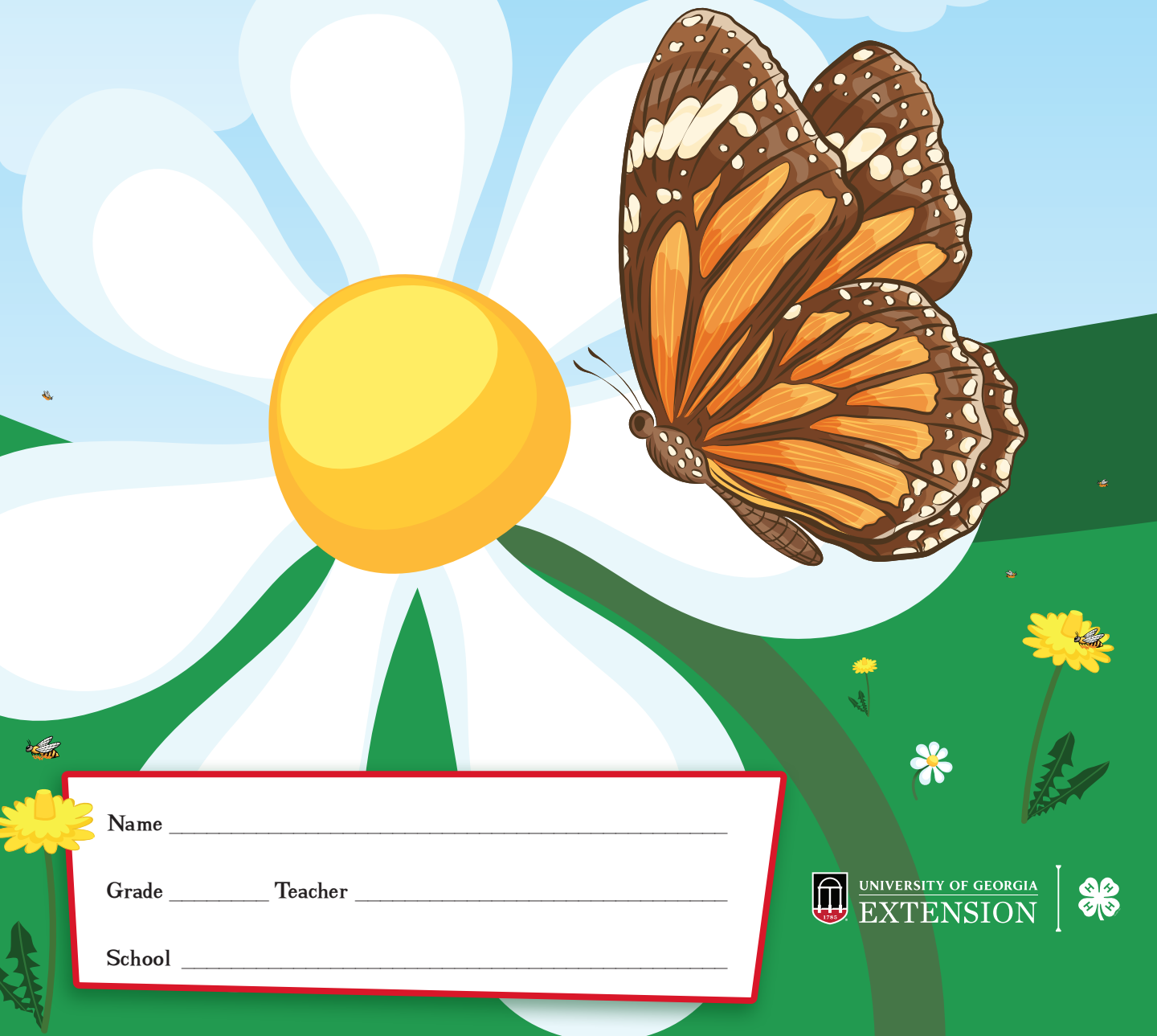




Friends

Pollinators!



Name _____

Grade _____ Teacher _____

School _____



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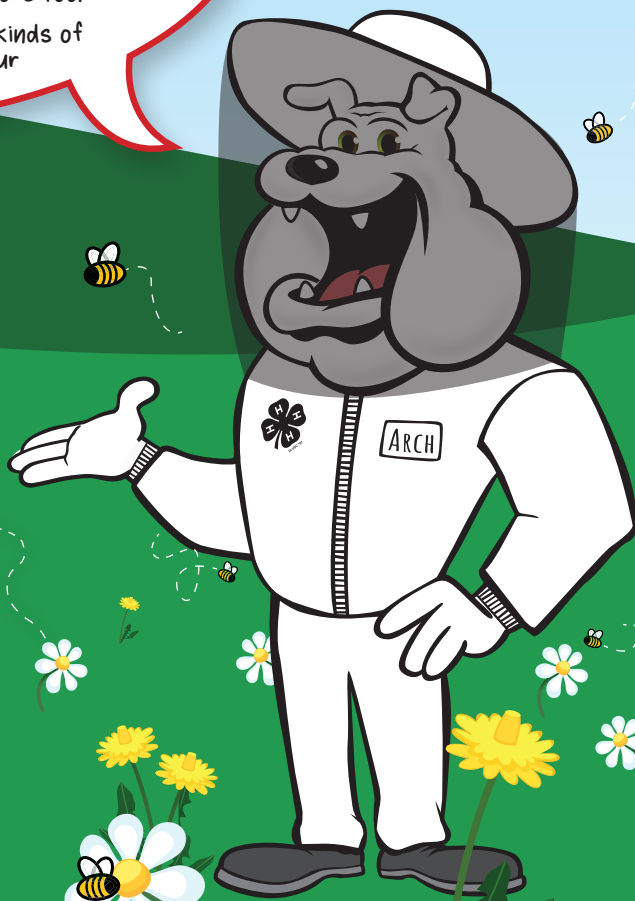
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What are Pollinators?

Pollination is the process when pollen is transferred from the anthers of the male parts of a flower to the stigma of the female parts of the flower. Pollination allows plants to create seeds. In vegetable and fruit gardens, this triggers the formation of fruit, like apples and peaches!

Anything that transfers pollen can be considered a pollinator! You probably think of insects and birds as pollinators - - - and they are! But there are plenty of other animals (including humans) that can act as pollinators too!

Come join me, **Arch the Dawg**, as we learn about all kinds of pollinators and why they are important for our ecosystems and food supply!



Georgia 4-H is a partner in public education and strives to incorporate Georgia Standards in the education materials produced for in-school use. The following Georgia Standards are correlated to the content delivery included in this publication:

AFNR-AS: Investigate and develop an understanding of agricultural systems such as Agricultural Mechanics; Plant Systems; Animal Systems; and/or Food Systems.

5AS5. Connect the role of pollinators in agriculture.

S5L1. Obtain, evaluate, and communicate information to group organisms using scientific classification procedures.

B. Develop a model that illustrates how plants are sorted into groups (seed producers, non-seed producers) using data from multiple sources.

Standards from Georgia Standards, www.georgiastandards.org

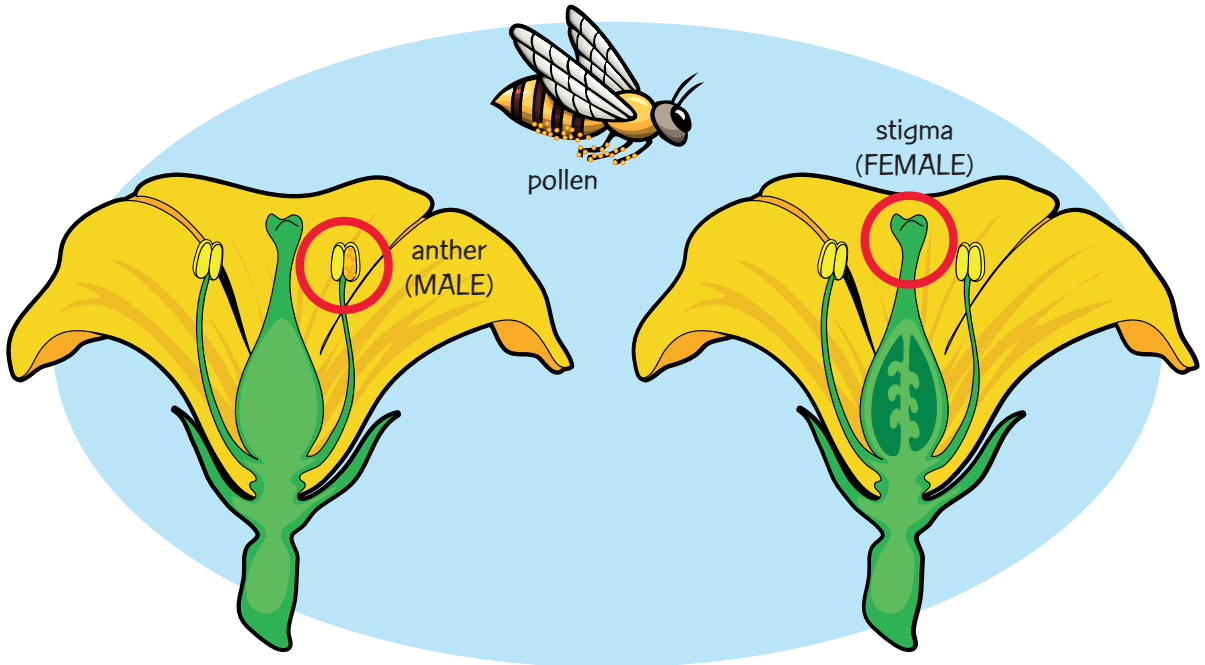
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THE POLLINATION PROCESS

Plants are living organisms that use sunlight for the photosynthesis process to create their own energy. Vascular plants have tube-like structures that move water and nutrients through the plant. **Angiosperms** are vascular plants that create flowers.



Pollen consists of tiny reproductive granules that are located on the **anther** of the flower. In order for the flower to produce seeds, the pollen must move from the anther to the **stigma**. When the pollen reaches the stigma, that is pollination! Typically, for pollination to be successful, the pollen must move from one species of plant to the exact same species of plant. For example, daffodil pollen can't pollinate a coneflower. Some plants have the ability to self-pollinate while others need assistance from wind, water, and animals. After the pollen reaches the stigma, the plant begins to produce fruits and seeds - enabling it to grow and reproduce!

Did you know that all of the Georgia crops below have to be pollinated? Circle your favorites!



strawberries



apples



peppers



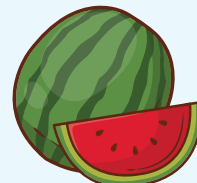
blueberries



tomatoes



peaches



watermelons



INSECTS

Insects are a group of living organisms that have specific characteristics. All insects are **invertebrates**, meaning they don't have a backbone. Additionally, insects have:

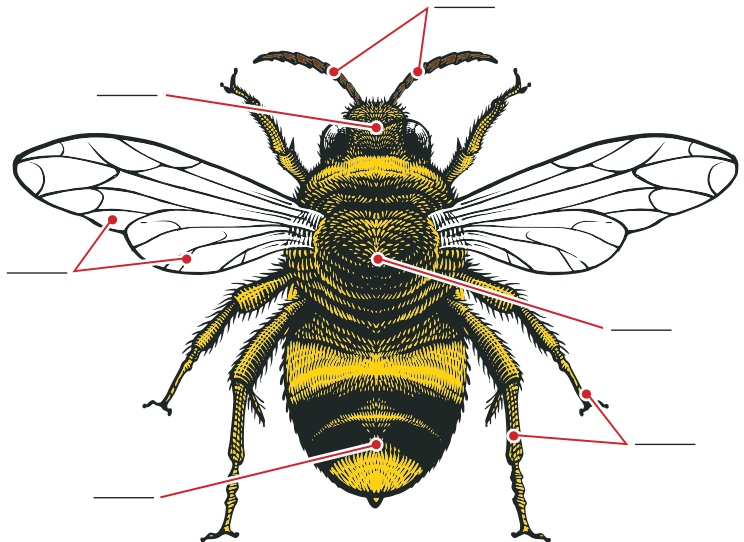
- an exoskeleton that protects their body
- 3 main body parts – a head, a thorax, and an abdomen
- antenna on their head that are used as sensory organs
- eyes on their head – most insects have both simple & compound eyes
- 6 jointed legs attached to their thorax
- wings – most insects have 2 sets of wings but some have 1 set and others don't wings at all

Many insects travel from flower to flower consuming nectar, which is an energy source for them. As the insects consume the nectar, the flower's pollen attaches to their bodies. So when they visit another flower, they are spreading the pollen as they move, resulting in pollination. Some insects intentionally collect pollen as a protein source for their young.

Bees are some of the most effective pollinators. They have specialized body parts that allow them to easily navigate inside flowers to find the pollen and nectar. Their hairy bodies grab onto the pollen really well, allowing them to easily spread it to other flowers.

Use your identification skills and label the following parts on this honeybee:

- A. Head**
- B. Thorax**
- C. Abdomen**
- D. Legs**
- E. Wings**
- F. Antennae**



Bugs, Bugs, Everywhere!



Scientists estimate there are between 6 and 10 million different species of insect – more than any other group of animals in the world!

Insects can be found in almost every habitat, from mountain ranges covered in snow to the hottest deserts on the planet. The largest known order of insects is Coleoptera (beetles), followed by Lepidoptera (butterflies and moths), Diptera (true flies), and then Hymenoptera (ants, bees and wasps).



MORE POLLINATORS

Some scientists estimate that one out of every three bites of food we eat is pollinated by animal pollinators. There are many insects, such as bees, butterflies, flies, and wasps, that are pollinators. But, did you know that there are other types of animals that can act as pollinators, too?

Birds

At least 150 species of flowers are primarily or exclusively pollinated by birds. The nectar that the birds want is deep down in the flower's floral tube, so pollen is transferred onto the bird's body. Hummingbirds are great examples of pollinators. They have a long tongue that extends deep down into the flower, grabbing the nectar! **Ornithophily** (*pronounced orn-o-tho-fully*) is when pollination is performed by birds.



Bats

Bats are the only mammals capable of true flight. Bats are very important pollinators, especially in tropical and desert climates. Bats feed on the insects in the flowers as well as on the nectar and flower parts. There are over 500 plant species that need bats to pollinate their flowers, including some mango, banana, durian, guava and agave plants. **Chiropterophily** (*pronounced ku-ropt-toe-row-fully*) is when pollination is performed by bats.



Venture outside and find a pollinator!

Draw your pollinator in the blank space below and answer the following:

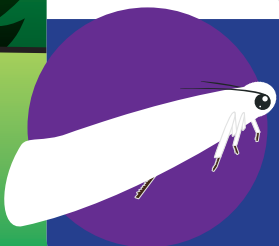
1. Is your pollinator an insect or another species of animal? _____
2. How do you know? _____

3. Describe the flower your pollinator was visiting. What did it look like?

4. What color was it? _____
5. Did the pollinator visit more than one flower? _____
6. Did you observe any pollen on the animal? _____
7. What did it look like? _____

Nighttime Pollination Creature Feature

One of the most exciting partnerships between an insect and the plant it pollinates is the yucca moth and the yucca plant! Yucca plants can be found in different regions around the world, including the United States. Indigenous peoples used yucca for food, medicine, and making rope. The yucca moth is the only species that can pollinate the yucca plant; they are so interdependent that one cannot live without the other! Yucca moths are small, white, and nocturnal, meaning they are active at night. Most butterflies and moths have long tongues. The yucca moth, however, has tentacles around its mouth to collect pollen. At night, they travel from blossom to blossom and spread the pollen, pollinating the yucca plants.





COUNTING POLLINATORS

Scientists study the populations of different pollinators to learn about their health, growth or decline, and their effectiveness. One way they may capture this information is through observations – like counting the number of different pollinators they see!

Practice your science skills by completing this pollinator census!





1. Go outside and choose a plant where you see insect activity. If you know the species of the plant, you can record it on your data chart.
2. Note the date and time of your observation. Scientists always want to keep good records.
3. Next, you will want to document the weather. What are the weather conditions? You'll circle the appropriate option. If you have a thermometer, you can even record the temperature. The weather could greatly impact your observations. For example, it is difficult for insect pollinators to fly when it rains.
4. Set a timer for 15 minutes. During this time, you will count the number of pollinators that visit your flower. Each time they land, make a tally mark.

Pollinator Census

Name of Plant (if known): _____

Date: _____ Start Time: _____

Weather Conditions (circle below):

Sunny Partly Cloudy Cloudy Rainy

Temperature (if known): _____

Number of Pollinators Counted: _____

What can you conclude from the evidence you recorded? _____

If you enjoyed this activity, you should consider participating in the Great Southeast Pollinator Census! Each August, thousands of youth and adults go outside and did just what you did – count pollinators! They classify them into different groups and report their findings to the University of Georgia.

Learn more at: <https://gsepc.org>

SPOTLIGHT ON CAREERS

Dr. Elizabeth (Izzy) Hill is the United States Department of Agriculture (USDA) Pollinator Coordinator for the Office of the Chief Scientist (OCS). In this role, she promotes collaboration across USDA offices, and with federal agencies, the commercial pollinator industry, and USDA grant recipients. Izzy previously was an Agricultural Economist in the Office of the Chief Economist's Office of Pest Management Policy, where, among other duties, she examined the interface between the needs of agricultural pest management and pollinator protection. Prior to joining USDA, Dr. Hill worked on pest management and pollinator initiatives with the Environmental Protection Agency and on agricultural and beekeeping programs as an Agricultural Extension Agent with the University of Maryland. Izzy attended the University of Georgia for graduate school in Environmental Economics and Conservation Ecology and Sustainable Development, where she focused on conservation land use policy. She spends her spare time tinkering with bees.





HONEY TASTING

Although not native to the United States, the honeybee is a common pollinator and provides us with a rich treat... honey! Honeybees travel from flower to flower, collecting nectar. Once the bee returns to the hive, the nectar she gathered is placed into a honeycomb cell. Sister bees use their wings to evaporate some of the water from the nectar. When the nectar is approximately 18% water, the nectar is now honey. The bees cap it with a wax cap for storage. It is an energy source for the bees, full of nutrition. Humans can also harvest the honey to enjoy it as well!

Throughout the year, different plants bloom at different times. Honey is named for the primary plant that is blooming when it's made. Here in Georgia, native blackberries bloom in May. Bees visit the blackberry blossoms foraging for pollen and nectar, and as a bonus, they pollinate the blackberries. Although other things are blooming in May, blackberry plants are the primary plants in bloom, so the honey made at this time would be called blackberry honey. Even though it's called blackberry honey, the honey won't actually taste like blackberries. Next time you visit the farmer's market, see what types of honey are available! There are over 300 varieties of honey including wildflower, orange blossom, sourwood, and clover.



Sample some honey varieties and record your observations. It is recommended to source your honey from a local beekeeper who can help you determine the type of honey.

For each sample, you'll record the honey type, the color, and your tasting comments.

Sample #1	Sample #2	Sample #3
Honey Type:	Honey Type:	Honey Type:
Color:	Color:	Color:
Tasting Comments:	Tasting Comments:	Tasting Comments:

Which one is your favorite? _____

Did you know?

The U.S. Department of Agriculture classifies honey into seven color categories as shown below. The color of honey is characteristic of its floral source due to minerals and other minor components. Color does not indicate quality.





TEST YOUR KNOWLEDGE

An **entomologist** is a scientist who studies insects. Using your entomology skills, try matching these vocabulary words with their correct definition. Afterward, check your answers!

- | | |
|-----------------------|--|
| _____ 1. pollination | a. vascular plants that create flowers |
| _____ 2. angiosperm | b. a pollinator not native to the United States |
| _____ 3. pollen | c. sensory organs of an insect |
| _____ 4. honeybee | d. animals that are active during the night |
| _____ 5. antenna | e. the process when pollen is transferred from the anthers of the flower to the stigma of the flower |
| _____ 6. bat | f. when pollination is performed by birds |
| _____ 7. ornithophily | g. only mammal capable of true flight and is an important pollinator |
| _____ 8. nocturnal | h. tiny granules located on the anther of the flower |

Answers: 1 - e, 2 - a, 3 - h, 4 - b, 5 - c, 6 - g, 7 - f, 8 - d



Hey Adults!

Thank you for taking time to review this publication with your child. Please help your 4-H leader know that you have learned more about pollinators with your child.

Parent/Guardian Signature

Date



REFERENCES AND RESOURCES



Georgia Performance Standards, www.georgiastandards.org

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