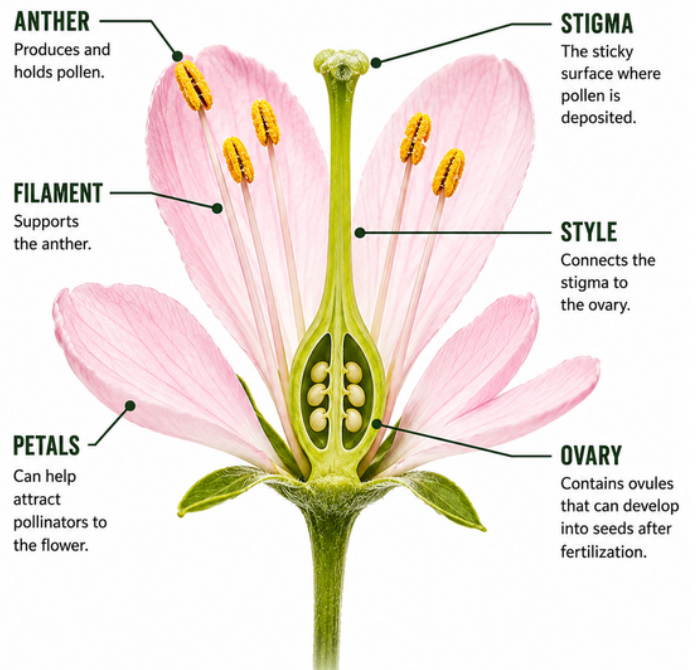


POLLINATION IN ACTION

HOW FLOWERS, BEES, AND FARMERS
WORK TOGETHER TO GROW OUR FOOD

Flowers do more than look and smell beautiful. They contain the structures plants use to reproduce. When pollen reaches the right part of a flower, it can begin a process that leads to the development of seeds and, in many plants, fruit.

A QUICK LOOK AT A FLOWER!



DIFFERENT WAYS TO GET THE JOB DONE...

POLLINATION ISN'T ONE-SIZE-FITS-ALL

Different flowers have different shapes and structures. That means one type of pollinator may be better suited to a flower than another.

HONEY BEE POLLINATION

FLOWER TO FLOWER

Honey bees visit flowers to collect nectar and pollen. As a bee moves around a flower, pollen grains stick to its body. When the bee visits another flower, some of that pollen may rub onto the stigma.

Honey bees are managed by beekeepers and can be moved to farms when large numbers of pollinators are needed during bloom.

LOOK FOR: A HONEY BEE MOVING POLLEN BETWEEN OPEN FLOWERS.

BUMBLE BEE POLLINATION

FUZZY POLLINATORS

Bumble bees are larger and fuzzier than honey bees. Their hairy bodies can pick up and carry large amounts of pollen as they visit flowers.

Bumble bees can also pollinate some flowers in a way honey bees cannot: by buzzing!

LOOK FOR: A LARGE, FUZZY BEE COVERED IN POLLEN.

BUZZ POLLINATION

SHAKE IT OUT!

Some flowers keep their pollen inside tube-like anthers with tiny openings.

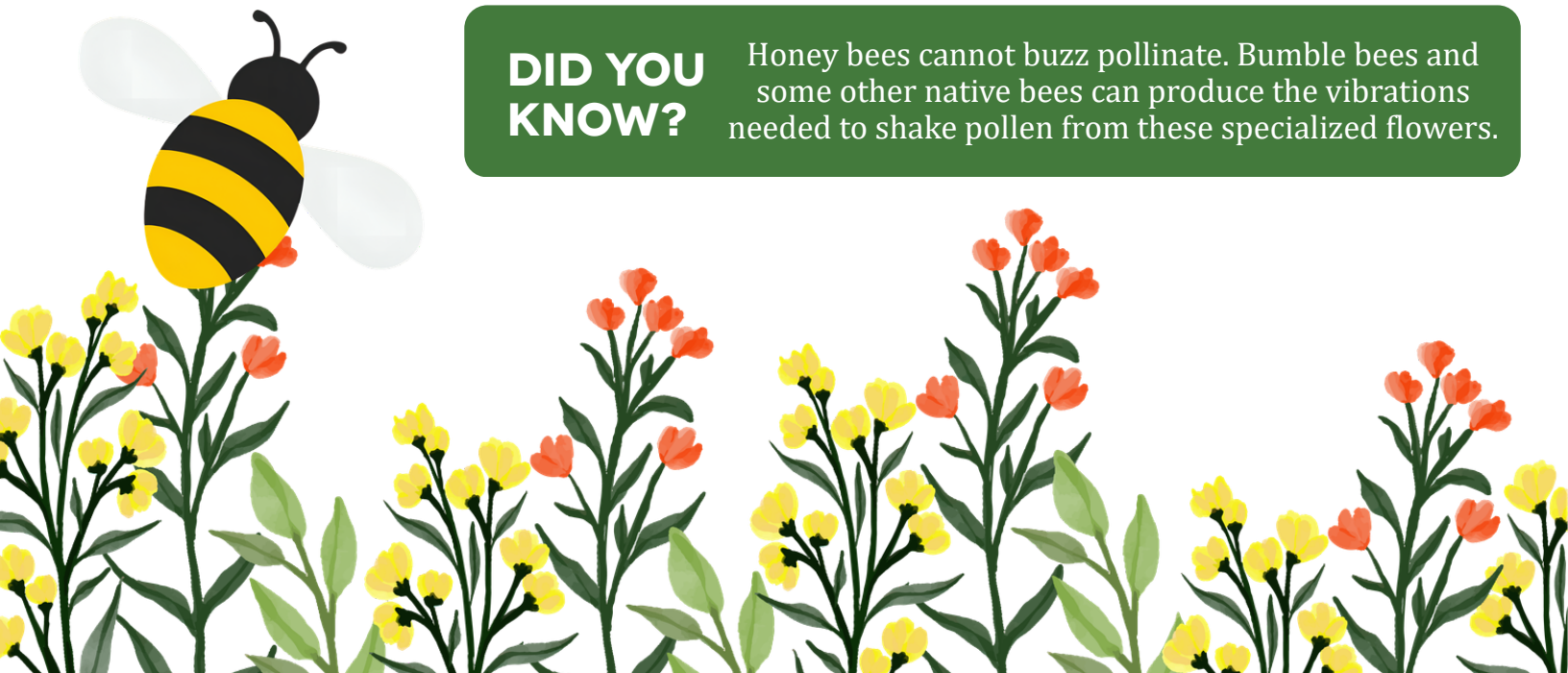
Certain bees, including bumble bees, can grab the flower and rapidly vibrate their flight muscles. The vibration shakes pollen out of the anthers and onto the bee.

This behavior is called buzz pollination.

BLUEBERRIES, TOMATOES, PEPPERS, EGGPLANTS, AND CRANBERRIES ARE EXAMPLES OF CROPS THAT CAN BENEFIT FROM BUZZ-POLLINATING BEES.

DID YOU KNOW?

Honey bees cannot buzz pollinate. Bumble bees and some other native bees can produce the vibrations needed to shake pollen from these specialized flowers.



WHEN FARMERS LEND A HAND...

HAND POLLINATION

Bees aren't the only way pollen can move from one flower to another. Sometimes, people do the job by hand.

HOW DOES IT WORK?



1 COLLECT



Pollen is collected from the anther of one flower.

2 TRANSFER



A person uses a small brush, cotton swab, or another tool to move the pollen.

3 POLLINATE



The pollen is placed onto the stigma of a compatible flower.

WHY POLLINATE BY HAND?

HAND POLLINATION
MAY BE USEFUL WHEN:

POLLINATORS ARE LIMITED

There may not be enough insects visiting flowers to provide reliable pollination.

PLANTS ARE GROWN INDOORS

Greenhouses and other controlled environments may have limited access to natural pollinators.

GROWERS NEED MORE CONTROL

Plant breeders and researchers may deliberately move pollen between selected plants.

A CROP IS DIFFICULT TO POLLINATE

Some crops may require extra help to achieve reliable fruit or seed production.

THE BIG TRADE-OFF

Hand pollination gives people greater control, but pollinating flowers individually can require a lot of time and labor.

For a farmer growing thousands of plants, that creates a challenge:

How could we pollinate many flowers efficiently when natural pollinators aren't available?



WHAT'S HAPPENING TO OUR POLLINATORS?

SMALL CREATURES. BIG JOB.

Bees and other pollinators play an important role in agriculture. Many fruits, vegetables, nuts, and seeds depend on animals to move pollen between flowers. But scientists have documented declines in the health or populations of many pollinators.

THERE ISN'T JUST ONE CAUSE!

Pollinator health is complicated. Scientists study several factors that can affect bees and other pollinators, including...

THE GOOD NEWS?

Scientists, farmers, beekeepers, conservationists, and communities are working to protect pollinators.

Creating and protecting pollinator habitat, providing diverse flowering plants, managing pests and diseases, and reducing harmful pesticide exposure are some of the ways people can support pollinator health.



HABITAT & FOOD

Pollinators need places to nest and a variety of flowering plants that provide pollen and nectar.



PESTS & DISEASES

Parasites, pathogens, and viruses can affect bee health.



PESTICIDE EXPOSURE

Some pesticide exposures can harm pollinators, making careful use and management important.



ENVIRONMENTAL & MANAGEMENT STRESS

Weather, climate, transportation, and other environmental or management conditions can also affect pollinator health.



THE AGRICULTURAL CHALLENGE



WHAT HAPPENS WHEN POLLINATORS ARE MISSING?

Imagine a crop is flowering, but there aren't enough pollinators available to visit all of its flowers.

Without successful pollination, the plants may produce fewer fruits or seeds.

Farmers still need a way to move pollen from flower to flower — and doing every flower by hand could take too much time.

YOUR CHALLENGE

How could you design a tool or system that helps pollinate flowers when natural pollinators are limited?

THINK LIKE AN AGRICULTURAL ENGINEER.

THINK BEFORE YOU BUILD

What can you learn from the way bees move pollen?

OBSERVE. DESIGN. TEST. IMPROVE.



MOVE POLLEN

Transfer pollen from one flower to another.



PROTECT THE FLOWER

Pollinate without causing unnecessary damage.



WORK EFFICIENTLY

Consider how the design could make pollination faster or easier.



BE REPEATABLE

Work on more than one flower.

