

POLLINATORS

USES:

Birds, Bees,
Butterflies,
Moths, Flies,
Beetles, Bats

WHAT ARE POLLINATORS?

Three-fourths of the world's flowering plants and about 35 percent of the world's food crops depend on pollinators to reproduce. More than 3,500 species of native bees help increase crop yields. Some scientists estimate that one out of every three bites of food we eat exists because of pollinators like bees, butterflies, moths, birds, bats, beetles and other insects.

HOW POLLINATION WORKS:

Pollinators visit flowers in their search for food (nectar and pollen). During a flower visit, a pollinator may unknowingly deposit pollen from a different flower. The plant then uses the pollen to produce a fruit or seed. Many plants cannot reproduce without pollen carried to them by foraging pollinators.



VOCABULARY

ANTENNA(E): The moveable, sensitive feelers on an insect's head, which detect odor and movement.

ANTHER: The part of a flower's stamen that contains the pollen.

CROSS-POLLINATION: Pollen is transferred from the flower of one plant to the flower of another plant.

FILAMENT: Supports the anther, which is where pollen develops.

INSECT: A six-legged, air-breathing invertebrate with a body that has well-defined segments, including a head, thorax, abdomen, two antennae and usually, two sets of wings.

INVERTEBRATE: An animal without a backbone.

MAMMAL: A warm-blooded vertebrate characterized by a covering of hair on some or most of the body, a four-chambered heart, and nourishment of offspring with milk from maternal mammary glands.

NECTAR: A sweet liquid secreted by flowers of various plants.

PETAL: A leafy flap in a flower, often brightly colored to attract animal pollinators.

PISTIL: The female part of a flower, which consists of the stigma, style and ovary.

POLLEN: A fine powdery substance, often yellow, produced by the anthers and collected by pollinators.

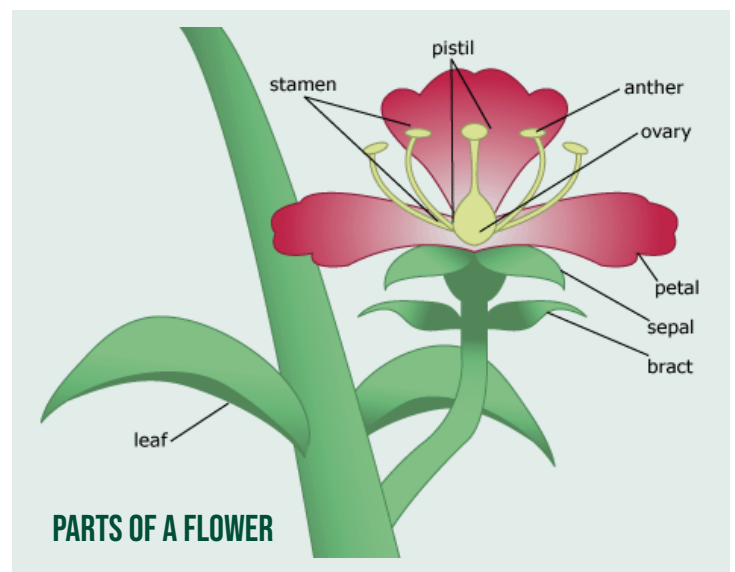
POLLINATOR: Moves pollen from the male anthers of a flower to the female stigma of a flower resulting in fertilization.

SELF-POLLINATION: Takes place when pollen is transferred from the stamen of one flower to the pistil of the same flower or plant.

STAMEN: The male part of a flower which produces pollen and consists of a filament and an anther.

STIGMA: The female part of a flower which receives pollen during pollination.

VERTEBRATE: An animal with a backbone.



POLLINATORS

HONEY BEES

Take the journey from flower to table:



1. Flowers produce nectar.



2. Honey bees collect pollen and nectar from blooming flowers and plants and store it in honeycombs inside their hives. These honey bees are called worker bees, and are exclusively all females.



3. They evaporate the water from the nectar which leaves thick, sweet honey. The wind from the bees' wings helps evaporation.



4. Beekeepers pull frames out of beehives. They take off the wax that covers the cells.



5. Beekeepers put frames in a machine called an extractor. It spins the frame very quickly, and the honey comes out.



6. The honey goes through a very small strainer to catch any pieces of wax.



7. Honey is sealed in jars and bottles.

BUTTERFLIES



Butterflies are very important pollinators. Look to these indicator species to help determine how healthy your surroundings are. Make sure your yard has plenty of butterflies and other insects happily buzzing about!

- The world's food supply depends on pollinators.
- Butterflies are an indicator species that tell us about the health of our environment.
- Butterflies are sensitive to changes in climate.
- Butterflies are sensitive to presence of harmful chemicals.
- Butterflies are sensitive to pollution in the air and water.

What can WE do?

- Provide a safe and attractive habitat.
- Plant both milkweed and nectar plants.
- Make sure your plants get plenty of sunlight.
- Determine moisture conditions.
- Make sure you are planting in good soil.
- Check the wind conditions before planting.



HONEY BEES AND AGRICULTURE

One third of the foods you eat directly or indirectly depends on pollination by honey bees. Many crops, including nuts, vegetables, alfalfa (used for hay), apples, cantaloupe, cranberries, pumpkins and sunflowers, are 90 percent dependent on honey bee pollination. Other products, such as beef and dairy, also depend on pollination. Cows eat alfalfa hay, which is pollinated by insects. Approximately 220,000 colonies of bees are used to pollinate alfalfa fields for seed production.

POLLINATORS

CAREERS: Entomologist, Apiarist,
Botanist, Honey Farmer,
Plant Scientist

SPOTLIGHT ON CAREERS:

ENTOMOLOGIST: An **entomologist** is a broadly trained and educated professional who studies insects. Entomologists are needed worldwide to help farmers and ranchers produce crops and livestock more efficiently by using sound pest management strategies. They also produce information about endangered species, fragile ecosystems and our environment, and help prevent the spread of serious diseases in plants and animals.

You can find entomologists in professions such as medicine, law, pharmacology, veterinary medicine, teaching, and research. They also work in many aspects of agribusiness as well as in private pursuits such as consulting. Many entomologists also work for local, state, federal, or international agencies.

Education is an important part in the process of becoming an entomologist. In high school, take a college preparatory curriculum and include as many science-based courses as possible. In college, a major in entomology is the best preparation for you; however, a well-rounded biological sciences program would be excellent preparation for graduate work. As an undergraduate, you will take courses in biology, agriculture, chemistry/biochemistry, mathematics, and statistics, as well as computer science, English, history, and the humanities. As a graduate student you will get experience in taxonomy, physiology, morphology, behavior, and pest management.

APIARIST (BEEKEEPER): **Beekeepers**, also known as **apiarists**, are responsible for ensuring the efficient production of honey and beehive by-products, such as wax and pollen, by managing colonies of honey bees located within an apiary (where bees are kept). Beekeepers also provide pollination services to horticultural and seed crop producers.

Many beekeepers are self-taught or learn their skills on-the-job. Attending workshops, conferences, talking to active beekeepers, and taking correspondence courses are great ways to learn the skills necessary to become a beekeeper.

It is helpful to complete coursework in areas such as agriculture, botany, biology, environmental engineering and horticulture. Pursuing coursework in these areas can help you acquire the necessary knowledge for becoming a beekeeper.

YOUR GARDEN CAN “BEE” ATTRACTIVE TO POLLINATORS

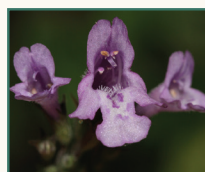
Give bees something to love all season. Plant continuously blooming annuals and native perennials to encourage visitors, including bees, hummingbirds, butterflies and other pollinators all season long. Go to <http://pollinator.org/guides.htm> to find plants that attract pollinators to your area.

ILLINOIS FAVORITES:

(Annuals)



Sweet Alysum



Lesser Calamint



Coreopsis



Cosmos

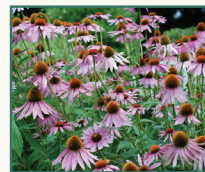
(Perennials)



Salvia



Butterfly Weed
(Asclepias Tuberosa)



Coneflower
(Echinacea)



Goldenrod
(Solidago)



Asters



Lemon Queen
Sunflowers



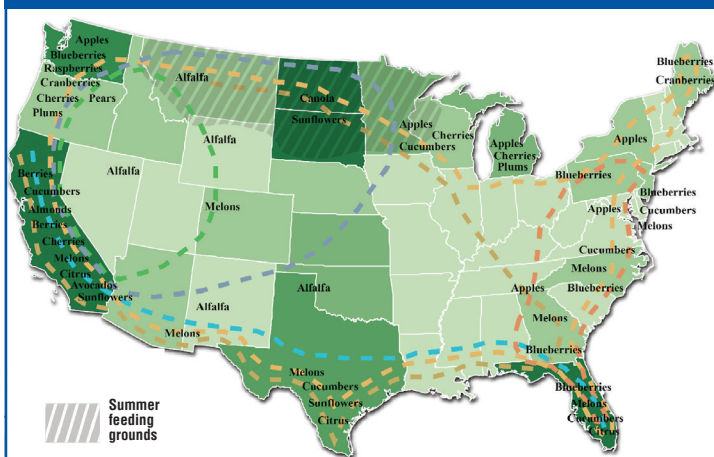
Teddy Bear
Sunflowers

POLLINATORS

DID YOU KNOW?

- Of the **100 crop species** providing **90 percent** of the world's food, **over 70** are pollinated by bees.
- Bees communicate by **dancing**.
- Honey Bees have four wings that stroke **12,000 times per minute**.
- The average honey bee lives about **1 month**.
- There can be **60,000+** honey bees in one hive.
- A hive of bees must fly almost **55,000 miles** to make one pound of honey.

Pollinator movement and crops in the U.S.



Total pollinated crop acres by state

Less than 20,000	150,001 to 250,000
20,001 to 80,000	250,001 to 500,000
80,001 to 150,000	More than 500,000

As of June 2014

Source: USDA, Economic Research Service; Sautzman (2011), with input from commercial beekeepers and apiculture experts, including Dr. Jeff Pettis and Dr. David Epstein, an entomologist and authority on pollinators with the USDA's Pest Management Policy. Crop production acres are from USDA, National Agricultural Statistics Service, 2012 Agricultural Census.

SCIENCE AT HOME

POLLEN POWER

All flowers need pollen to make seeds. Some pollen is light and smooth enough to be carried by the wind. Other flowers produce pollen that must be carried by insects and other animals.

Materials Needed:

Ruler	1/8 teaspoon
Pencil	Small bowls or cups
Black Paper	Straw
5 powders such as flour, baby powder, cinnamon, or other spices	Clear tape
	5 cotton swabs

Directions:

1. You will try different things with each of the powders and observe what happens. Make predictions about each powder.
2. Look at each powder with a magnifying lens. Make a hypothesis. Which powders look as though they are going to travel more easily by air? By animal? Why?
3. Make sure the black paper is placed in an area with no wind. Keep the short edge closest to you. Place the ruler next to the paper and mark a line half an inch from the edge closest to you. This area will be labeled "Powder Pollen Area." Place 1/8 teaspoon of one powder in the starting area. Place 1/8 teaspoon of the same powder in a small cup.
4. Place the tip of the straw near the pile of powder. Blow one quick small puff of air through the straw and record how far the pollen travels.
5. Dip your finger quickly in and out of the cup of powder. Roll your finger around on the sticky side of a piece of clear tape to show how much powder stuck. Place this tape in the correct box on the chart.
6. Dip the cotton swab quickly in and out of the cup of powder. Roll it around on the sticky side of a piece of clear tape to remove the powder. Place this tape in the correct box on the chart.
7. Repeat steps 3 to 6 for each powder. Record the results on the chart.
8. Take time to write your conclusion in one paragraph.
9. Please visit aginthe classroom.org for the chart to use with this lesson.

THE
IAA
FOUNDATION



www.iaafoundation.org

Illinois
AGRICULTURE
in the ClassroomSM

www.aginthe classroom.org