

Pollinators

This month we are learning about our good garden friends the pollinators. Who are the pollinators? Bees, hummingbirds, moths, bats, butterflies, flies, and beetles are a few notable representatives. Pollinators are animals that help many flowering plants produce their seeds and thus ensure the continued existence of millions of plant species, and in turn, of most animal species, including humans. Each week we will dig into a different pollination-focused topic and provide instructions for engaging, hands-on lessons. By the end of the month we hope your young gardeners will understand the intricate relationship between pollinators and flowering plants and also learn to love, respect, and appreciate these hard-working animals.

Week 2: Who are the pollinators?

Learning Objectives

This week kids will:

- learn how to identify common pollinators
- discover why different pollinators are attracted to different kinds of flowers
- sharpen their observation skills

Materials Needed for the Week

Activity 1:

- Pollinator/Flower Profile Cards
- Crayons, colored pencils or markers

Activity 2:

- Pollinator Scavenger Hunt Printout
- Crayons, pencils, and pens
- Clipboard (optional)

Activity 3:

- Writing paper, journal, or Pollinator Journal
- Pencil or pen



- Field guides or access to digital identification tools
- Clipboard (optional)
- Camera (optional)

Introduction

Although bees are the best-known and most widespread pollinators, other kinds of animals, including wasps, beetles, flies, butterflies, moths, birds, and bats act as pollinators for various kinds of flowers. Over millions of years, many flowers and pollinators have adapted together and developed special relationships. For example, a pollinator may have an adaptation that allows it to detect the colors or scents of a certain flower, so it's able to recognize it as a valuable source of nectar and pollen. Another type of pollinator may have evolved special structures, such as an extralong tongue, so it can reach the nectar deep inside a tubular bloom. These special adaptations give the pollinators advantages over their less fortunate kin, and they pass the adaptations on to their offspring. Over many generations these traits have become well established in pollinator populations. Meanwhile flowers have also evolved, giving rise to specific characteristics or adaptations that attract particular pollinators.

To compete for the attention of pollinators, flowers have come up with creative methods to entice creatures to their sugar-filled nectar and protein- and vitamin-rich pollen. In exchange, the unsuspecting creatures unintentionally act as messengers, delivering pollen between blooms that would otherwise never touch. The amazing diversity of flowers results from their unique adaptations to lure a range of pollinators (or to ensure that wind or, more rarely, water carries pollen). Every aspect of a flower, from the designs on its petals to the timing of its bloom, is vital to its pollination strategy. Below are examples of flower characteristics that attract some common pollinators:

Pollinator Flower Preferences

Flower Preferences Pollinators Bees Did you know? There are about 4,000 species of Yellow, blue, purple flowers. There are hundreds of types of bees that native bees in the U.S. come in a variety of sizes and have a range of flower preferences. ranging in length from less They can't see red, but are attracted to some red flowers, such as bee than 1/8" to more than 1". balm, that reflect ultraviolet light. Small bees, which have short Most of these bees are tongues, prefer packed clusters of tiny flowers (e.g., saliva, alyssum, solitary nesters. Unlike the lilacs, phlox, butterfly weed, aromatic herbs). They like flowers with a non-native (but now good supply of nectar and pollen. They use the nectar to make naturalized) hive-building honey, and they also store pollen in their honeycombs to use as an honeybees, solitary native alternate food source. bees have no hive to defend and are unlikely to sting!



Butterflies	Red, orange, yellow, pink, blue flowers. They need to land before feeding, so prefer flat-topped flower clusters (e.g., Joe Pye weed, calendula, butterfly weed, yarrow, daisy, zinnia) in a sunny location. They like flowers with lots of nectar available. Just as important, butterflies also seek out specific plants on which to lay their eggs, so that when the eggs hatch the larvae (caterpillars) have a ready food source. Different butterfly species need different plants for their larvae, including milkweed, aster, lupine, thistle, fennel, violets, hollyhock, black-eyed Susan.
Moths	Light-colored and white flowers. Most moths are active at night, so they prefer plants that open at dusk such as evening primrose and moonflowers. They like flowers with lots of nectar available and tend to be attracted to flowers that give off a strong sweet scent.
Pollinating beetles	Dull white and green flowers. Since they do not all fly (or at least fly well), beetles prefer wide-open, bowl-shaped flowers that they can sit in, such as magnolia, aster, sunflower, and rose. They like flowers that have lots of pollen to eat. They may also eat the petals and other plant parts.
Flies	Green, white, or cream flowers. They have short tongues, so prefer simple, bowl shapes. Pollen is an important food source for them. They are attracted to flowers that give off foul odors, such as trillium and western skunk cabbage.
Hummingbirds	Red, orange, purple/red flowers. Their long beaks fit well into tubular flowers with lots of nectar. Nectar is their main food source and so they search out flowers with an ample supply (e.g., honeysuckle, sage, fuchsia, jewelweed, fireweed, cardinal flower, bee balm, nasturtium, century plant). No landing areas are needed since they hover while feeding.
Bats (Pollinating bats are found primarily in the Southwest)	White and light-colored flowers. Bats prefer large, night-blooming flowers with strong fruity odors (e.g., many types of cacti). They like flowers with lots of nectar available.

Activity 1: Pollinator/Flower Profile Cards

- 1. Read the Blooming Café reading page independently or together. Complete the reading comprehension questions and then talk about the special relationships between plants and pollinators and the characteristics of each that support the dependence on each other. You can use the introductory information for additional details to share.
- 2. Print out the Pollinator/Flower profile cards and play a matching game with your kids to talk about how different pollinators are attracted to different types of flowers. If you have a larger number of kids playing, you can give each child a flower or pollinator card and then give them time to find a partner with the matching pollinator or flower card. Make as many copies as you need so that each



child has their own card. Alternatively, if you are playing with just one or two kids, you can turn the cards over and play the game as a memory matching game.

Here are the answers to the pollinator-flower matches:

Magnolia – Beetle Monarda – Hummingbird Moonflower – Moth Saguaro – Bat Snapdragon – Bee Trillium – Fly Zinnia – Butterfly

3. As an optional extension to this activity, have the kids color the cards, keeping in mind the information in the introduction about the colors and patterns that each of the pollinators tends to be attracted to.

Activity 2: Pollinator Scavenger Hunt

- 1. Go on a pollinator scavenger hunt. Use the scavenger hunt worksheet or create your own to help you find pollinators in your garden or in a local green space. This activity is best done in the spring through the fall as it is hard to find flowers and pollinators during winter months.
- 2. A few optional adaptations to this activity:
 - To add to the fun, you can turn it into a game to see who can find the most pollinators and pollinator-attracting flowers.
 - Go on multiple pollinator hunts at different times of the day using a different worksheet each time, and then compare your results. Make sure to record the time of your observations at the top of your sheet before you start. Do you notice any differences in what pollinators you find or what flowers are open at different times of the day? You could also record temperature or weather conditions and look for patterns. Repeat more than once for best observations. You could also track over many months and look for seasonal differences. Graph your results to practice additional math and science skills.

Activity 3: Start a Pollinator Journal

- 1. Take your young explorer's observation skills to the next level by starting your own pollinator journal. You can create your own with notebook or even scrap paper stapled together, you can use a composition book, or you can also print out the KidsGardening Pollinator Journal included at the end of this lesson. Another option is to purchase a <u>Pollinator Field Guide</u> from Gardener's Supply Company if you would like a more defined resource to direct your child's observations.
- 2. To get started, set aside some chore-free time to **explore your garden or a nearby green space**. For maximum enjoyment, select days with comfortable weather and a relaxed schedule. As



with the scavenger hunt, you can also try visiting at different times of the day to see of time, temperature, and sunlight impact your garden visitors.

Before heading outside, set the stage with a few ground rules and tips:

- Respect all life in the garden.
- Observe living creatures with your eyes, not your hands.
- Write down or draw as many details as possible.

Younger observers may want to rely on drawings. For older children, encourage them to take written observations and more extensive notes. This activity can be a way to help sharpen their science and writing skills. If tools are available, you can also encourage them to take photos that they can later add to their journals and/or use to create a digital journal or collage.

- 3. Either while you are outside or when you return home, use resource materials to help you identify any pollinators you do not already know. There are a number of printed field guides that can be purchased or checked out from a local library. There is also a growing body of online identification guides available. Here are a few digital resources you may want to check out:
 - Bee Identification Guides from the Pollinator Partnership: https://www.pollinator.org/bee-quides
 - Seek by iNaturalist created by California Academy of Sciences and National Geographic: https://www.inaturalist.org/pages/seek_app
 - Citizen Scientist Pollinator Monitoring Guide by The Xerces Soceity for Invertebrate
 Conservation at the University of California at Berkeley:
 https://xerces.org/sites/default/files/2018-05/11-010_01_XercesSoc_Citizen-Science-Monitoring-Guide_California_web.pdf

There are many, many more online resources available. Your state's land grant university's entomology department is often a great place to look for information about insects specific to your area. Make sure to match your identification activities to the interest and developmental level of your kids. For example, identifying a bee as a bee or a beetle as a beetle may be more than enough for younger children (and not require a field guide), but older students may want to take on the challenge of identifying the specific species of bee found.

4. Want to expand on this activity further? Encourage your kids to conduct a pollinator inventory to deepen their understanding about how many pollinators are out there at work. This can be as simple as keeping a tally in a chart in your journal of the different pollinators you see or as involved as participating in an organized wildlife inventory.

There a number of organizations that offer regional and nationally planned inventories which are usually conducted to support conservation efforts and awareness. In addition to increasing their knowledge, participating in an organized inventory can be a fun way for kids to connect with others and feel like they are making a difference. Here are a few inventory opportunities you may want to explore (note that not all of these are specific to pollinators):



- iNaturalist from the California Academy of Sciences and National Geographic:
 https://www.inaturalist.org/ (conduct a search of community projects to see if there are any in your area)
- Monarch Watch: https://www.monarchwatch.org/
- Earth Challenge 2020 from the Earth Day Network: https://earthchallenge2020.earthday.org/
- October Big Day (Bird count): https://ebird.org/octoberbigday
- The Great Backyard Bird Count (February): http://gbbc.birdcount.org/
- The Lost Ladybug Project: http://www.lostladybug.org/
- Journey North (monitors a variety of migratory animals): https://journeynorth.org/

Digging Deeper

You can use the following resources to dig deeper into this week's lessons:

Books

The Reason for a Flower by Ruth Heller

Beautiful illustrations and simple text providing an overview of the purpose of flowers in the plant world.

Bea's Bees by Katherine Pryor

Follow Bea as she learns what kind of flowers bees like and their other habitat needs.

The Flower Alphabet Book by Jerry Pallotta and Leslie Evans

This book shows the diversity of flowers found in all different colors, shapes and sizes.

Videos

Slo-Mo Footage of a Bumble Bee Dislodging Pollen from the Smithsonian Channel: https://www.youtube.com/watch?v=J7q9Kn1rhRc

The Beauty of Pollination from Moving Art(TM):

https://www.youtube.com/watch?v=MQiszdkOwuU&t

Pollination: Trading for Food for Fertilization from Cornell University's Naturalist Outreach Series https://www.youtube.com/watch?v=Lu7AjOvznh8

Additional Related KidsGardening Lessons and Activities to Try

Petal Attraction:

https://kidsgardening.org/lesson-plans-petal-attraction/

Wonderful Wildflowers:

https://kidsgardening.org/lesson-plan-wonderful-wildflowers/



Imperfect Flowers: A Design for Genetic Diversity

https://kidsgardening.org/lesson-plan-imperfect-flowers/

Insect Safari:

https://kidsgardening.org/lesson-plans-insect-safari/

Bug Hunt:

https://kidsgardening.org/garden-activities-bug-hunt/

Wildlife Inventory:

https://kidsgardening.org/garden-activities-wildlife-inventory/

Plant Families for Pollinators:

https://kidsgardening.org/garden-how-to-plant-families-for-pollinators/

Planting a Flower Clock:

https://kidsgardening.org/garden-activities-planting-a-flower-clock/

Flower Adaptations to Lure Pollinators:

https://kidsgardening.org/garden-how-to-flower-adaptations/





Blooming Cafés

Reading page for Pollinators week 2: Who are the pollinators?

Do you have a favorite food? What do you like about it? Do you like the way it looks? Do you like the way it smells? Or is your favorite thing about it the way it tastes? Did you know that just like you, pollinators have favorite foods too?

Pollinators are animals like bees and butterflies that help plants move pollen from one flower to another flower. This helps them make their fruit and seeds. Pollinators need flowers too. Flowers provide pollinators with food. Pollinators drink the sugar-filled nectar and eat the protein- and vitamin-rich pollen that flowers make.

Since there are lots of blooming plants out there, how does a plant make sure that pollinators will visit their flowers and move their pollen?

Think about some of the ways restaurants and grocery stores get you to buy food products. Do they put it in a pretty package? Do they make sure it smells good? Are they open during the hours you are awake and hungry?

In addition to the nectar and pollen they make, flowers have developed special traits to help attract pollinators to them, such as the colors, patterns, and shapes of their petals, the time of day they are open, and even the smell they give off. These traits act like advertisements to encourage pollinators to come visit them. Here are some examples of pollinators and their favorite flowers:



Bees like yellow, blue and purple flowers. Because they have small tongues for sipping nectar, they like tiny flowers that grow in groups best.

Butterflies like bright colors, so they're attracted to red, orange, yellow, pink, and blue flowers. They like to sit on the flower while they drink the nectar, so they like flowers that have a wide top that can serve as a landing pad.

Moths and **bats** are out looking for food at night. They are attracted to white and light-colored flowers that smell sweet and fruity.

Beetles do not always fly much, so they like bowl-shaped flowers that they can crawl around and sit in. Sometimes they eat the petals and other flower parts too!

Hummingbirds are really attracted to the color red, and their long beaks fit well in tube-shaped flowers. They use a lot of energy flying so they also look for flowers that have lots of nectar to drink.

Flies like green and white flowers. They also like flowers that give off stinky odors that smell like rotting meat. Yuck!

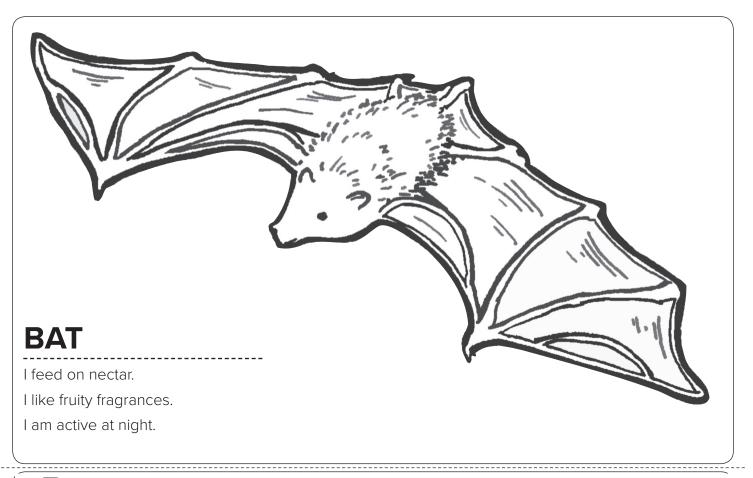
So next time you notice a pretty flower or take a moment to smell its scent, remember that there is purpose behind these appealing qualities. Just like a cool box design or a prize inside might get you to try a breakfast cereal, the flower is working hard to get the pollinator to try their nectar and pollen so that without knowing it, they also help the flower make its seeds.

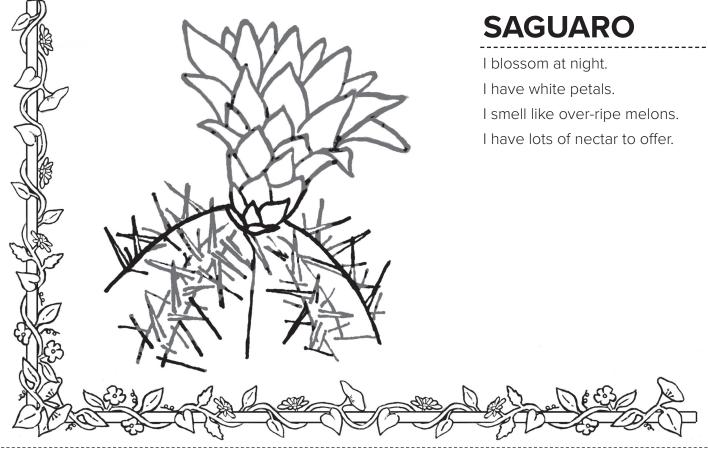


Reading Comprehension Questions

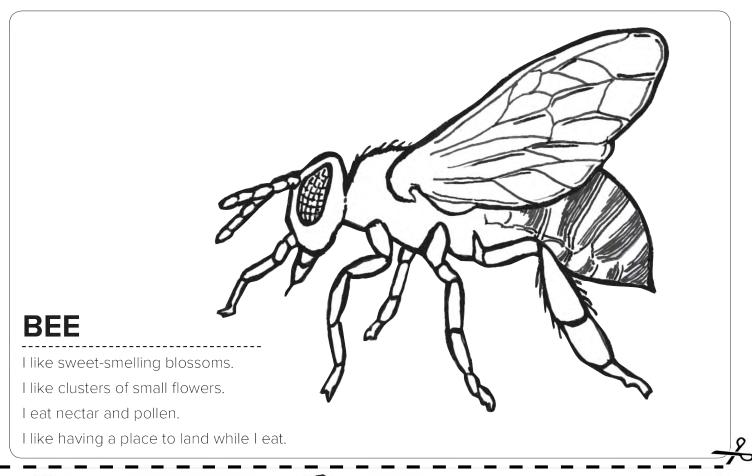
- 1. How to pollinators help plants?
 - A. They water plants.
 - B. They provide plants with food.
 - C. They move pollen from one flower to another flower.
 - D. None of the above.
- 2. How do flowers help pollinators?
 - A. They provide them with shelter.
 - B. They provide them with food.
 - C. They look pretty.
 - D. Flowers do not help pollinators.
- 3. What traits of flowers help them attract the attention of pollinators?
 - A. Scent
 - B. Color of petals
 - C. Shape of the flower
 - D. Pollen and nectar available
 - E. All of the above
- 4. True or false, pollinators have favorite flowers?
- 5. Cactus plants have white flowers that smell sweet and bloom at night. What kind of pollinators do you think would be attracted to a cactus flower?

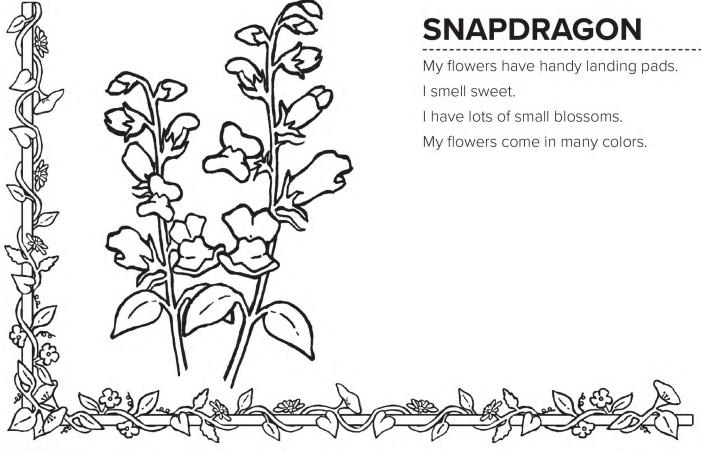




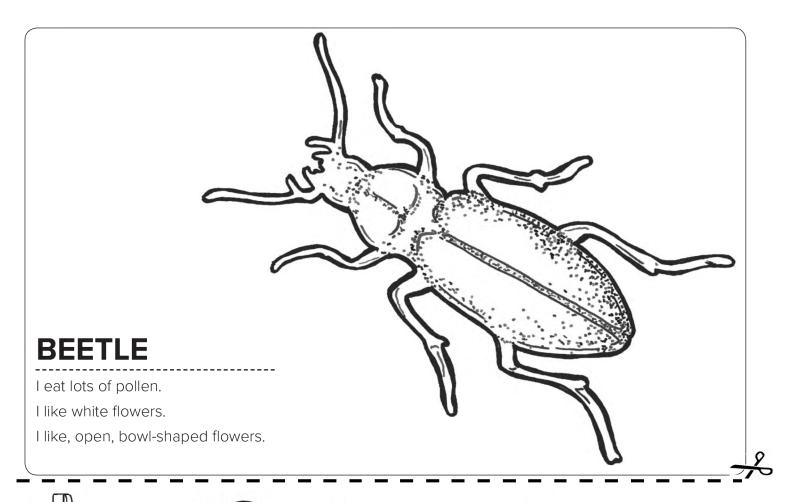


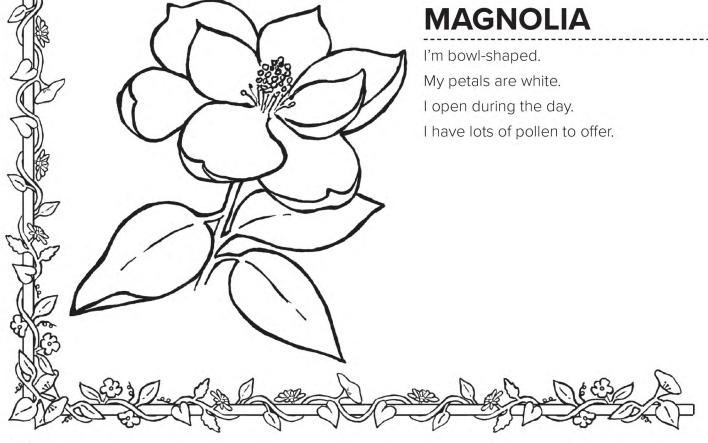




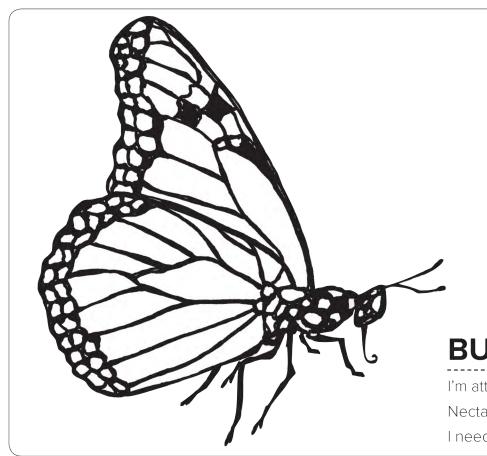








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BUTTERFLY

I'm attracted to bright flowers.

Nectar is my main food.

I need a place to stand while I eat.



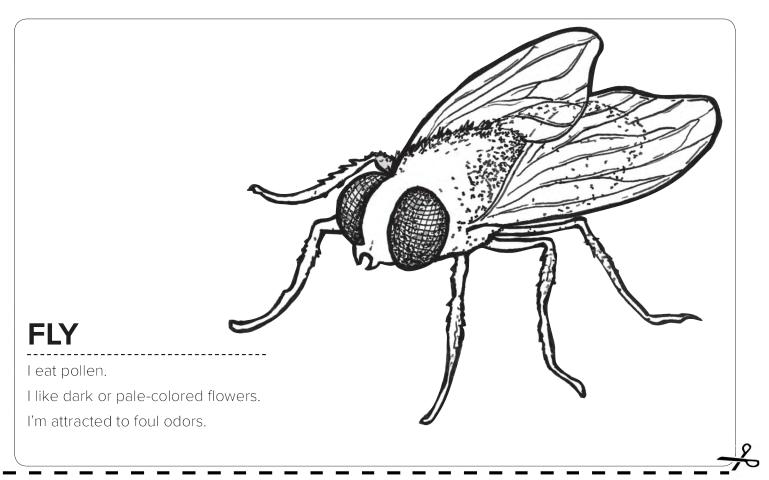
Zinnia

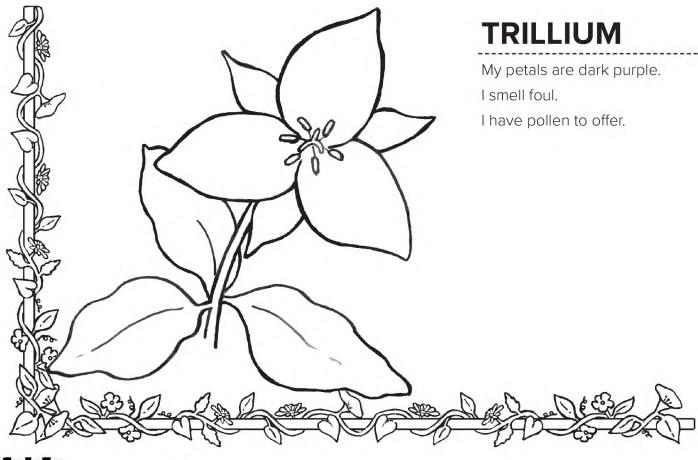
I have clusters of small flowers.

I have a flat top to stand on.

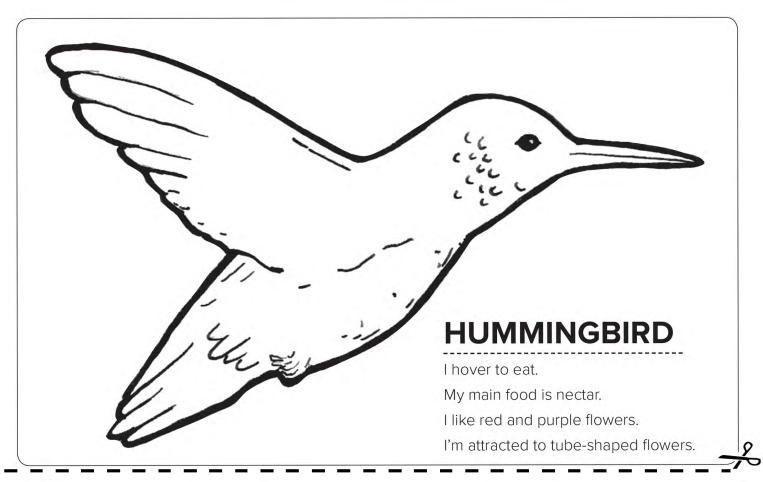
I come in bright colors such as yellow, red, and orange.













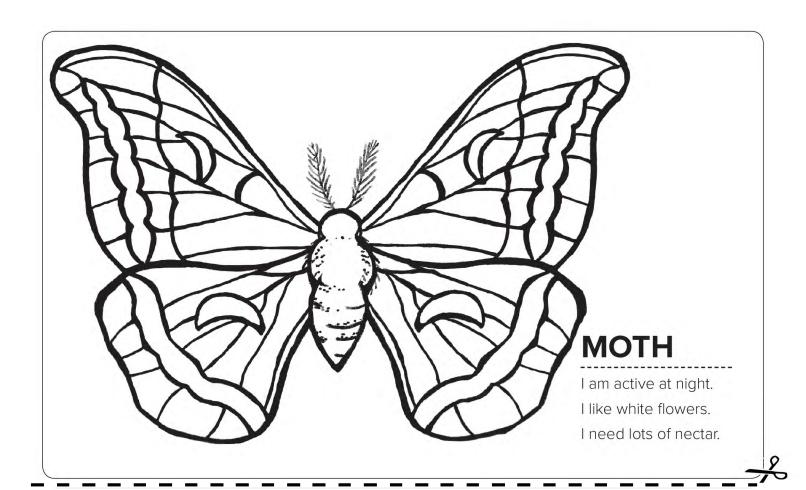
MONARDA

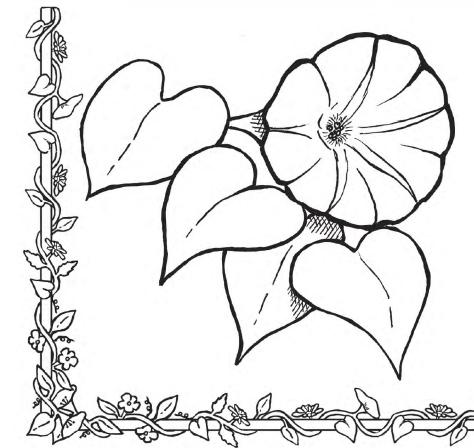
My petals are tubeshaped.

I have lots of nectar.

My petals are bright red or purple.







MOONFLOWER

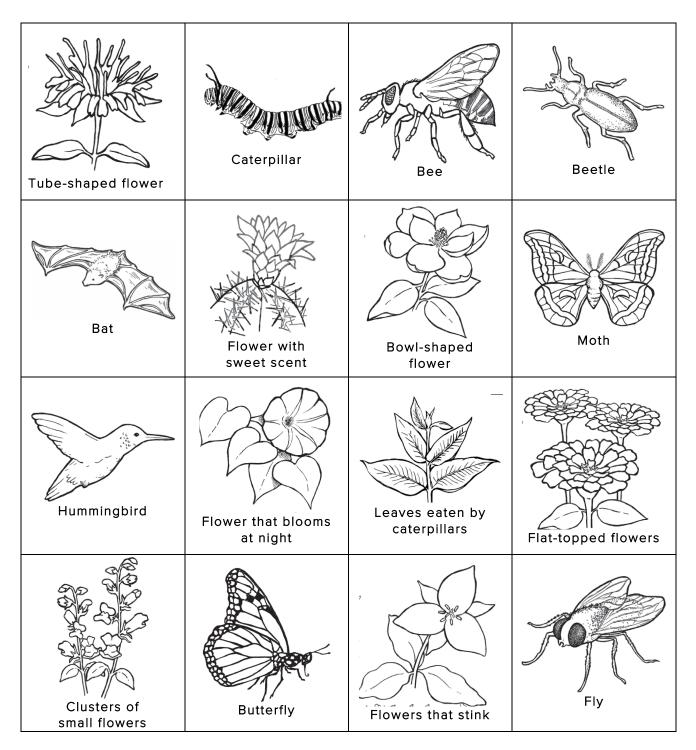
My flowers open at night. My petals are white.

I have nectar to offer.



Pollinator Scavenger Hunt

How many of these pollinators or flower shapes can you find?





My Pollinator Journal

EMAN



It Takes Two – What are Pollinators?

A garden full of flowers is a beautiful sight! You might think that flowers exist just to please our eyes, but their real goal in life is to create more plants. In order for many plants to produce the seeds that grow into new plants, pollen from the male parts of one flower needs to be carried to the female parts of another flower. This transfer of pollen is called **pollination.**

How does the pollen make its journey from one flower to the next?

In some plants, the wind helps move pollen from flower to flower. But in many plants, living creatures called pollinators are needed to do the job. Many pollinators are insects, such as bees, wasps, flies, butterflies, moths, ants, and beetles. But hummingbirds and even bats act as pollinators for some plants!

While we enjoy the beauty and fragrance of flowers, their strong scents and brightly colored petals are actually used to attract pollinators, signaling that the blossoms are a source of food. When you see a butterfly perched on flower, it's there to sip from the flower's nectar – a sweet substance jam-packed with protein and vitamins.

A bee foraging on a flower may be eating nectar or protein -rich pollen, or collecting it to feed to developing baby bees back in the hive.

As they move about on flowers, pollinators pick up some of the powdery pollen on their bodies and carry it with them to the next flower they visit, in the process helping the plants as the plants help them. It's a win-win situation!

Pollinators are also important to us, for without their help we wouldn't be able to enjoy many of the foods we eat. Without pollinators, we'd miss out on foods like apples, cucumbers, almonds, and strawberries, which come from plants after they've been pollinated. We'd also lose many

food plants that are grown from seed, like beans, melons, cabbage, and carrots, since without pollination they can't produce seeds to grow more plants. And that cotton shirt you're wearing would have to go too – cotton plants need pollination to produce the fibers used to make cloth.

This is why it's so important to learn about and protect all kinds of pollinators. Plants need pollinators – and we need plants!

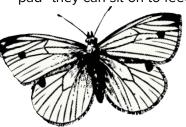


Types of Pollinators

BUTTERFLIES

- Brightly colored wings
- •Fly during the day
- Attracted to flowers with bright red, orange, yellow, pink, or blue petals
- •Attracted to flowers with petals arranged to form a flat "landing pad" they can sit on to feed





MOTHS

- ·Wings not colorful
- ·Most fly at night
- Attracted to flowers with white or light-colored petals

Both butterflies and moths have a mouthpart called a proboscis. It looks like a coiled up drinking straw. When these insects eat, the proboscis uncoils, allowing them to reach nectar deep within flowers to sip up. As they reach for the nectar, butterflies and moths collect pollen on their bodies, carrying it to a different part of same flower or to a new flower, pollinating the flower in the process.

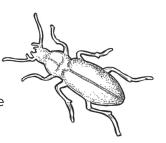
BEES

- Most important pollinators
- A single "busy bee" can visit up to 240 flowers in one trip
- Collect nectar and pollen from sweet-smelling, brightly colored flowers
- Nectar and pollen are carried back to nest to feed the next generation of bees
- · Nectar also used to make honey that's stored in the nest



BEETLES

- · Usually visit white or green flowers with a strong, fruity odor
- These clumsy flyers typically pollinate flowers with an open bowl shape, like magnolia blossoms
- Beetles may feed on petals or other flower parts as they pollinate blossoms







FLIES

Attracted to odors that don't appeal to human noses Pollinate flowers that have brown, purple, or green flowers that smell like decaying meat or "poop" (yuck!), like skunk cabbage

Pollen sticks to flies hairy bodies

HUMMINGBIRDS

- · Most common bird pollinator in the United States
- · Able to hover in one place to feed on a flower
- Attracted to long, tube-like, red or orange flowers without a strong scent, like bee balm
- Feed by inserting long beak and brush-like tongue deep into flower to sip nectar
- Hummingbird collects pollen on its forehead as it feeds, transferring pollen as it moves from flower to flower

ithout a strong

BATS

 Most pollinating bats live in tropical areas and pollinate crops such as figs, guava, avocados, and wild bananas

 Night-flying bats are attracted to white or light colored flowers with a strong smell

 Pollinating bats have long snouts and bristly tongues that help them collect nectar to eat

• Bats get dusted with pollen as they feed on flower nectar, transferring it as they move from flower to flower

er nectar,

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Pollinators Need Our Help!

Imagine a world without apples for snacks or pumpkins at Halloween time. Imagine not having any carrot seeds to grow new carrots. These are just a few of things you'd have to live without if pollinators didn't exist.

Plants depend on pollinators and humans depend on plants. In fact, it's estimated that about one-third of the crops we rely on for food

depend on pollinators!

Now here's the scary part: many pollinators are in danger of disappearing! How is this possible? Throughout history, humans have changed the way the land is used. Our activities, from building to modern farming practices, have disturbed the habitat that pollinators depend on for survival. One way to help pollinators is to protect and restore the land that can be used to grow the plants that pollinators depend on for food. You've heard the saying, "Think globally, act locally." Well, here's your chance! Listed below are a few things you can do to help the pollinators in your part of the world.

•Create a pollinator-friendly garden. Pollinators use plants as food sources and nesting sites. Make sure the garden has plenty of native plants that will support the pollinators that are found in your area. Also remember to include some plants that will be in flower from spring to fall to feed pollinators all season long. Also include plants that will feed every stage of their life cycle. For example, while monarch butterfly adults will sip nectar from many kinds of flowers, their caterpillars will feed only on milkweed

plants.

- •Fill a birdbath or other shallow container with water and place it in the garden. In addition to water, pollinators need water to survive.
- •Create a bulletin board or newsletter at school to educate other students about the importance of pollinators and what people can do to help them survive.
- •Encourage your parents to allow dandelions and red clover to grow in your yard.



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What's Buzzing in My Garden?

Spend 30 minutes in your garden keeping track of the number of pollinators that visit different colored flowers. Record your observations in this chart.

	Red	Orange	Yellow	Green	Blue	Purple	Pink	White
Bee								
Butterfly								
Beetle								
Fly								
Hummingbird								

What can you learn from your observations?

What pollinator did you see the most?			
The least?			
Did some pollinators visit only flowers of one color?			
Which pollinators?			
Which colors?			
Did some pollinators visit many different colored flowers?			
Which pollinators?			
What colors?			

Pollinator Observation

Observe and record the pollinators that you see in your school garden or backyard!

Date:	Time:	Place:
Weather:		
Observations:		

Draw what you see

♦ GARDEN SOUVENIRS

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Date:	Time:	Place:
Weather:		
Observations:		
	Draw what you see	

Date:	Time:	Place:
Weather:		
Observations:		
	Draw what you see	

Date:	Time:	Place:
Weather:		
Observations:		
	Draw what you see	

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Pollinator Word Search



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BEE BUTTERFLY BAT MOTH BEETLE FLY

HUMMINGBIRD
FLOWER
POLLEN
POLLINATION
MONARCH

