



Nursery News

September 2006 - Research & Development
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Bees

- A Declaration of InterDependence (pg 1)

With our industrial and technological world, we often forget that our lives are still entwined with the natural world. Our survival depends on the environment's survival, which depends on how we manage farmland, city green spaces, and our landscapes.

Bees (and a few other insect groups) provide a useful and free service to us although it is mostly unseen. In exchange for a little pollen and nectar and some small space for nesting, bees pollinate the flowers of many of our ornamental, and edible plants. To some plants, bees are an absolute necessity, but bees, wild and domestic, are disappearing at alarming rates, because of habitat loss, pesticide poisoning, and exotic pests and diseases. The Green Industry can do its part to ensure we do not lose these important pollinators, by reducing pesticide use and designing bee-friendly plants into landscapes.



Pollination

Bees and plants have evolved to form a relationship that provides food for the bee and pollination and reproduction for the plant. Pollination occurs when insects, animals, or the wind carry pollen from flower to flower or within parts of the same flower. In flowers of the same species, this leads to fertilization and seed and fruit set. (see article 'Marketing Scents' to find out how flowers attract pollinators)

Bees use the high-protein pollen and nectar for reproduction and survival, and have developed fine hairs and special pollen-collecting body structures to collect this food. The goal of the bee is to take the pollen back to the nest to feed bee larvae, but some of it rubs off onto the reproductive parts of other flowers. Nectar (sugar water produced by the plant) is the fuel for adult bees, and is also added to nest cells to feed larvae as they hatch.

Pollinators are responsible Worldwide for:

- Eighty percent of the food plant species
- More than half of our fats and oils (cotton, oil palm, canola, sunflowers)
- About 1,000 of the about 1,330 plants used for food, beverages, fibers, condiments, spices, medicines
- \$40 billion in products annually in the U.S.
- Most of our wildflowers

North American Honeybees

Our honeybees are in a severe decline from the spread of diseases and parasitic mites, invasion of Africanized honeybees, exposure to pesticides, climatic fluctuations, and the elimination of government subsidies for beekeepers.

Colonists, looking for a bigger supply of honey than the native bees produced, introduced the honeybee from Europe 400 years ago. Providing a steady stream of honey requires seasonal migration following blooming cycles, so the early American beekeepers moved their colonies with difficulty by wagons, steamboats, and trains. The 1940's brought new highways and trucks, and a more reliable way for beekeepers to migrate with their hives, following the flowers.

After World War II, a boom in suburban development and agriculture took out much of the natural habitat of native bees. Modern agricultural methods destroyed many of the pollinators that made farming possible. Beekeepers found an untapped market, and went from paying farmers for use of their blooming crops, to charging farmers for their pollination services.

In the 1980s, widespread attacks by nonnative parasitic mites destroyed many honeybee colonies, and pesticide free land where bees can safely forage without being poisoned became increasingly hard to find. For example, after the pesticide Sevin is applied to crops, worker bees carry the contaminated pollen back to the hive, where it can affect the colony for months, and kill many of the bees. PennCapM (the insecticide for controlling corn rootworm) is a toxic nerve poison in pollen-sized beads. Bees pick up the pellets along with the pollen and carry them back to the colony. Corn growers rely on wind-pollination instead of bees, so they see PennCap-M as a cheap and efficient control for rootworm.



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Today, with the increased difficulty in raising healthy bees, demand for the services of migratory beekeepers increases. Those who suffer losses can move their hives away from where the pesticide is used, but some are bankrupted by massive bee kills, adding to the long-term decline of commercial honeybees. Honeybees have become a threatened species, which will have adverse effect on agriculture, and much of our food supply.

Commercial Honeybee Colonies in the US:

Late 1940's	5.9 million
1985	4.3 million
1995	2.7 million

With the decline of honeybees, the best hope for long-term survival of many American farmers may be a backup system, including the recovery of native bees. Farms or orchards with no nearby wild habitat must rely on rented honeybees, but those with nearby woods or wild habitat can rely on native bees of many species to pollinate even the most demanding crops. Conventional farming would have to be more sustainable to encourage native bees, including growing cover crops like rye and clover, restoring native plants in roadsides and ditches for nesting areas, and reducing pesticide use.

Native Bees

The United States and Canada are home to 4,500 species of native bee of all sizes and colors. These indigenous bees are the major unseen pollinators, and are all at risk due to increased pesticide use and habitat loss.



The Plight of the Bumblebee

There are about 45 species of Bumblebees in the US. They are responsible for the 'buzz pollination' of certain flowers of the tomato family (tomatoes, potatoes, eggplant, and peppers), which have pollen inside chambers with tiny openings like a saltshaker. The bee must vibrate her body to shake the pollen out, making a buzz. Bumblebees are bred for greenhouse production of these crops.

In the early 1990s, bumblebee colonies from Europe, carrying an infectious disease, were shipped to the United States, and escaped the greenhouses. Native bumblebees had no natural resistance, and were destroyed by the exotic disease. The USDA put restrictions on uses of bumblebees shipped from Europe, to keep them from escaping greenhouses, but the bees still find their way out.



Bee-Friendly Landscaping

Pollen and nectar plants are important in landscaping for bees, but we can also help bees by making nests or providing materials for a nest. We can safely share our gardens with bees if the nests are located far enough away from decks, patios and playing areas. Nests should also be located in the shade to protect larvae.

Bees in the City

Most bee species nest in the ground.

Some bees nest in preexisting cavities in old trees, wood, metal, or mason blocks. Carpenter bees chew their own holes into wood, which can be a nuisance when they choose doors and window frames, instead of dead tree branches, their natural habitat.

WHAT BEES LIKE

- **Native and heirloom plants**- cultivars and hybrids are selected for disease resistance and color, and usually do not contain enough pollen and nectar for bees
- **Successive blooming**- season-long to provide pollen and nectar to bees of all seasons
- **Water**- for drinking and creating nests, birdbaths, ponds or fountains.
- **Options**- 10 or more species of pollen/nectar producing plants, and large dense patches of like flowers
- **Privacy**- low maintenance landscapes- solitary native bees make their individual nests in the ground or in trees
- **Pesticide-free plants**



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Bees

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Bringing Back our Native Bees

Bees and chemicals do not mix. Pesticides poison them, and herbicides remove food sources and nesting materials. IPM (Integrated Pest Management) is important in maintaining healthy populations of native bees, monitoring pest levels and only applying chemicals when absolutely necessary.

Honeybee hives can be moved away from fields prior to spraying, but wild bees, and especially the small solitary bees are very vulnerable to pesticides. ***Ironically, heavy pesticide applications kill the bees that for many plants would improve quality and yield.***

...researchers found that in fields with both wild and domesticated bees, pollination efficiency was up to five times as high as that in fields without wild bees
 Henry Fountain, New York Times, Science Section, 8/29/06

IPM Tips for home gardeners, landscapers, and farmers

- * Monitor beneficials as well as pests
- * Be cautious when selecting pesticides- some are extremely toxic to bees
- * Do not use systemics (move throughout the plants, including the flowers) or dusts (cling to their hairs)
- * Apply pesticides at times when most bees are not out, and follow directions for recommended intervals
- * Know drift distances under different weather conditions
- * Avoid spraying directly on flowers
- * Remember that lawn chemicals can harm ground nesting bees
- * Use non-toxic methods of weed and insect control



Pesticides highly toxic to bees:

- | | | |
|--------------|--------------|------------|
| aldrin | bendiocarb | carbaryl |
| chlorpyrifos | diazinon | dichlorvos |
| dieldrin | dimethoate | endosulfan |
| EPN | fenitrothion | fenthion |
| heptachlor | | |

Diversity Bees, like the plants they evolved with, are very diverse in species and in habits. With the exception of the big bumblebee, most native bees are often overlooked. Unlike the social honeybees, which live in hives and colonies, almost all native bees are solitary, and the 'single mothers' forage, construct nests, and raise larvae on their own.

Some Native Bees	Appearance	Solitary	Pollinate	Other
Carpenter Bee	Similar to bumblebees, but with shiny black abdomen. Males have white markings on their head and no stinger.	X	passionfruit, blackberry, canola, corn, pepper, pole bean, and rhododendron (but often "rob" flowers by chewing into the side instead of pollinating them)	Wood chewing bee, can cause damage, prefers softwood, unpainted wood.
Blue Orchard Bee	Iridescent blue or blue-green, smaller than the honeybee.	X	many kinds of orchard fruit trees (except citrus)	Non-aggressive, more efficient than honeybees.
Bumblebee	Fuzzy, yellow & black stripes.		tomato, eggplant, pepper, potato, beans, clover, berries	Work harder, faster, and in cooler weather than honeybees.
Squash Bee	Large and orange-brown, between the size of a honeybee & bumblebee.	X	mainly pumpkins, squash and gourds	Can work in the dark, and cloudy cool conditions (honeybees do not).
Leafcutter Bee	Black with silvery white hairs, bands of white hairs on the top of the abdomen.	X	mainly legumes, sometimes carrots	Cut leaves to line their nests, more efficient and gentle compared to honeybees.



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The Bad Reputation

Wasps are often confused with bees and have developed a taste for human food especially meat and sugary drinks. Bees, on the other hand, are not interested in our food, they are too busy foraging for pollen and nectar from plants. Wasps are mostly predatory, hunting for small insect prey. When they fly around plants and land on flowers, they are usually looking for prey. Sometimes, you will see certain wasps in flowers, but these are usually beneficial wasps looking for a drink. Wasps have no interest in pollen, and their smooth bodies lack the parts bees have for pollen transport.

Female bees and wasps have stingers, used mostly for defense (Some wasps use them to paralyze prey). Bees and wasps usually only sting when they feel threatened. Even the more aggressive Africanized honeybee (or killer bee) attacks mostly in defense. Most bees are simply too busy to take notice of us. For male bees, their bark is worse than their bite. Males cannot sting, despite their occasional aggressive behavior. Females can be recognized by the yellow, purple, or white pollen on their legs, head, or bellies. Native Solitary bees do not sting because they have to defend.



Shrubs & Trees for Bees

Barberry	Linden
Black Gum, Tupelo	Maple
Butterfly bush	especially Red Maple, Amur Maple
Clethra alnifolia	
Crabapple	Persimmon (Diospyros)
Dogwood	Red Bud
Euonymous – some species	Rhododendrons and azalea
Fruit Trees-	Serviceberry
Apple, cherry, plum	Sumac
Golden Rain Tree	Tuliptree
(Koelreuteria paniculata)	Viburnum
Holly (Ilex)	Willow
Hydrangea	Witchhazel

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Farmers often rent honeybee colonies from apiculturists [to help their crops grow]. But honeybees aren't particularly efficient pollinators. For one thing, they don't always flit enough between male and female [flowers]. And the number of managed honeybee colonies is in decline in the United States and elsewhere because of overuse of pesticides and other problems. So one goal for researchers is to see if honeybee pollination can be enhanced.

Henry Fountain
 New York Times, Science Section, 8/29/06