

Pollinators

Have you ever noticed the beautiful smell or bright colors of some flowers? Different flowers have different smells and colors that attract insects. Insects use the nectar made by flowers as food. In the process of getting the nectar, insects and other animals transfer pollen from flower to flower. The transfer of pollen from one flower to the stigma of another flower results in the formation of a seed. This process is called pollination.

Three-fourths of the world's flowering plants and about 35 percent of the world's food crops depend on animal pollinators to reproduce. Some scientists estimate that one out of every three bites of food we eat exists because of animal pollinators. In the United States, the pollinators we depend on most are bees.

Identify each pollinator:

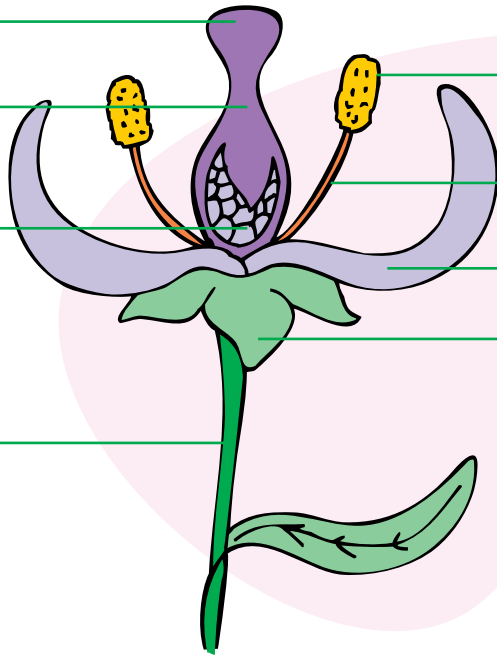
1. honey bee
2. butterfly
3. beetle
4. hummingbird
5. moth
6. bird
7. bat

Source: NRCS



Flower Power

Flowers contain the male and female reproductive organs of a plant. Flowers attract pollinators that carry the male pollen grains to the female stigma. Here the pollen grains germinate and eventually fuse with a female ovule, which then develops into an embryo that develops into a seed.



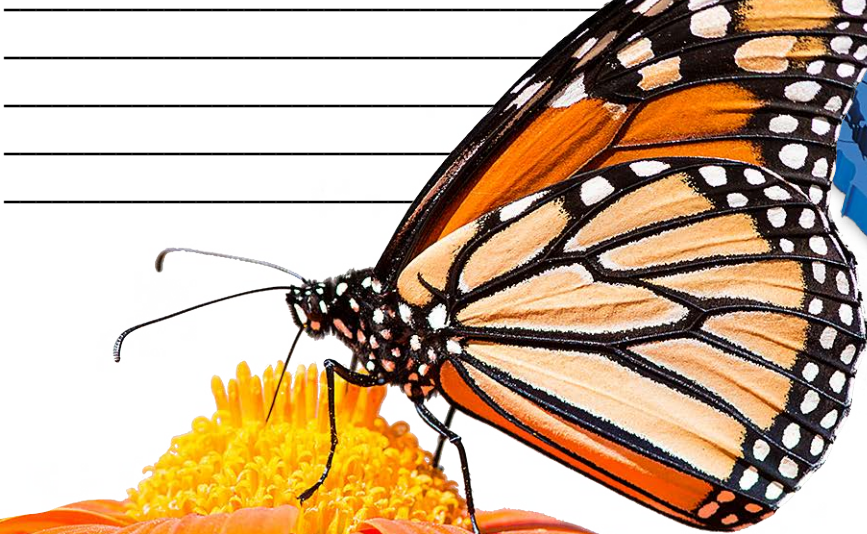
Plant Parts

Label the parts of the plant using these words: sepal, stamen, style, anther, stem, pistil, filament, stigma, ovary, petal.

Monarch Butterflies

Monarch butterflies are easy to recognize with their orange, black and white wings. These beautiful butterflies are important pollinators. The adult butterfly feeds on nectar from flowers while the caterpillar (larva stage) feeds only on the milkweed plant. Each year, monarchs migrate up to 6,000 miles roundtrip from their overwintering home in Mexico to summer homes in North America.

Can you name other animals that migrate in the winter?



istockphoto.com

Parts of the Honey Bee

After reading the information, label the bee with the words in bold.

Bees have a “skeleton” on the outside of their bodies called an exoskeleton. This exoskeleton is covered with branched hairs, which give it a fuzzy appearance. Bees use these branched hairs to feel and to collect pollen.

Head

Bees’ heads are shaped like triangles. Their heads contain the brain and primary sensory organs for sight, feel, taste and smell. The head also has glands that produce chemicals used for communication and royal jelly, which is a substance used as food to feed young brood and future queens.

Eyes: Two large compound eyes are for distance sight, and three simple eyes are for poor light conditions in the hive.

Antennae: Bees have two large antennae attached to their foreheads with thousands of tiny sensors that detect odors. Bees use this sense of smell to identify flowers, water, the colony and maybe even you. The antennae also have tiny hairs for feeling.

Mandibles: Bees’ jaws, called mandibles, are used for collecting pollen, feeding larvae, cutting food and carrying things.

Labium: When bees are feeding, special mouthparts that make up the labium are extended and form a tube through which nectar is drawn into the mouth. The labium ends in a ‘tongue,’ which is used to lap and suck nectar out of the flower. When not in use, the labium is retracted (folded).

Thorax

The thorax is the middle part of the bee where the wings and legs are attached.

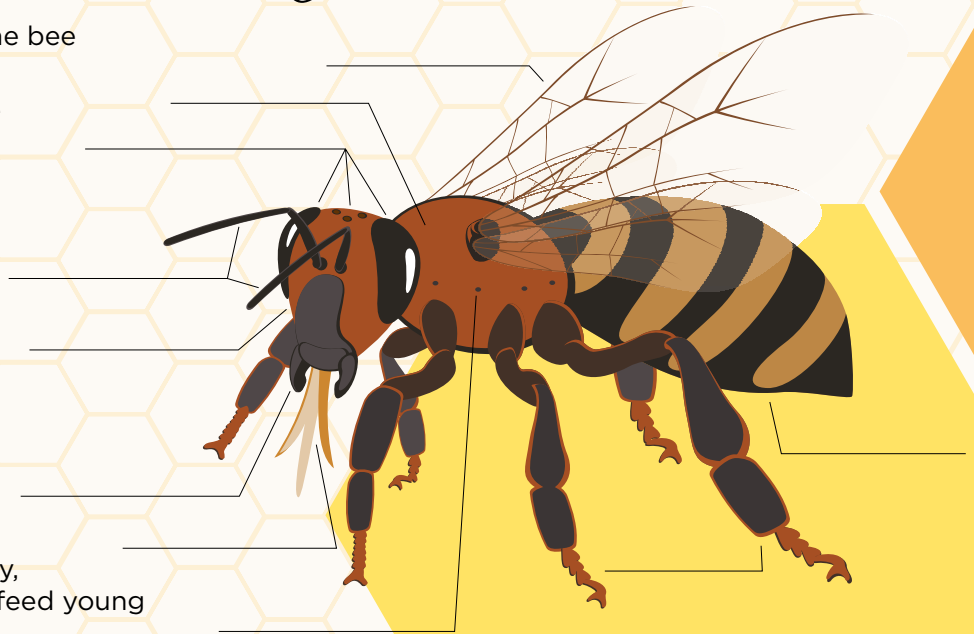
Wings: Bees have four wings that are hooked together in flight and separated at rest.

Legs: Bees have three pairs of legs. Each leg has six segments with taste receptors on the end. The forward legs clean the antennae. The middle legs help with walking and packing pollen onto the pollen baskets on their hind legs. The back (hind) legs contain special combs to brush, collect and carry pollen back to the hive.

Spiracles: These tiny holes along the bee’s thorax and abdomen allow the bee to breathe.

Abdomen

The abdomen contains the bees’ digestive organs, reproductive organs, wax and scent glands, and the stinger.



Types of Honey Bees

1. Queen: The largest of the bees, the queen mates with the drone and lays 1,000 to 1,500 eggs a day.

2. Drone: Drones’ primary purpose is to mate with the queen and to help control the temperature of the hive. They have bigger eyes than worker bees and don’t have stingers.

3. Worker: Female worker bees gather pollen, build honeycombs, make honey, keep the hive clean and feed the larvae.

Identify the queen, drone and worker bees.



Honey Bees by the Numbers

1. If a worker bee lives 42 days, how many weeks does it live?

2. If a queen bee lays an egg on April 4 and a worker bee develops in 20 days, when will the adult bee come out of its cell?

3. Queen bees lay about 1,500 eggs each day. How many eggs will she lay in a year?

4. A worker bee flies 15 miles per hour. How far could it fly in 20 minutes?

5. A worker bee makes $\frac{1}{12}$ teaspoon of honey in its life. How much honey will 12 bees make in their lifetimes?

6. A hive of bees must fly 55,000 miles to produce a pound of honey. How far must they fly to produce 5 pounds of honey?

7. If one bee colony produces 75 pounds of honey per year, how much honey will it produce in five years?

8. If a hive has 50,000 bees, but 10% of them die, how many bees are left?

9. A 12-ounce container of honey costs \$4.50 at your grocery store. How much does it cost per ounce?

10. The 16-ounce (1 pound) container costs \$5.60. How much does it cost per ounce?

11. Which container costs less per ounce?

12. Your recipe calls for 2 tablespoons of honey, and you want to double the recipe. How much honey do you need? What portion of a cup is that? (Hint: 1 cup = 16 tablespoons)

Wind Pollination

The wind also can pollinate plants. Wind-pollinated plants are different from insect-pollinated plants. Circle the correct word in each sentence.

- ◆ They are not (**scented** or **sented**) because there is no need to attract insects.
- ◆ They have small, (**feint** or **faint**) flowers because there is no need for (**bright** or **brite**) colors to attract insects.
- ◆ They have no (**nectur** or **nectar**).
- ◆ They produce (**pollun** or **pollen**) that is very light in texture, so it is easily (**blown** or **blone**) in the wind to increase the chance of pollination.
- ◆ Many of the world's most important crop plants are wind-pollinated. These include (**wheet** or **wheat**), rice, corn, rye, barley and oats.
- ◆ Most (**conifer** or **conifur**) trees also are pollinated by the wind.
- ◆ Many people are (**allergic** or **elergic**) to ragweed when its pollen is blowing in the wind.

Career Corner



For **Bob Morlock**, bees are more than just pollinators. He has enjoyed his career as a beekeeper for 40 years. Bob became interested in becoming a beekeeper after watching one work on his uncle's land and on a honey-extracting facility tour when he was a 4-H member. In college, Bob worked for several beekeepers. He started Morlock Honey Farms after buying a beekeeping business.

Being a beekeeper is a year-round job, and the location of his hives changes with the seasons. In winter when it is too cold for the colonies in North Dakota, he sends most of the hives to Idaho to be stored in potato sheds.

From Idaho, the hives are shipped to California to pollinate the almond orchards in early spring.

The hives then are sent to Texas and divided into several new ones with healthy worker bees and a new queen because the colonies need to grow.

The hives Bob moves back to North Dakota in May pollinate and make honey from canola, soybeans, alfalfa and clover. In July through September, Bob extracts the honey from the hives.








That little honey bear in your kitchen cabinet probably came from some of Bob's thousands of hives along with those from other beekeepers who make honey under the Sue Bee or Aunt Sue label.

Bob says being a beekeeper requires a lot of work, but he enjoys being able to be outdoors. He also knows he is helping the environment and the life of the bees. Bob reminds students, "Anytime you can help with the environment, remembering the honey bees when spraying or planting things that benefit them, is a big help."

Bob's advice for students who want to learn more about beekeeping is, "Do your research and ask questions."


Beekeepers

Beekeepers need to extract the honey from the hive. These are the steps necessary. Imagine you're a beekeeper, and number the steps in their correct order.

-  **Pull Frames Out of Hive** - Using a hive tool, lift the frames out of the hives.
-  **Extract the Honey** - Place the frames in an extractor that spins the honey from the frames. When the honey is removed from the outer portion of the frames, flip the frame and repeat the process.
-  **Brush Bees Off the Frames** - Using a soft-bristled brush, brush off any bees that may still be on the frames.
-  **Wear Proper Protection** - Wear a bee suit that covers your body, including your head and hands.
-  **Filter the Honey** - Pour the honey through a mesh filter to remove wax or other debris.
-  **Remove the Wax Caps** - When the bees fill a comb with honey in a frame, they place wax from their bodies over the hexagonal openings to keep the honey from spilling out. You need a sharp, warm knife to cut off the wax caps.
-  **Smoke the Bees** - Smoking helps keep the bees calm during harvest. Using a smoker that burns grass, twigs or paper allows you to open the hive and does not harm the bees.

Urban Toad Media

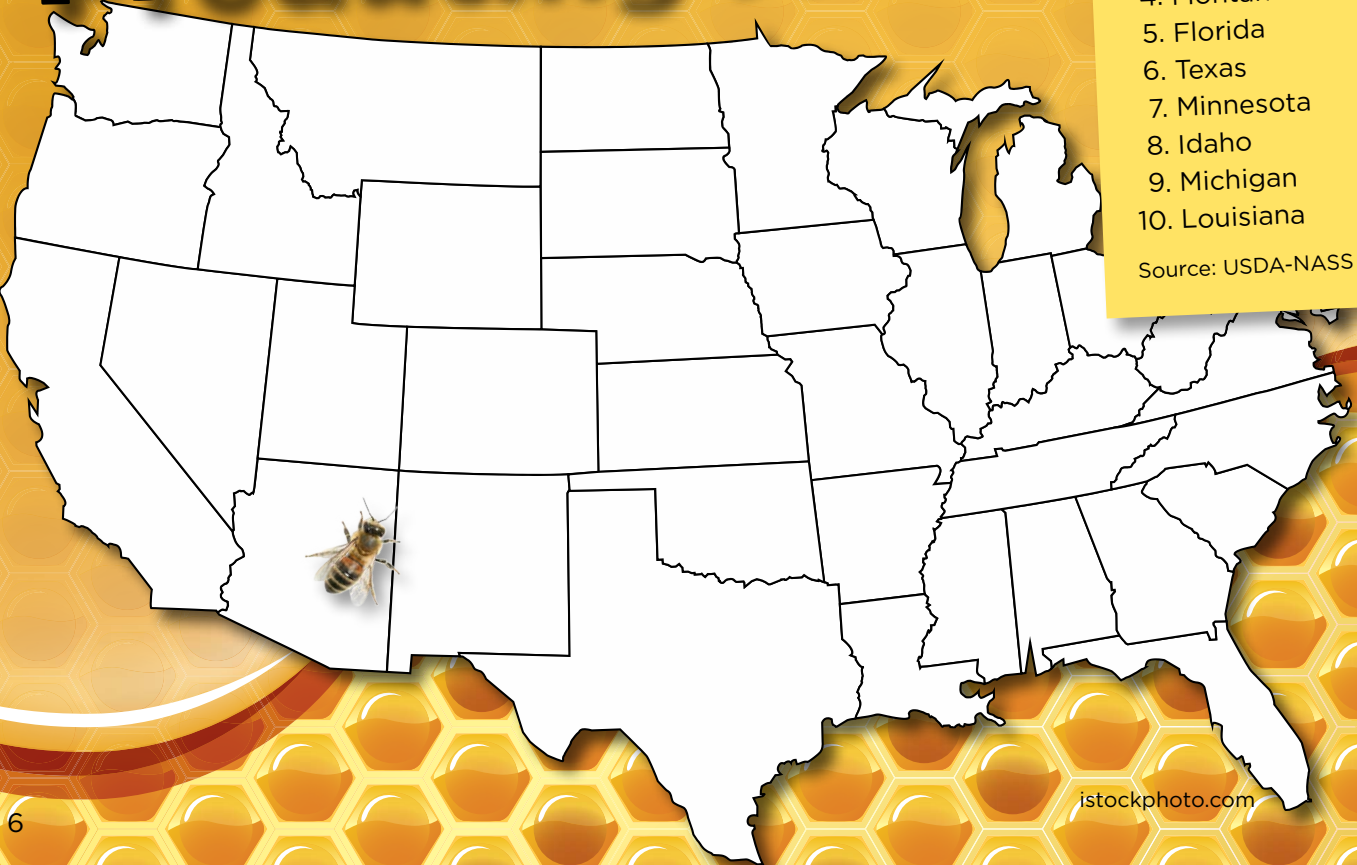
Top 10 Honey-Producing States



Number then color these states on the map.

1. North Dakota
2. South Dakota
3. California
4. Montana
5. Florida
6. Texas
7. Minnesota
8. Idaho
9. Michigan
10. Louisiana

Source: USDA-NASS 2017



istockphoto.com

Fun Facts About Honey



Use the words in the word bank to fill in the blanks.

Bees must visit about _____
to gather enough nectar
to make one pound of
honey.

Bees collect
nectar from flowers
within a radius of around

and take this nectar
to their hive.

Ancient

civilizations regarded
honey as a symbol
of blessings and
happiness.

If the queen bee
dies, workers will
create a new queen by
selecting a young larva
(a newly hatched young
insect) and feeding it a special food
called _____. This
enables the larva to develop into a
fertile queen.

Honey is the only
food made by an

and eaten by both the
insect and humans.

In 1791, when the

government demanded
a record of all hives for
collecting taxes, their
owners destroyed
many hives.

WORD BANK

30,000 pounds
waggle dance
French
60,000 bees
insect
enzyme
2 million flowers
royal jelly
Greek
crystallizing
4 miles

Honey keeps
indefinitely in a jar.
However, it can react
to cool temperatures by
_____.



A typical
beehive houses about

most of them workers,
busily making honey
and the honeycombs
in which it is
stored.

Rameses III, an
ancient Egyptian
pharaoh, offered a river
god a honey sacrifice
by dumping

_____ of honey into the
Nile River.

Bees have glands
that secrete an

that is mixed with nectar
the bee collects in the
bee's mouth.

To share
information about
the best food
sources, bees perform a
_____.

When the worker returns to the hive, it
moves in a figure eight and waggles its
body to indicate the direction of the
food source.



Take this issue of Ag Mag home to share what you've learned about

Pollinators

Sources:

- American Bee Journal
- Bee Culture
- Buzz about Bees
- InsectIdentification.org
- Learn about Nature
- National Agriculture in the Classroom
- National Geographic
- North Dakota Beekeepers Association
- North Dakota Department of Agriculture
- North Dakota Game and Fish Dept.
- North Dakota State University
- Pollinator Partnership
- USDA Economic Research Service
- USDA Natural Resources Conservation Service
- U.S. Forest Service
- Utah State University
- Xerces Society



Photos: istockphoto.com

The North Dakota Ag Mag is a project of the North Dakota Agriculture in the Classroom Council, which is organized through the North Dakota Department of Agriculture.

N.D. Department of Agriculture
600 E. Boulevard Ave., Dept. 602
Bismarck, ND 58505-0020
701-328-2231
ndda@nd.gov
www.nd.gov/ndda/ag-classroom

Ag Mag Production by North Dakota State University
Agriculture Communication: Charles J. Wallace, Writer;
Becky Koch, Editor; David Haasser, Graphic Designer

Thank you to these sponsors of this Spring 2019 Ag Mag

