasps that will be tracked by field biologists conducting field work in Wisconsin. By adding these bees as Species of Special Concern, researchers will start keeping records when these species are found. Over time, this database will provide a picture of the bees' abundance and distribution on the Wisconsin landscape.

While some plants are also pollinated by the wind and by mammals

Populations of the workhorse of crop pollinators, the honey bee, have been declining for several years, losing 30-35 percent of their population. The collapse of honey bee colonies may be due to a combination of mites, diseases, nutrition issues, stress, pesticide use and exposure to other chemical residues.



JOHNNY N. DELL, BUGWOOD.ORG

like bats, bee pollination from managed hives and wild native bees remains an important part of the mix, sustaining both native and cultivated plant species. In areas where agricultural fields have lost many of their natural pollinators, surrounding pastures take on added significance and provide two valuable benefits, according to agricultural and ecology researchers. First, they act as a backup source for insects that pollinate crops. Second, they act as a refuge where pollinating insects can build strength before slowly recolonizing degraded croplands.

Wildlife depends on these natural pollinators both as a source of food and for enabling the fertilization of plants they rely on for fruit, seed, cover and sustenance.

"By aiding in wild land food production, helping with nutrient cycling, and as direct prey, pollinators are important in wildlife food chains," say biologists who study hooded warblers in fragmented forest areas. "Many migratory songbirds require a diet of berries, fruits and seeds from insect-pollinated plants" and the larvae of these insects are an important component of the diet of these young birds,

noted the research team with the Nebraska Ornithologists Union.

One increasingly common strategy for farmers who are hedging their bets by bolstering native bees is to increase the natural growth of grasses, shrubs and trees surrounding their fields. For instance, instead of renting honey bees, canola growers in Alberta found they got better seed set and increased profits if at least 30 percent of their land was left in natural habitat and

### Wasps are not bees

**Yellowjackets and many other wasps and hornets get bad press for a reason. The aggressive, uninvited guests at picnics that suck up soda, crawl over fruit and help themselves to brats and burgers are not bees, nor are they significant pollinators. They nest in papery hives above ground or underground. The wasps are relatively hairless, and have pointed abdomens. These ill-tempered hotheads readily sting people. True bees are usually hairy, are much more docile and usually don't sting unless they are stepped on or forced to defend a nest site.**

cover rather than fencerow-to-fencerow row cropping. These buffer zones of natural vegetation provided food and shelter for more native bees and increased bee visits when their crops set flowers. Pressure from native bees also can make honey bees more efficient and effective when pollinating hybrid seed crops by causing the honey bees to move more frequently between rows of male and female plants.

### Encourage a variety of nesting sites

Though we think of bees as social insects that live in hives with highly-organized social structures, most bee species are more solitary and almost 70 percent of native bee species nest in the ground or near the ground rather than in exposed hives. The female bees either excavate nest tunnels with a series of brood chambers or use existing holes or burrows bored by insects, worms or rodents into soil or under tree bark. The females place a mix of pollen and nectar in each brood cell, lay an egg and plaster over the cell with mud or little bits of leaves. The adult female bees live only a few weeks and die after the nest area is complete. The eggs hatch, become larvae, pupate and emerge as adults either the same year or the following season depending on the species.

Conserving the habitats and plants these native bee species use is an important strategy for sustaining adequate numbers of plant pollinators where honey bee populations are naturally lower, have dropped off significantly or are in short supply.

For the first time, the 2008 Farm Bill (Food Conservation and Energy Act) specifically mentioned native bee protection and provided money for both bee research and bee habitat preservation. Provisions added by the House of Representatives make pollinator conservation a national priority in conservation programs administered by the federal Department of Agriculture. The Farm Bill also provided \$10 million a year for the next five years for grants to research honey bee and native bee

ERIC MADER, THE XERCES SOCIETY



To attract a variety of bees, plant flowers of differing sizes, shapes and colors that bloom at different times of the year. Here a bumble bee visits wild indigo.

biology, potential solutions for colony collapse disorder, bee health and bee ecology. An additional \$7.5 million will add bee research programs to the USDA Ag Research Service, \$2.75 million to inspect and monitor honey bee populations for five years, and provide insurance and disaster relief for beekeepers.

### Planting to attract bees

Informing consumers and farmers about the value of native bees, and simple steps they can take to conserve and increase the numbers and diversity of natural pollinators are equally important. Bees collect pollen, and butterflies, birds and bees collect nectar from a range of plants from spring through the end of the fall growing season. You can create habitats where these insects can forage in backyards, rain gardens, parks, school grounds, golf courses, farms and woodlands. Here's advice from The Xerces Society on how to get going:

Small patches are fine as long as you provide a **diversity of plants that flower all season**. Different species of pollinators are active at different times of the thawed out seasons from May through October.

**Use local native plants.** Research shows native plants are four times more attractive to native bees and butterflies than exotics. In gardens, heir-

loom varieties of herbs and perennials also provide good foraging.

**Choose several colors of flowers of differing heights.** Native bees are particularly attracted to blue, purple, violet, white and yellow blooms.

**Plant flowers in clumps.** Clusters of flowers attract more pollinators than individual blossoms. Clumps four feet or more in diameter are particularly attractive to bees.

**Include flowers of different shapes.** Bees have different sizes, different body shapes, different tongue lengths and consequently choose different shaped flowers. Variety will attract a greater mix of species.

**Talk with experienced gardeners.** Groups like UW-Extension's Master Gardeners, local chapters of The Wild Ones, the Native Plant Society and native plant nurseries can provide advice on choosing native varieties that will work well given the location, moisture, soil types and light that you have available.

**Consider larger-scale projects.** The new pollinator provisions contained in the 2008 Farm Bill provide direct financial assistance to rural landowners for conservation efforts that support bees. The Environmental Quality Incentives Program and the Wildlife Habitat Incentives Program provide guidelines for cost-sharing to



establish wildflowers, flowering trees and shrubs. Contact local Natural Resource Conservation Service offices and U.S. Department of Agriculture service centers.

### A beeline to these blossoms

Here are some native plant genera that are good sources of pollen and nectar, but the list is by no means exhaustive. Consult wildflower guides, nurseries and local experienced gardeners for advice on particular species.

Aster (*Aster*)  
 Beardtongue (*Penstemon*)  
 Beebalm (*Monarda*)  
 Blazing star (*Liatis*)  
 Cup plant (*Silphium*)  
 Wild indigo (*Baptisia*)  
 Fireweed (*Chamerion*)  
 Goldenrod (*Solidago*)  
 Giant hyssop (*Agastache*)  
 Ironweed (*Vernonia*)  
 Joe pye weed (*Eupatorium*)  
 Leadplant (*Amorpha*)  
 Lobelia (*Lobelia*)  
 Lupine (*Lupinus*)  
 Milkweed (*Asclepias*)

New Jersey tea (*Ceanothus*)  
 Obedient plant (*Physostegia*)  
 Prairie clover (*Dalea*)  
 Purple coneflower (*Echinacea*)  
 Rattlesnake master (*Eryngium*)  
 Spiderwort (*Tradescantia*)  
 Steeplebush (*Spiraea*)  
 Sunflower (*Helianthus*)  
 Willow (*Salix*)

Here are some garden plants that are also bee-friendly. Supplement these with native species:

Basil (*Ocimum*)  
 Borage (*Borago*)  
 Catnip (*Nepeta*)  
 Cosmos (*Cosmos*)  
 Lavender (*Lavandula*)  
 Oregano (*Origanum*)  
 Rosemary (*Rosmarinus*)  
 Russian sage (*Perovskia*)  
 Spearmint (*Mentha*)  
 Squill (*Scilla*)

### Building to attract a buzz

About 70 percent of our native bees live in the ground in old tunnels, snags or similar locations, but they will adapt to manmade structures or enhanced nest-

ing spots if the site is a comfortable fit. Here are some simple projects you can do. Consider working on these as family projects since the designs are all simple and your children can have the satisfaction of building bee habitat.

**Nesting blocks** – A sheltered piece of an untreated 4 x 4 or 4 x 8 can make a fine bee condo. Drill holes between 3/32" and 3/8" in diameter approximately three-quarters of an inch apart. The holes should be smooth inside and closed at one end. The height of the nest block is not critical, eight inches or more is fine, but the depth of the holes is important. Holes less than a quarter-inch in diameter should be three to four inches deep. Holes a quarter-inch and larger in diameter should be five to six inches deep. You can also drill holes in tree stumps to attract bees. Follow the same advice on hole size and spacing. Also make sure the stumps are dry if drilling with electric drills to avoid the risk of shock. Mount the nest blocks as you would a bird house on a post or side of a garage, barn or shed. Keep the tunnels hori-

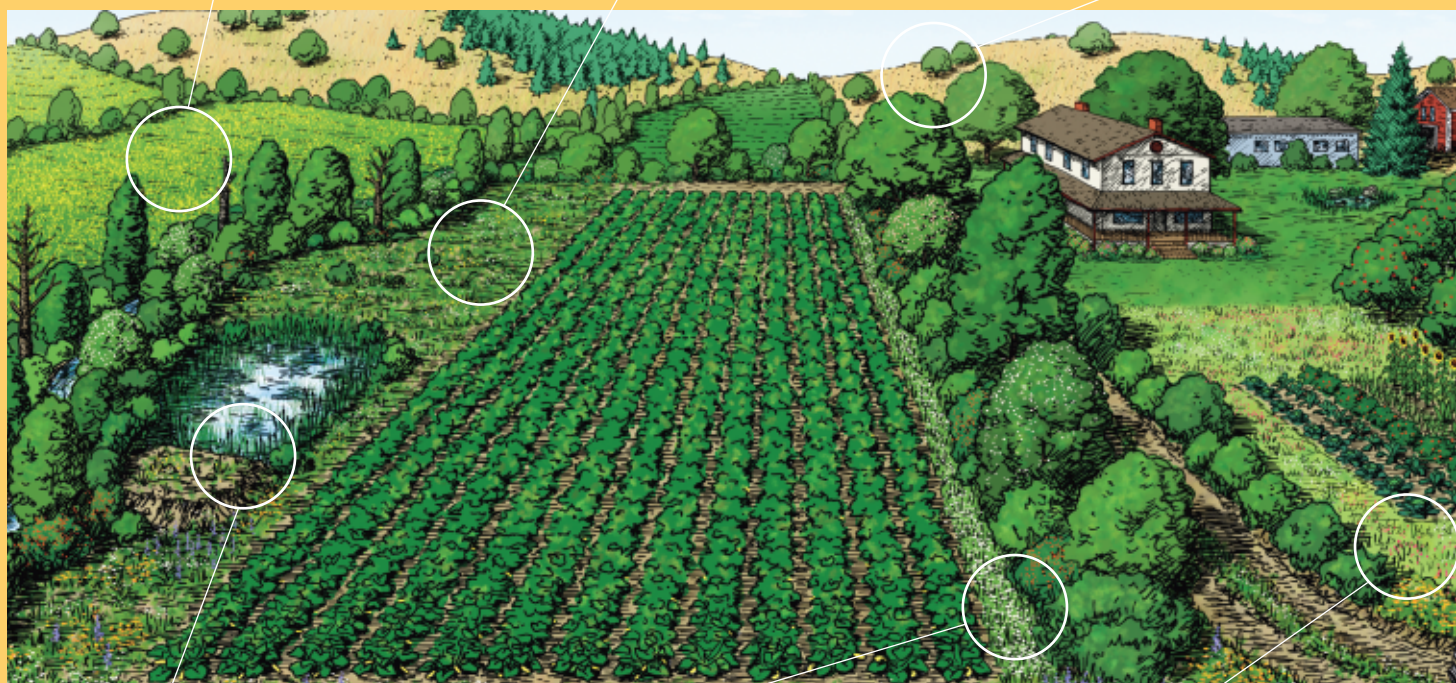
## FARMING FOR POLLINATORS

Protect a variety of plants and nest sites that benefit native bees.

### Temporary Bee Pasture

### Fallow Fields & Set-Asides

### Natural or Undeveloped Areas



### Ponds & Ditches

### Field & Road Borders

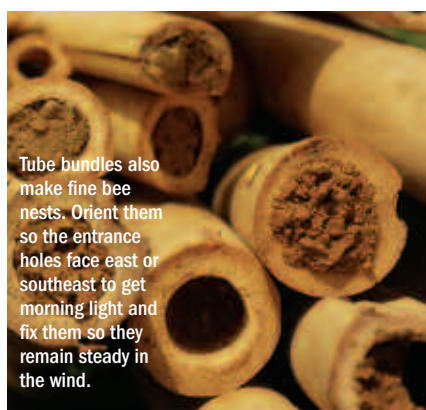
### Cover Crops/Food





Homemade nesting blocks provide shelter for bees. Place them where they are sheltered from weather.

MACE VAUGHAN



Tube bundles also make fine bee nests. Orient them so the entrance holes face east or southeast to get morning light and fix them so they remain steady in the wind.

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## Artificial Nests/ Shelter



Gardens/Food

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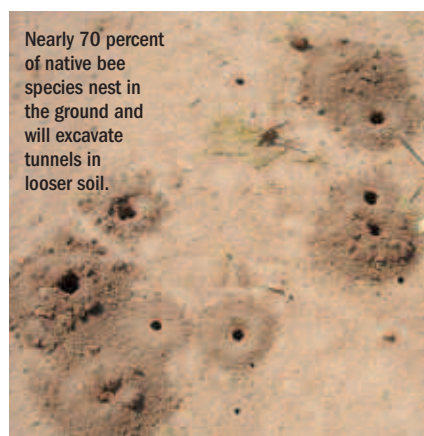
zontal with the entrance holes facing out. The idea is to mimic the holes bored into a tree by beetles. Nests of this type attract a variety of very docile spring and summer nesting solitary bees.

**Stem or tube bundles** – Reeds and other plants that have naturally hollow stems can also make good nesting tubes for tunnel-nesting bees. Cut the stems into six- to eight-inch lengths and be careful to leave one end sealed at a natural node. Tie 15-20 of these tubes together with the sealed ends toward the back. Slide the tubes into a low wooden frame, piece of PVC pipe or other container that will keep the tubes dry and protected from weather.

Whether building nest boxes or tube nests, location will determine if they are used by bees. Shelter the nests from the worst of the rain and wind with the entrance holes facing east or southeast. This placement will provide some morning sun to warm up the nests more quickly and protect them a bit from midday heat. Keep the stem bundles horizontal. Nest heights can vary, but three to six feet off the ground is recommended. They can be placed against buildings, fences, and staked or anchored in trees. Fix the nests firmly so they don't shake in the wind.

**Ground nests** – Clear the vegetation from small south-facing areas that are level or slope gently downward to drain well. Gently compact the soil surface. Creating small patches of different heights, pitches and locations will attract different bee species. You can also create an artificial pit. In a sunny, well-drained spot, dig a pit about two feet deep and fill it with a mix of light-colored, fine drained sand or loam. Planter boxes and raised beds can also serve as bee nesting sites.

**Bumble bee nests** – These bees look for warm dry cavities of varying sizes. In nature, they would seek out mouse holes and openings under grass tussocks. Artificial nest boxes made from untreated lumber about seven inches on a side will also attract bumble bees. Drill a few small ventilation holes near the top and cover these




Nearly 70 percent of native bee species nest in the ground and will excavate tunnels in looser soil.

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The top is removed to show the bedding material, ventilation and entrance in this bumble bee nesting box.

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openings with screening fine enough to keep out ants. Make a few small drainage holes in the bottom. Fill the box loosely with upholsterer's cotton or short lengths of unraveled string. Make sure the box is weather tight to keep the larvae relatively warm and dry and to deter mold and fungi growth. An entrance tunnel of three-quarter-inch plastic in a contrasting color will attract bees. Place the box in an undisturbed area on, or buried in, the ground in full or partial shade where there is no risk of flooding. Put out the box in spring when you first notice bumble bees or when willows and flowers start blooming. Don't get discouraged as bumble bees occupy only about one in four such artificial boxes. If you don't have "tenants" by late July, store the box until next spring and try a different location. 

David L. Sperling edits Wisconsin Natural Resources magazine.

Many fact sheets, brochures and downloadable books about native bees and pollinator conservation are available free-of-charge through The Xerces Society website at [www.xerces.org](http://www.xerces.org).