

Bees and Pollination Information Pack



Working with the Centre for
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Introduction

Plants and animals are found living side by side in different habitats. Their lives are linked together through food chains and webs, and also as part of their life cycles.

Flowering plants and pollinating insects rely on each other to survive. The flowers provide food for the insects, while the insects help the plant to reproduce.

Pollination

Pollination is part of a plant's life cycle. It creates new seeds so the plant can reproduce.

Flowers can have both male and female parts. Some plant species have flowers with both male and female parts, while others have separate male and female flowers, either on different plants or together on the same plant.

Pollen can be thought of as the male sex cells of the plant. For reproduction to take place, these have to join with the female sex cells, which are contained in the eggs, called ovules. Pollen is created on the anthers, while ovules grow in the ovary.

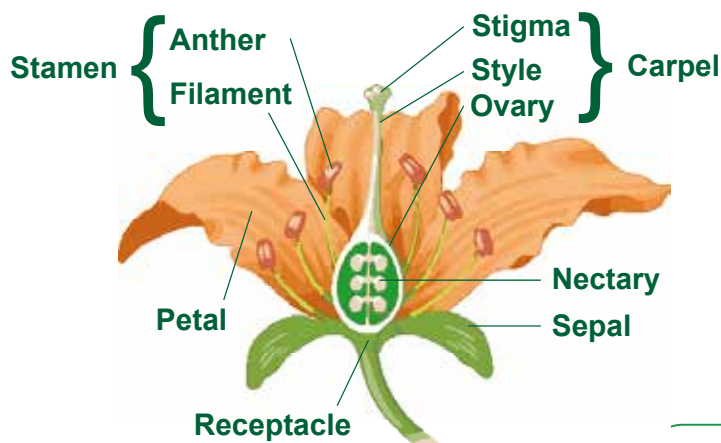
Pollen is carried from flower to flower by the wind, or by insects and other animals.



'Lavender, an insect-pollinated plant'

Insect-pollinated plants have bright flowers and a strong scent to attract insects. Their flowers also make nectar, a sugary liquid that is food for insects and other animals.

The nectar is at the base of the flower, so the insect must move past the anther and stigma to get to it. The pollen from one flower's anther sticks to the insect or animal's body. It is transferred to another flower's stigma as the insect moves from flower to flower.



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Not all insects visit flowers just for nectar. Some, like bumblebees, also eat pollen because it contains lots of protein. Larger flowers can reflect the Sun's warmth onto insects when they climb into the flower. This helps warm them up, especially in the early morning when it is cold.

Wind-pollinated plants have large, feathery anthers that allow the wind to 'catch' pollen and take it to the large, fluffy stigma on other flowers. Their flowers don't need to be bright and scented.

When pollen lands or sticks to a stigma, each pollen grain grows a tiny pollen tube. These reach down into the flower's ovary until they each meet an ovule.

When the male and female sex cells join, fertilization takes place. This creates new seeds that grow and can be dispersed, ready to germinate and grow new plants.



'Ragweed, a wind-pollinated plant'

Pollen

Pollen looks like a fine, yellow dust. It is made of tiny grains you need a microscope to see. Depending on the plant, these grains can be from about 0.005mm to 0.1mm across.

Each species of plant has pollen which is a unique shape and size. Plants can only reproduce using pollen from the same species, although some can use pollen from a plant that's closely related to them.

Pollen from wind pollinated plants is large and light, so the wind can easily carry it from plant to plant. Pollen from insect-pollinated plants is small and sticky, to help it stick to visiting insects or other animals.

Some people have an allergic reaction to pollen, known as hay fever. This can lead to watery eyes, sneezing and itchy eyes, throat and nose.

Some plants do not use pollen and seeds to help them reproduce. Some, such as mosses and ferns, release spores (fertilised eggs) into the air, ready to form new plants where they land.

Pollination even happens underwater. Some water plants, such as sea grasses, release their pollen into the water around them.

Pollen is helpful in archaeology. By studying the pollen found at archaeological sites, it is possible to learn more about what people grew and ate thousands of years ago, or what the climate was like. By comparing the pollen found with that from other sites, archaeologists can even work out the age of a site and its remains.

Fossilised pollen has been found, dating back over 350 million years.



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Pollinators

Many insects and other animals are plant pollinators:

Insects	Animals
Bumblebees	Birds
Honeybees	Bats
Solitary bees	
Wasps	
Hoverflies	
Flies	
Moths	
Butterflies	
Beetles	

Insects like bees and hoverflies are the most important pollinators in the UK.

Crops

Pollinating insects are important because they pollinate many crops as well as the flowers we enjoy in gardens, parks and the countryside.

These crops include:



Oilseed rape, used to make vegetable oil



Orchard fruits, like apples, pears, plums and cherries



Soft fruits like strawberries, raspberries and blackberries



Vegetables like broccoli, cauliflower, lettuce, parsnips, cucumber, peppers and pumpkins, tomatoes and peas.



Beans

Insect pollinators like bumblebees are very important. If there are no insects to visit and pollinate these crops, it will be much more difficult to grow these fruits and vegetables

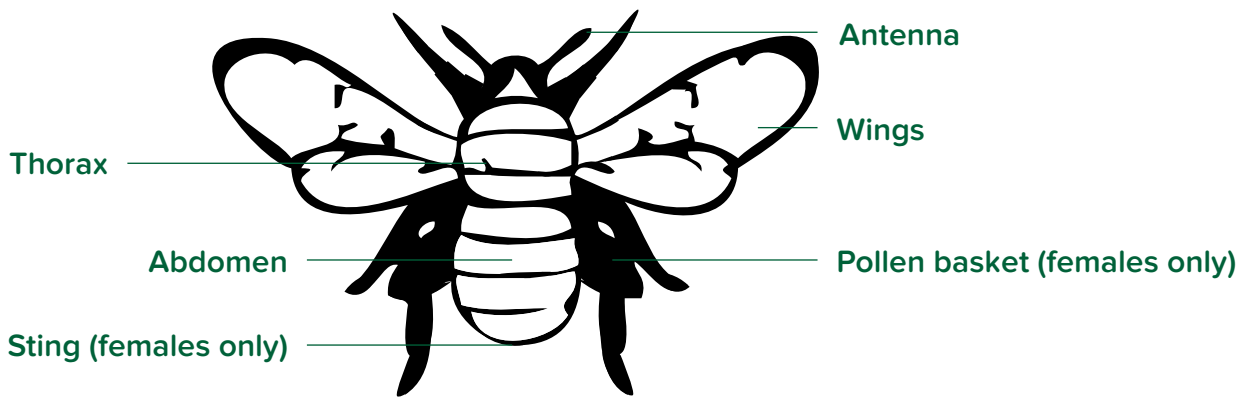
In some countries where the loss of bumblebees is greater than in the UK, farmers have to pollinate some crops by hand – a slow and difficult job.



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Bumblebees

Bumblebees are the largest type of bee.



There are 24 species found in the UK. In the Big Bumblebee Discovery each bumblebee will be classed into one of six colour groups.

Bumblebees are mostly found in cooler, northern climates although some species are found south of the Equator.

Bumblebees look quite different from honeybees and solitary bees. The main difference is that bumblebees tend to be larger (they are the largest type of bee) and they are also covered in dense hair. Wasps, in comparison, have a smooth body and legs, and their bodies are long and thin.



Bumblebees can be up to 25mm long but they weigh less than 1g (about the same as one grain of rice!). Like all insects they have three pairs of legs. Bumblebees have two pairs of wings, one large and one small. The small wings are joined to the large wings by a row of tiny hooks so they beat together.

A bumblebee's buzz does not come from its wings. Instead, this is the sound of the flight muscles that move them. These muscles fill almost all of the bumblebee's upper body, or thorax. These muscles need to be warm before a bumblebee can fly (at least 30°C). When cold, a bumblebee will 'shiver' a bit like a human. This movement warms the flight muscles until they are ready to fly.

Bumblebees have eyes but see the world differently to humans. They can see some wavelengths of light that we cannot, such as ultraviolet light. But bumblebees cannot see red. Instead, they are attracted to ultraviolet patterns on flowers, including red flowers, which humans cannot see.

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Bumblebees in pollination

Bumblebees have a thin tongue called a proboscis which lets them reach into the flower to find the nectar. The bumblebees use nectar for energy and take some back to the nest to make honey for their young. However, bumblebees do not make much honey so are not used to produce the honey we eat.

Their bodies are covered in hairs giving them their furry appearance. When bumblebees fly these hairs pick up a charge of static electricity and this helps attract pollen. When a bumblebee visits a flower, these hairs brush against the anthers, rubbing off pollen, which sticks to the hairs.

This grooming moves the pollen to special pollen baskets on their rear legs. These are flat, shiny patches surrounded by long hairs that keep the pollen in place. The pollen in each basket may only weigh around 0.01g, but each can store around a million grains of pollen.

The pollen that gets brushed into the pollen baskets gets taken back to the nest for the queen and larvae to eat, whilst pollen which is on the bumblebees body can rub off onto the stigma when the bumblebees visit another flower – this pollen is used to pollinate the plant.

Bumblebees have a unique way of pollinating some flowers, thanks to their buzz. They pull the flower close to them and buzz their wings powerfully. This shakes the pollen from the flower on to their body.

Bumblebees leave a scent on flowers they visit. This tells other bumblebees that it's not worth visiting that flower for a while, until it has created more nectar and pollen.

Life in the nest

Bumblebees are social insects and live in large groups in a nest. Each group is called a colony. Bumblebee colonies contain a few hundred bees and, depending on the time of year, will also contain eggs and larvae.

Bumblebees like to nest in dry, dark places, like rubble. Many make nests in the ground but nests can be found in any dry, shady place, like under a shed, in an upturned flowerpot or under rubble.

Bumblebee nests are not neat like honeybees' honeycombs. Inside, the queen builds wax 'cells' to hold eggs, honey and pollen stores. Each cell is like a little pot. The cells are joined together in a rough ball shape.

While bumblebees do store honey in the nest for food, they only keep a few days' worth at one time, because they do not need a large store of honey to last all winter.

To create honey the bumblebees regurgitate (bring back up) some of the nectar they have drunk from the flowers they visited. If the nest gets too hot the workers will stand at the entrance and fan out the hot air, and fan in cooler air with their wings.

Together these evaporate some of the water from the nectar, making it darker and thicker.



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The bumblebee life cycle

Most bumblebees live for around 9 – 12 months.

In early springtime the queens emerge from the nest where they have hibernated over the winter. They each find new nesting places and rear their first batch of eggs.

To do this, each queen needs to build her strength, as she will be weak after months of hibernation. She must visit lots of early flowers and find the nectar and pollen she needs.

These first eggs grow into female worker bees. Their job in the nest will be to rear the other batches of eggs the queen will lay.

A bumblebee's life involves four stages: egg, larva, pupa and adult.

When the eggs hatch, small larvae emerge. These look a bit like maggots. After a few weeks the larvae spin a cocoon of silk around themselves and become pupae. In their cocoons the larvae transform into adult bumblebees. This process is called metamorphosis.

Like other insects adult bumblebees have a hard outer skeleton (called an exoskeleton) under their hairs. So once hatched, bumblebees cannot grow larger during their adult life.

In late summertime the queen lays a special batch of eggs that hatch into male bumblebees and new queens. After mating, the male bees die, as do the old queen and the female worker bees she laid during the spring and summer.

The new queen bees survive and hibernate over winter, ready to lay the next generation of bumblebees next spring.

Flights and travel

When finding nectar and pollen a bumblebee can fly very fast – around 50km per hour. Bumblebees will visit the same areas each day. These are usually within a few kilometres of the nest. Each day, a bumblebee might make up to 10 trips from the nest, visiting thousands of flowers and travelling many kilometres.

Unlike honeybees, bumblebees do not 'swarm' (leave the hive en-masse to establish a new colony). Because most bumblebees die before winter, there is no need to find a new home until the queen leaves the nest in spring. Bumblebees are also not aggressive, and only female bumblebees have a sting. They will not use their sting unless they are threatened, so there is no need to worry when observing bumblebees.



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Threats to bumblebees

Although they can get nectar and pollen from some food crops, bumblebees rely on wildflowers for most of their food.

There are many reasons why bumblebees are in decline. Changes in farming and how we use the land means there are now far fewer wildflowers for bumblebees and other pollinating insects to visit than there used to be. In fact, we have lost almost all the UK's wildflower meadows in the last 70 years.

Changing agricultural practices, such as the use of new technology, means that farmers use meadows differently. Where meadows once had wildflowers, they may now be used for crops or grazing, meaning less wildflowers can grow.

Bumblebees are also at risk from disease, including diseases from other types of bee.

Finally, climate change and other environmental changes are also affecting bumblebee populations. Wild habitats are disappearing as more land is put aside for buildings or other uses. Our weather patterns are changing, affecting how bumblebees are able to nest, hibernate, emerge in spring and forage for food.

For all these reasons there are fewer bumblebees today, and two species have even become extinct in the UK in the last 80 years.

This loss of bumblebees does not just affect humans. As well as pollinating many of the crops we eat, bumblebees also play an important role in food chains and webs. For example, many other insects and birds feed on the plants that bumblebees pollinate.



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How to help

Anyone can help bumblebees by planting and growing the right kinds of flowering plants and trees, such as lavender.

You could also plant:

- ▶ apple or other fruit trees
- ▶ berries (like raspberries or blackberries)
- ▶ broad beans
- ▶ chives
- ▶ clover
- ▶ comfrey
- ▶ cornflowers
- ▶ foxglove
- ▶ geraniums
- ▶ honeysuckle
- ▶ heather
- ▶ herbs (like mint, sage, and rosemary)
- ▶ nasturtium
- ▶ wallflowers

Look out for mixed seed packs for cottage gardens, wildflowers and herbs.

About lavender

Lavender is an evergreen shrub, meaning it has leaves all year round. Lavender blooms from June to August, giving masses of beautiful, highly scented flowers.

There are many types of lavender but the most common is the English Lavender found in gardens, parks and farms across the UK.

Mankind's love of lavender goes back thousands of years. Lavender was found in Tutankhamen's tomb! It is believed that the Romans brought lavender to the UK.

Lavender has a long history of being used as a herb for cooking and medicine. For example, in the Middle Ages it was believed that a bunch of lavender would protect the wearer from the plague.

Today lavender is grown commercially in the UK. The crop provides essential oils for cosmetics, toiletries and herbal medicine, herbs for cooking and as a food crop for honeybees that create lavender honey.

Lavender grows well in well-drained soil in a sunny flowerbed or in large pots.

Terms and conditions

Find out more about the Great EDF Energy Experiment and the Big Bumblebee Discovery 2014 at www.jointhepod.org/experimentzone (terms and conditions apply).

