



THE FOOD & WATER
INSTITUTE

BEE-FRIENDLY GARDENS AND URBAN BEEKEEPING

INTRODUCTION

Every gardener knows that bees are a common sight in their garden. Not everyone, however, knows what a vital role these tiny, diligent workers play amidst their flowers and vegetables. With the exception of root vegetables and herbs, everything we grow in our gardens to eat is the product of the *pollination of a flower*. While many flowers are wind or bird pollinated, many of the plants we grow for food are pollinated by bees, and without adequate visits from these insects would either set no fruits at all, or set dramatically smaller, misshapen, poor quality fruits. Plants in the squash family in particular rely heavily on bees, due to their separate male and female flowers and subsequent lack of ability to self-pollinate – they even have their own specialist type of squash bee. Gardeners who want the best possible harvest would do well to make their gardens as welcoming as possible to bees! This could involve becoming a beekeeper if you are so inclined, or simply going to the effort to plant a few native wildflower species amidst the other plants in your garden. This guide will introduce you to some of the details of the bees' life cycle, give ideas for plants that can be added to a garden to encourage bee visits, and introduce the practical facts about urban beekeeping.

FLOWERS THAT WILL BRING IN THE BEES

If we want to ensure the best pollination of our garden plants, it is best to encourage lots of visits from bees throughout the growing season. The best way to do this is to offer the bees a wide variety of flowers on which to dine – remember, from a bee's perspective, they're not coming around your garden to do you a favour and pollinate your plants; they're coming to collect pollen and nectar for food! The following is a selection of flowers that will attract a variety of bees to your garden, grouped by when they bloom in the season – planting a few from each group will ensure that there is always something inviting in your garden to encourage bee visits.

Early Blooming	Mid-Season	Late
Blueberry	Blackberry	Aster
Cottoneaster	Cat Mint	Beggar's Tricks
Crabapple	Catnip	Borage
Cranberry	Chives	Coneflower
Crocus	Dahlia	Cornflower
Foxglove	Hyssop	Cosmos
heliotrope	lavender	Goldenrod
Hazelnut	Raspberry	Pumpkin
Heather	Sunflower	Sedum
Primrose	Yarrow	Squash
Willow		

NATIVE FLOWERS, EXOTIC FLOWERS, HYBRIDS AND HEIRLOOMS

The type of bees that visit your garden will depend largely upon whether your flowering plants are native or exotic. If you garden includes lots of native flowers, you will see visits from lots of native bee species; exotic flowers, on the other hand, will tend to attract only honey bees. Another important concern when choosing flowers is whether they are hybrid varieties. Most hybrids (like the mule offspring of a donkey and a horse) tend to be *sterile* - and as a consequence they may produce little or no nectar or pollen for the bees to eat – an unpleasant surprise for a bee coming around in search of food! So planting a bee-friendly garden should involve more heirloom flowers and fewer hybrids, and more native flowers.

MAKING A BEE-BATH

Bird-lovers know that a great way to encourage birds to visit their yard is to set out a shallow bowl of water in which birds will bathe. Bees will be attracted to water in much the same manner, but you must make the water shallower for them, or they may crash and drown! A very simple, economical, and attractive way to do this is to simply fill a regular bird bath with stones, such that the top of the stones are still above the water. This way the bees can find a suitably shallow spot to enjoy a bath without drowning.

MAKING A SOLITARY BEE HOUSE

Bird baths to bee baths, and now bird houses to bee houses – just as it is fairly easy to construct a suitable home for birds and just set it out and wait for them to come and set up, it is easy to encourage bees to nest in or near one's garden by simply giving them appropriate lodgings. The type of bees that will set up their nests in your bee house will be *solitary bees* – that is, bees that do not live in hives. There is no queen/worker division of labour; it's more like a bee apartment complex! Here's what bees look for in a new home:

- ❖ A box open on one side, about the size of a milk carton – you can actually *use* a milk carton, with the top cut off!
- ❖ If such a box is to be made from wood, avoid cedar.
- ❖ Bright colours – paint the exterior of your bee house a bright colour, but be sure to use a paint with zero (or at least very low) VOC (volatile organic compounds) – otherwise your paint might be toxic to the bees.
- ❖ If you are planning to have more than one of these bee houses, paint them different colours to avoid confusing your bee residents.
- ❖ Fill the box with some type of nesting tubes – you can buy these from a garden store or make your own by wrapping a sheet of brown paper around a pencil and taping it into a tube. These tubes should be about 6 inches long and sealed at one end – you can staple them, tape them, or fold them if they're long enough to make two each.
- ❖ The bee house should be placed such that the nesting tubes lay horizontally, with the opening in the box on the side rather than the bottom.
- ❖ Your bee house should be at about eye-level in an area that is sheltered from the rain, facing south or east.
- ❖ The bees that come to live in your bee house will build their nests with clay, so either dig down to a layer of moist clay in the ground below your bee house or simply keep a bowl of moistened clay available nearby.
- ❖ You can also buy suitable bee houses online, or experiment with alternative designs – you could use old pots instead of a box or simply drill appropriate nesting tubes from a block of wood.

Once your bee house is up and the weather is appropriate (12-14°C), you should start to see bees taking an interest in your bee-house – flying around the house, taking “mental snapshots” of it as they search for a suitable nesting spot. Eventually they should take up occupancy, although it may not happen the first season. If you have a lot of trouble attracting solitary bees to your bee house, you can purchase them from a garden store or local beekeeper.

BEEKEEPING WITH HIVES

When people think of beekeeping, they think of large hives, beekeepers' suits, queens, workers, drones, and of course, honey. Unfortunately, there are a few restrictions that make keeping hives difficult. In Ontario, it is illegal to have a bee hive within 30 meters of a property line that abuts with a residence or land used for any sort of public assembly or recreation. Unfortunately for us city-dwellers, this makes most of our backyards unsuitable for bee hives. Luckily there are often local beekeeping organizations that one can join to learn more about keeping hives of honeybees.

FOR THE BEE-ENTHUSIAST – AN INTRODUCTION TO THE HONEYBEE LIFE CYCLE

Honeybees have sophisticated social structures with different social castes and an intriguing system of communication. Almost everyone knows at least the basics – that there is a queen bee, and all of the bees in the hive are her progeny. Many people may not realize that virtually all of the bees they might see foraging on flowers – the worker bees – are female. Male “drones” live only to mate with a virgin queen bee, after which they shortly die. Male bees have half the genetic material of a female – 16 chromosomes for males, 32 for females. There is typically only one queen in any given hive; new queens are produced when an old queen is aging or has already died, by selective feeding of royal jelly to new females. Male drones and new queens emerge early in the season and fly away from home to mate. Afterwards the drone dies and the queen returns to the hive and begins to lay eggs. These eggs will be either fertilized (from her one-time mating) and develop into female workers (or new queens, if they are fed enough royal jelly), or unfertilized. The unfertilized eggs each contain half of the queen's DNA, and will develop into new male drones.

Worker bees are the most abundant and active social caste in a bee hive, and do all of the foraging and most pollination of flowers (male drones do visit flowers too, for nectar to fuel their flights to find mates). Bees collect nectar and pollen from flowers; the nectar is basically just calories (sugar), while the pollen is rich in proteins, lipids, and other important nutrients that bees need. Nectar becomes honey through thickening by evaporation of the water in worker bees' mouths. Honey and bee pollen are both harvested by humans for food or supplements. Honeybees produce other important substances - royal jelly is secreted by worker bees and fed to larval bees. Royal jelly plays a crucial role in the development of new female honeybees – if their feeding of royal jelly is terminated after about three days, the larvae will develop into sterile female workers, while if larvae are fed royal jelly until adulthood they will develop into fertile new queen bees. Another important secretion of honey bees is wax, used as a structural building block of the honeycomb cells for new young. Royal jelly and beeswax are both harvested by humans, for a nutritional supplement and ingredient in skin creams in the case of royal jelly, and for candles, moulds, and balms in the case of beeswax.

Communication in honeybees involves a fascinating “bee dance” – when a worker bee returns to the hive after locating a particularly choice foraging site, she will perform a very specific “dance” over the surface of the hive, bumping into other workers and catching their attention. This dance manages to communicate all of the relevant information about the flowers she has found – which direction to fly, how far away the flowers are, and how excited she is about the find – if she's located a particularly good foraging site, lots of workers will respond to her dance and leave in search of the flowers. The location information is relative to the position of the sun, but the “bee dance” works even on cloudy days.

POLLINATOR DECLINE

There is widespread concern about the decline in abundance of pollinators and the consequences that this could have on our economy and food supply – around 30% of *all the food we farm* is dependent on pollination by bees, which amounts to about \$15 billion in the United States. One of the major threats to bees is widespread pesticide use, so a very important rule for creating a bee-friendly garden is to **AVOID USING PESTICIDES**. Choosing our flowering plants with bees in mind or going so far as to set up bee houses amidst our gardens is one simple way that we, as gardeners, can both help maintain pollinator populations and improve our own gardening experience and harvests!