



POLLINATOR PASSPORT

The Mystery of Pollination:
The Curious Case of How
Flowers Become Food

TEACHER'S GUIDE

GRADE LEVELS: 2ND-5TH

We need your help to solve a very important mystery!

Across gardens, farms, and forests, something strange is happening. Flowers are blooming, but without help, many of them cannot finish their job. Fruits are not forming as they should, seeds remain unscattered, and crops are wasted.

Our food supply could depend on solving this case.



Do you like fruit? Delicious strawberries, ripe watermelon, bananas – even chocolate. They all need help from farmers, food scientists, agronomists, agricultural engineers - and most importantly, pollinators. Nuts, pumpkins, chocolate, tomatoes, passion fruit, mangos, apples, peaches, pears, and so many other foods that we love to eat rely on the power of pollinators to grow and thrive.



CASE FILE: #PP-001:

The farmers have discovered the strangest problem with their crop this year. The berries do not look very appealing and taste even worse. They are worried about not selling the crop this year, but are not sure what is happening to their berries.

We've got to help them solve this mystery.



CASE FILE #PP-001: THE CURIOUS CASE OF HOW FLOWERS BECOME FOOD

MISSION BRIEF

Clue #2

The Pollinator Team — DISCOVER

Hello, Detective!

Have you ever stopped to wonder who helps flowers move their pollen from place to place? And more importantly, **HOW?** Bees may be the most famous pollinators, but they aren't working alone! Butterflies, moths, beetles, flies, hummingbirds, bats, and even wind and water can help flowers grow fruits and seeds.

FLOWERS AND
POLLINATORS
WORK LIKE A TEAM!

Each pollinator has special body parts that help it collect nectar and move pollen:



Bees have fuzzy hairs called **setae** that trap pollen easily.



Butterflies use long mouth parts called **proboscises** to sip nectar.



Hummingbirds use long **beaks** and **tongues** to reach deep flowers.



Moths and bats help pollinate flowers at **night**.

CASE FILE #PP-001: CLUE 2

PASSPORT EVIDENCE LOG



FIELD
WORK

☐

Complete the **Pollinator Bodies** exploration.

☐

Complete the **Pollinator Feeding Station** exploration.



FIELD
SKETCH

☐

Draw or describe your favorite pollinator.

Label the parts of the body and show where pollen is gathered. Be sure to include the mouth parts and how the pollinator moves through the garden.



YOUR MISSION:

- Uncover the *secret of pollination* and why it matters.
- Learn how **flowers become the foods** we love & find ways that you can help support the creatures who make it possible.
- Complete each clue, finish your activities, gather the evidence, and earn a stamp!
- Collect **all 5 stamps** to become a *Certified Pollination Detective!*

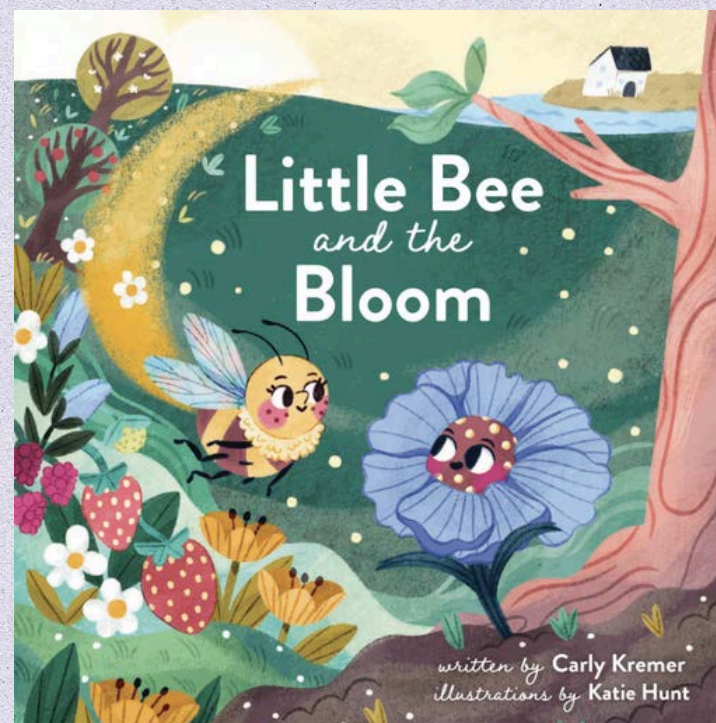
Clue #1: The Flower Puzzle — WONDER

Mini - Lesson: Flowers need help to reproduce to make more flowers.

READ TOGETHER...

Little Bee and The Bloom*

by Carley Kremer



*link to video

DISCUSS...

- 1 What does the flower need to live and thrive?
- 2 Why does the flower need Little Bee?
- 3 How does Little Bee help the flower?
- 4 What does the flower give Little Bee to help her complete her mission?
HINT: WHAT IS THE STICKY GOLD ON THE BEE'S LEGS AND TRAVELING IN CLOUDS ON THE WIND?
- 5 Why do you think it is important for the flower to give Little Bee nectar?
- 6 Who does Little Bee ask to help her with her mission?

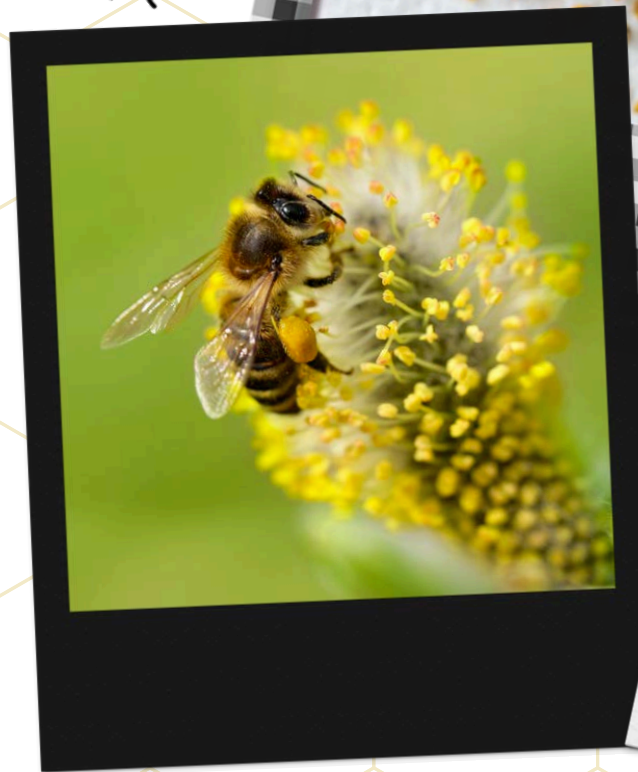




Clue #1: The Flower Puzzle — WONDER

Video & Resource Links

1. [Flower Power - Flight of the Pollinators](#)
2. [KWL Chart](#)
3. [Cross-Pollination](#) with Britannica.com
4. [Images of Pollen](#)
5. [Pollen Resources](#)



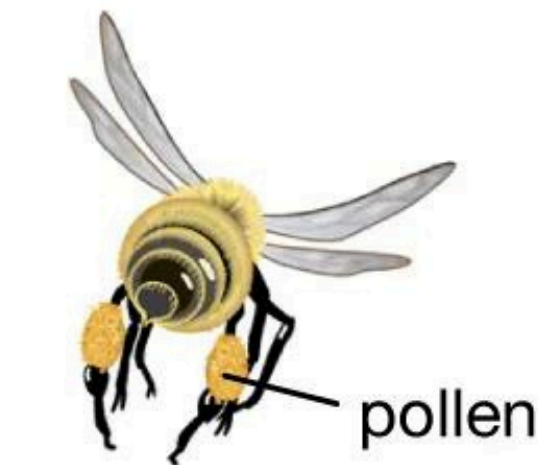
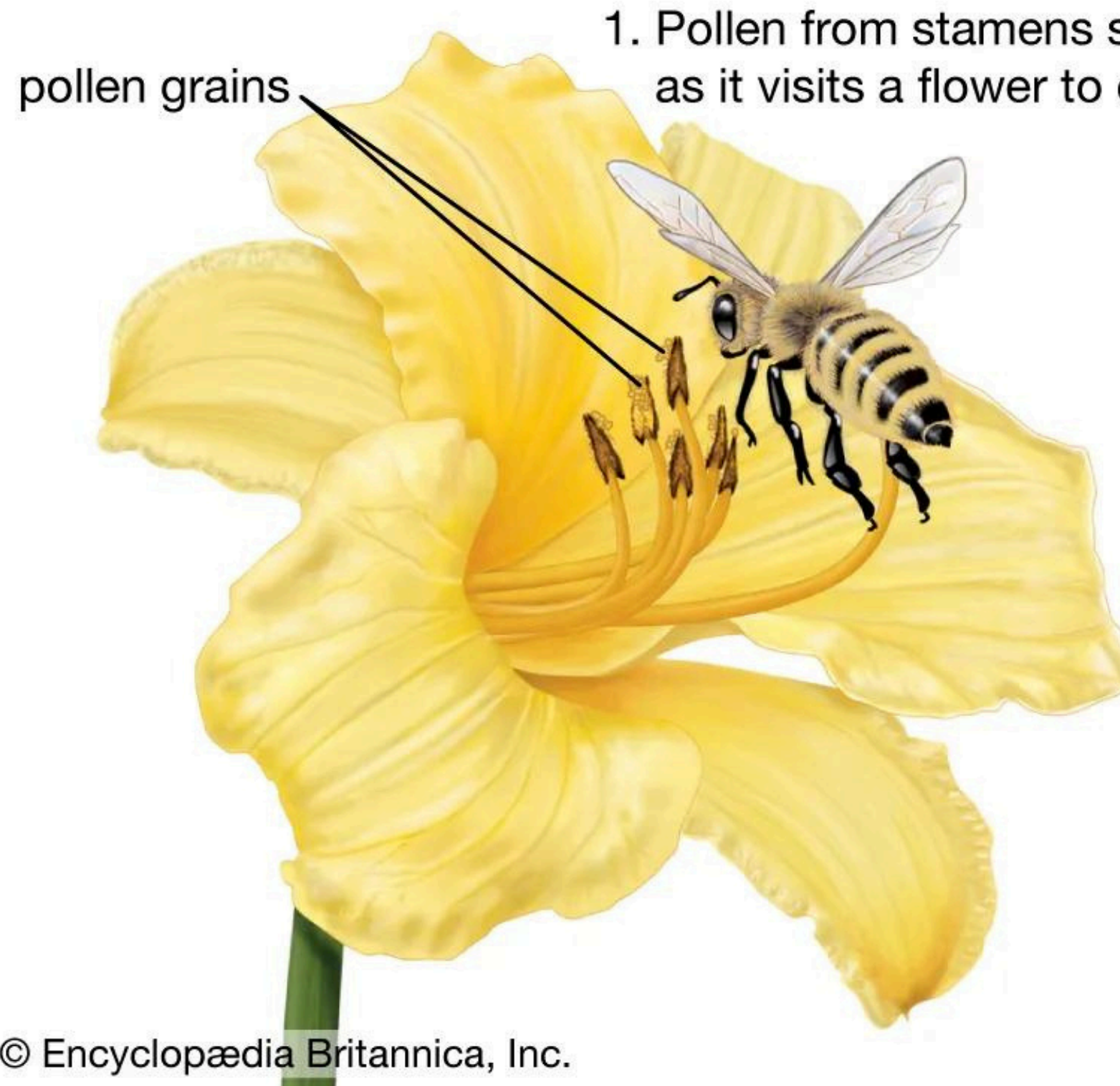
KEY TERMS

- beehive
- bee pollen
- corbicula
- colony



Clue #1: The Flower Puzzle — WONDER

Cross-pollination



2. The bee travels to another plant of the same type.



Clue #1: The Flower Puzzle — WONDER

Outdoor Field Mission: Observe Real Flowers



LOOK FOR...

- different kinds of flower shapes
- size of the plant
- clusters of flowers
- single flower stems
- single petal vs. multiple petals
- weather conditions
- time of day



Clue #1: The Flower Puzzle — WONDER

Indoor Activity: Flowers & Pollen

Use the links below to find plants in your area.
You will need to know your zip code.

- <https://nativeplantfinder.nwf.org/plants>
- <https://www.pollinator.org/guides>
- <https://www.pollinator.org/garden-cards>

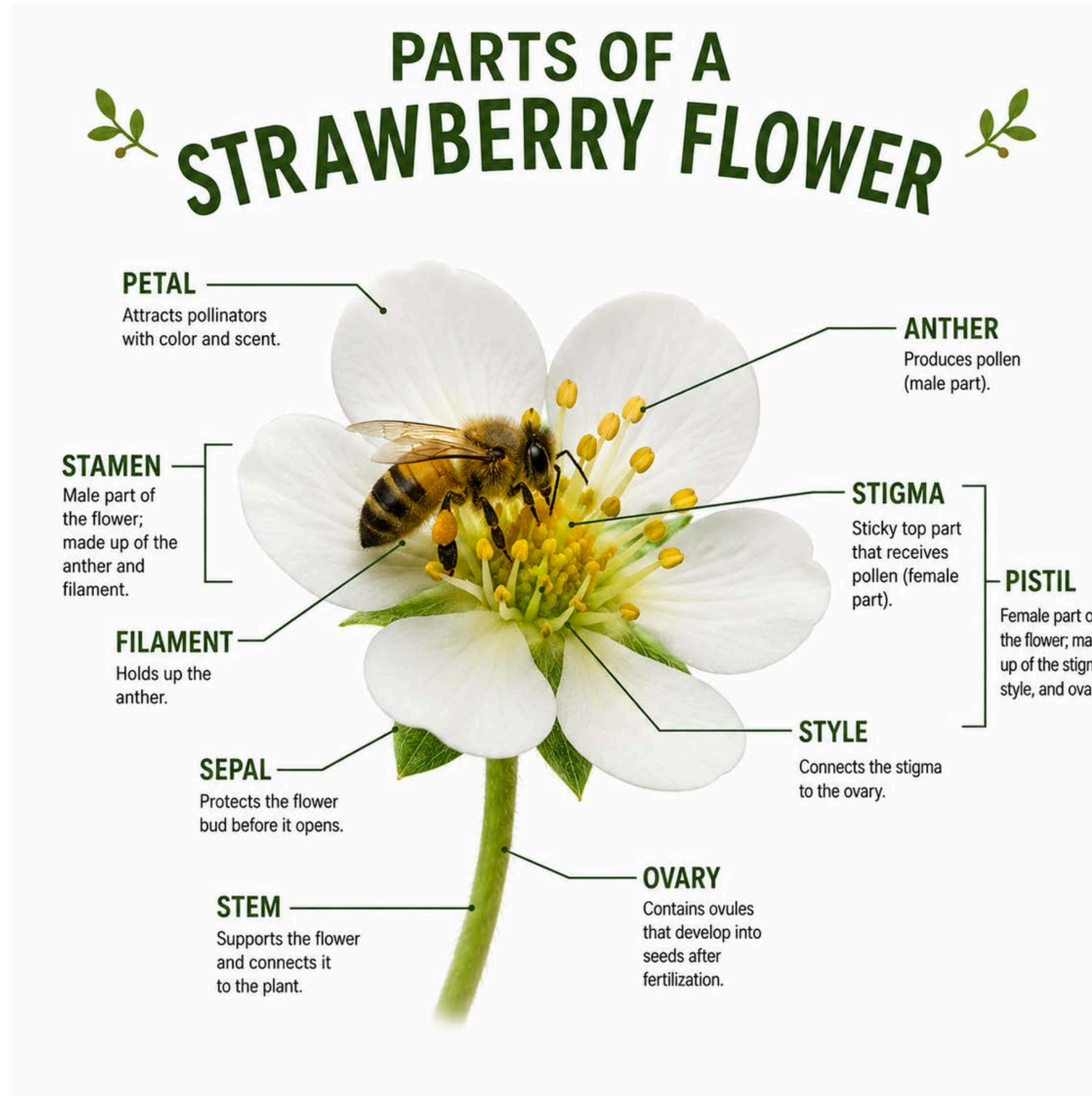
 DISCOVER MORE

Explore any of the following links:

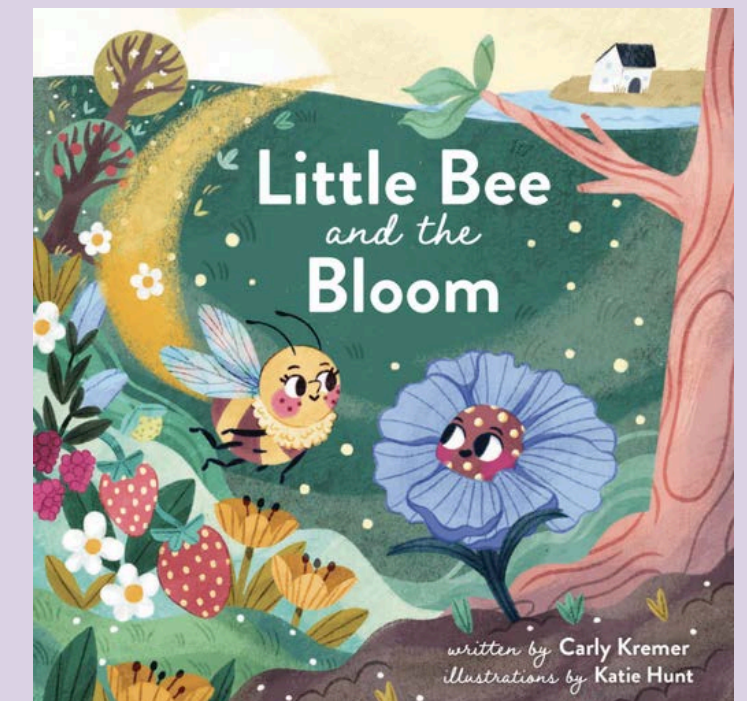
- [NatGeo - The Lifecycle of a Plant](#)
- [Look Inside A Flower](#)
- [Flower Structure and Function](#)
- [The Structure of a Flower](#)



Clue #1: The Flower Puzzle — WONDER



“If you want, I’ll share my wings, so you can see what flying brings.”



Clue #1: The Flower Puzzle — WONDER



Complete Clue #1 assignment and receive a sticker for completion before moving on to the next clue.



JOURNAL PROMPTS

- 1 Why are flowers so colorful?
- 2 Did you notice any smell or fragrance from any of the flowers?
- 3 Why do you think some flowers have fragrance and some do not?
- 4 How could flowers become our food?



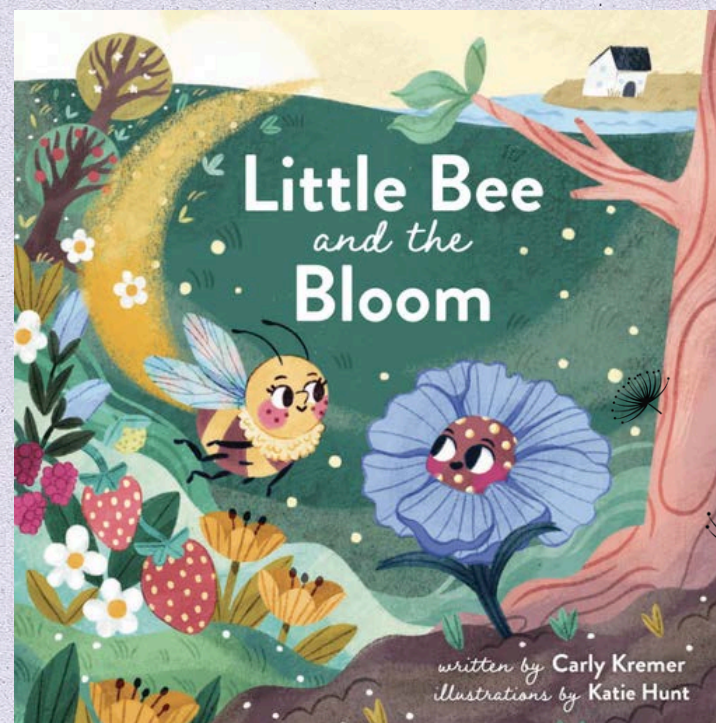
Clue #2: Meet The Pollinators — DISCOVER

Mini - Lesson: Different pollinators help plants in different ways.

READ TOGETHER...

Little Bee and The Bloom*

by Carley Kremer



*link to video



DISCUSS...

- 1 ***"There's a problem, don't you see, this golden pollen clings to me. To help seeds sprout and bloom with pride, it must be spread out far and wide?"***

What does the Bloom mean?

- 2 ***"It sticks to me! I just found out! I'll land on you, then fly about!"***
Why are fuzzy insects, like bees, especially good at carrying pollen?
- 3 Why might some flowers attract butterflies while others attract bees?
- 4 What kinds of animals do you think might be pollinators? What is your evidence?
- 5 Some garden insects are beneficial insects. While they do not pollinate flowers, they are part of the larger ecosystem.



Clue #2: Meet The Pollinators — DISCOVER

Video & Resource Links

1. [The Beauty of Pollination](#)
2. [Wind and Water Pollination](#) (optional)



KEY TERMS

- setae
- pollinator
- bee
- scales
- proboscis
- attract





Clue #2: Meet The Pollinators — DISCOVER

Outdoor Field Mission: Pollinator Bodies



HONEY BEES, CARPENTER BEES, BUMBLEBEES

Top agents & very
efficient pollinators



BUTTERFLIES

Color-loving travelers



MOTHS

The “nighttime shift”
pollinators



Clue #2: Meet The Pollinators — DISCOVER

Outdoor Field Mission: Pollinator Bodies



BEETLES

Ancient flower visitors



FLIES

Surprisingly important
helpers



BIRDS

Especially
hummingbirds



BATS

Night shift workers



Clue #2: Meet The Pollinators — DISCOVER

Outdoor Field Mission: Pollinator Bodies

BEE POWER



Why did the pollen stick so well?
Why are bees such strong pollinators?
What might happen if bees did not have setae?

BUTTERFLY BALANCE



Why would butterflies need a long mouthpart?
Why do butterflies like open, colorful flowers?

HUMMINGBIRD HOVER



Which flowers work best for birds?
Why are long beaks useful?

NIGHT SHIFT POLLINATORS



Why would smell matter more at night?
Why don't butterflies usually pollinate at night?

Clue #2: Meet The Pollinators — DISCOVER

Indoor Activity: Pollinator Feeding Station

Test different mouths on different flowers.

- Which mouths work better?
- Which flowers match which pollinators?
- Why does specialization matter?





Clue #2: Meet The Pollinators — DISCOVER



Complete Clue #2 assignment and
receive a sticker for completion before
moving on to the next clue.



JOURNAL PROMPTS

- 1 I wonder how flowers attract the “right” pollinator?
- 2 Which pollinator would you want to be? Explain.
- 3 What did you discover about flowers today?

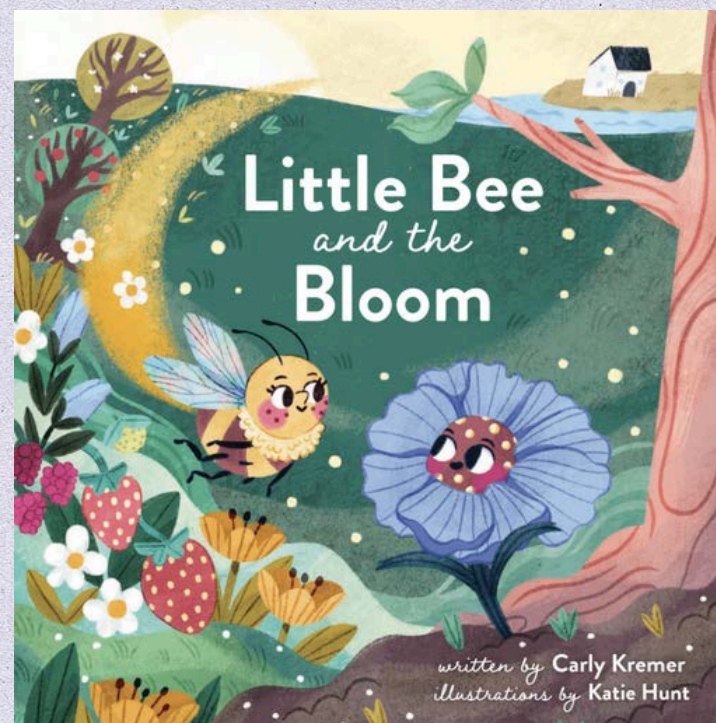
Clue #3: THE PLANT LIFECYCLE — CONNECT

Mini - Lesson: Pollination supports the plant lifecycle and food systems.

READ TOGETHER...

*Little Bee and The Bloom**

by Carley Kremer



*link to video

DISCUSS...

"Let's thank the bees for all they do, to bring good food for me and you."

- 1 Why do plants need seeds?
- 2 Have you eaten seeds? Why didn't they grow inside your body?
- 3 How does pollination help flowers make seeds?
- 4 What food in your lunchbox started as flowers?
- 5 What might happen if pollinators disappeared?



Clue #3: THE PLANT LIFECYCLE — CONNECT

Video & Resource Links

1. [How Does a Seed Become a Plant?](#)
2. [Seeds and Germination Explained](#)



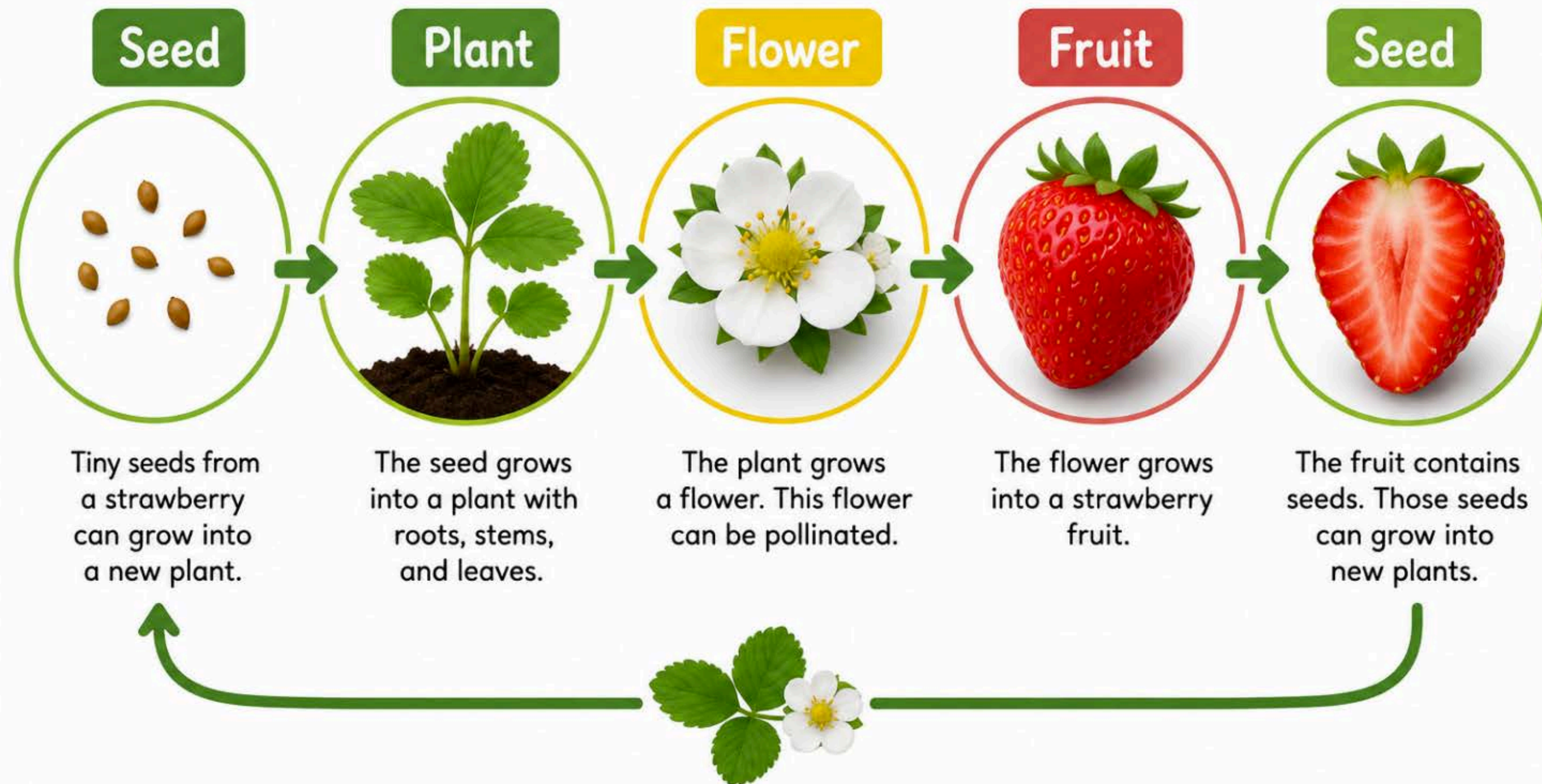
KEY TERMS

- lifecycle
- seed
- fruit
- flower



Clue #3: THE PLANT LIFECYCLE — CONNECT

The Life Cycle of a Strawberry Plant





Clue #3: THE PLANT LIFECYCLE — CONNECT

Outdoor Field Mission: Every Third Bite Tag



DISCUSSION

- 1 What happened when fewer pollinators were available?
- 2 How did the “harvest” change?
- 3 What foods disappeared from the lunchbox?
- 4 Why do scientists say every third bite of food depends on pollinators?

Scientists say that about

1 in 3 bites of food

we eat depends on
pollinators!



Clue #3: THE PLANT LIFECYCLE — CONNECT

Indoor Activity: Lunchbox Investigation

AFTER-PLAY DISCUSSION

- 1 How does pollination help plants continue their life cycle?
- 2 Why is pollination important for people?
- 3 What connections did you discover between flowers and food?





Clue #3: THE PLANT LIFECYCLE — CONNECT



Complete Clue #3 assignment and receive a sticker for completion before moving on to the next clue.



JOURNAL PROMPTS

- 1 What foods would you miss the most if pollinators disappeared?
- 2 Why are seeds important?
- 3 How are flowers connected to the foods we eat?
- 4 What surprised you about pollination today?



Clue #4: THE FOOD CONNECTION — EXPLORE

Mini - Lesson: Pollinators help create diverse foods, support healthy ecosystems, and promote human nutrition.

Video & Resource Links

1. [Plant Diversity - The Many Types of Plants](#)
2. [How Do Bees Make Honey.](#)





Clue #4: THE FOOD CONNECTION — EXPLORE

Pollinated Foods

OF THE

RAINBOW

Thanks to pollinators like bees, butterflies, birds, and bats, we enjoy a colorful variety of healthy foods!

RED	ORANGE	YELLOW	GREEN	BLUE	INDIGO	VIOLET
Strawberries	Oranges	Bananas	Kiwi	Blueberries	Grapes	Black Currants
Cherries	Carrots	Pineapple	Apples	Blackberries	Figs	Passion Fruit
Tomatoes	Pumpkin	Lemons	Cucumbers	Plums	Eggplant	Purple Cabbage
Red Bell Peppers	Sweet Potato	Yellow Bell Peppers	Green Beans	Grapes	Purple Cauliflower	Mulberries
Watermelon	Apricots	Mangoes	Avocados	Eggplant	Elderberries	Lavender

POLLINATORS
help plants grow...
WE all grow!



Clue #4: THE FOOD CONNECTION — EXPLORE

DISCUSS...

- 1 Do each of these foods taste the same or different? Why?
- 2 Why does it matter to have diverse foods to choose from?
- 3 How does pollination affect the foods we eat?
- 4 If flowers look and smell different, what do you think that means for the taste of the nectar from different flowers?
- 5 Why might honey taste different depending on the flowers bees visit?
- 6 What do pollinators have to do with solving the mystery?





Clue #4: THE FOOD CONNECTION — EXPLORE

DID YOU KNOW....



Honey is the only food on the planet that will not spoil or rot.



Honey has been used for millennia as a topical dressing for wounds since microbes cannot live in it. It also produces hydrogen peroxide.



To make one pound of honey, workers in a hive fly 55,000 miles and tap two million flowers.



It takes one ounce of honey to fuel a bee's flight around the world.



Honey is nectar that bees have repeatedly regurgitated and dehydrated.





Clue #4: THE FOOD CONNECTION — EXPLORE

Indoor Activity: Honey Tasting Detective Lab



HONEY OBSERVATION:



Color - Hold the honey to the light. What colors do you see?



Texture - Watch the honey move. Is it slow or quick-moving?



Smell - Take a deep sniff. What do you observe with your nose?



Taste - Can you taste the differences in the honey varieties?





Clue #4: THE FOOD CONNECTION — EXPLORE

DISCUSSION

- 1 Why does honey taste different?
- 2 What flowers did the bees visit to make the different varieties of honey?
- 3 How does plant diversity affect honey?
- 4 Why do different flowers attract different pollinators?
- 5 How does pollination help farmers and gardeners?
- 6 What connections did you notice between flowers and food?





Clue #4: THE PLANT LIFECYCLE — CONNECT



JOURNAL PROMPTS

- 1 Why is food diversity important?
- 2 How are flowers connected to honey?



Complete Clue #4 assignment and receive a sticker for completion before moving on to the next clue.



Clue 5: BEE A FRIEND - ACT

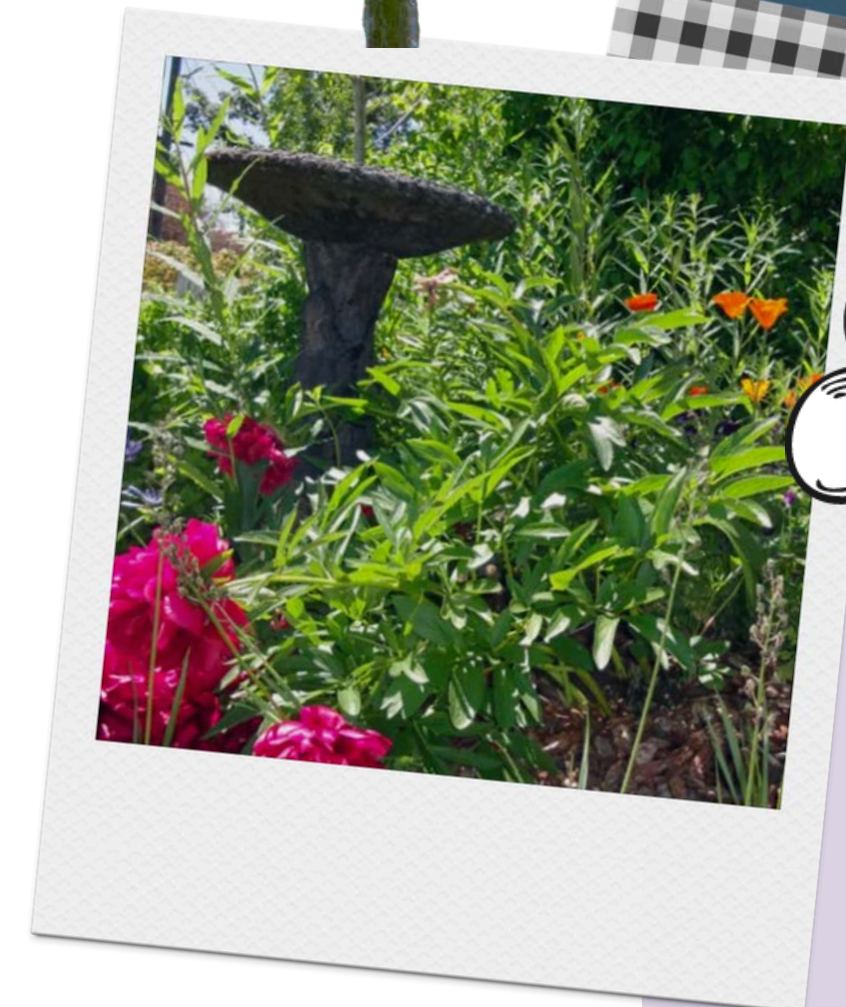
Mini - Lesson: Pollinators need our help.

Video & Resource Links

1. [Bee A Friend to Pollinators](#)

DISCUSS...

- 1 Why are pollinators important for healthy ecosystems?
- 2 What challenges do pollinators face?
- 3 How can humans help pollinators survive?



Create and Advocate for Pollinator Friendly Schools & Outdoor Community Spaces

Wrap your mind around a world without strawberries, watermelons or chocolate! Humans rely on pollinators such as native bees, honey bees, butterflies, birds and even flies and bats for these and other important foods around the world.

In our own neighborhoods, pollinators are in trouble. The food, shelter and water they need to live, grow and raise their young is disappearing. You can help pollinators where you live, go to school, and even where you play!

Explore this map to learn more about how you can help pollinators in your community.

FOOD

Flowers provide food for pollinators. As they move from flower to flower sipping nectar, they also move pollen with their bodies, helping the plants complete their lifecycles. The best way to provide food for pollinators is to plant native trees, shrubs, vines, and flowering plants. Edible herbs and vegetable plants also create landscapes with year-round flowers. Native trees provide the most pollen and nectar at one time. Planting a special garden for pollinators can make your campus even more bee friendly!

— BEE A FRIEND TIP —
Plant flowers in groups rather than separately. This helps pollinators save their energy by putting all the food they need in one "bee buffet."

WATER

All living things depend on water and pollinators are no exception. Natural water sources are all great places for pollinators to quench their thirst, but a simple birdbath, garden fountain or a shallow dish filled with water can provide the hydration pollinators need.

— BEE A FRIEND TIP —
Bees can't swim so be sure to place a few stones or pebbles in your water source to help bees and other pollinators climb out.

BEE NATURAL

Small areas mowed only once or twice a year can become a pollinator paradise! Less mowing means less pesticide use and more food. Flowers of common weeds such as dandelions and clover are great food sources.

— BEE A FRIEND TIP —
Design a sign that explains what a "bee meadow" is. Describe why "weeds" are allowed to bloom and how this helps pollinators. Help others learn to appreciate the wilder side of supporting pollinators.

SHELTER

Pollinators need safe places to rest and raise their young. Honey bees live together in beehives while native bees, butterflies and beetles live alone. Humans help keep beehives clean and healthy and in return, harvest delicious honey. Dead plant stems, leaves, twigs, mulch and even a pile of sticks can become shelter in a storm.

— BEE A FRIEND TIP —
Investigate how to build a pollinator house or bee hotel to add shelter to your landscape. Is your school ready to host a hive of honey bees? Check out **The Bee Cause Project** for more information at: www.thebeecause.org

BEE AN ADVOCATE

Share what you have learned about pollinator friendly landscaping practices with others. Invite a beekeeper, entomologist, native plant enthusiast or Master Gardener to speak to your group. Talk to administrators and maintenance personnel, share your pollinator plan with them so they can help. Encourage them to learn about Integrated Pest Management (IPM) strategies to help create pollinator friendly spaces.

— BEE A FRIEND TIP —
"That's A Wrap": Celebrate your pollinator friendly space by painting a mural, hosting a pollinator parade or creating a sculpture using recycled materials. Apply for a grant or have a fundraiser to put your plan into action!

SPONSORED BY THE TEAM AT BEE'S WRAP!
LEARN MORE ABOUT THEIR SUSTAINABLE FOOD STORAGE AT BEESWRAP.COM

WRITTEN BY AMY DABBS, MALLORY DAILEY,
TAMI ENRIGHT AND ALESSANDRA ROBERTSON
ILLUSTRATION AND DESIGN BY TORBORG DAVERN



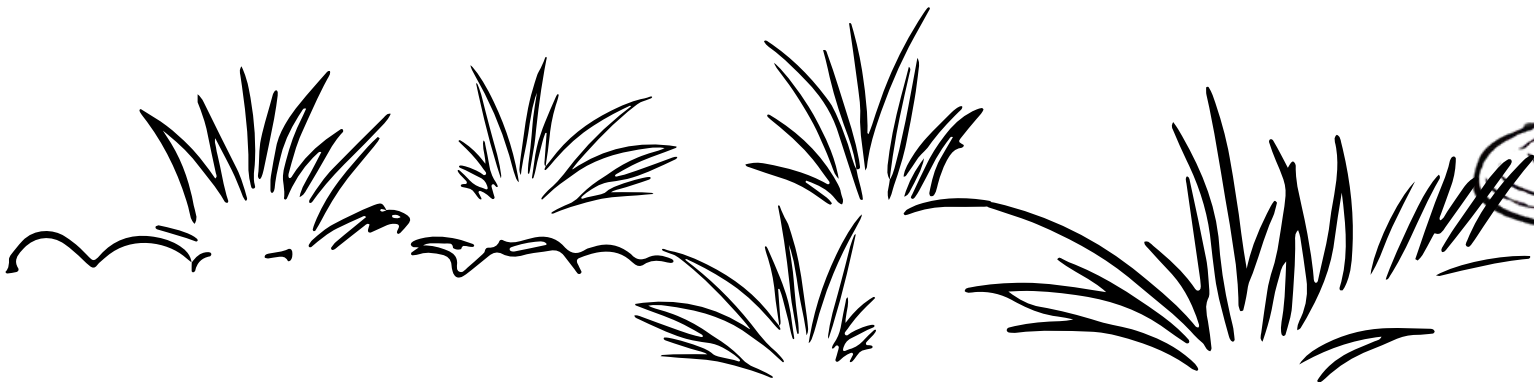
 Clue 5: BEE A FRIEND - ACT

Outdoor Field Mission: Campus Assessment

Use the Bee A Friend to Pollinators Habitat Assessment to see whether your campus provides the fundamental needs of local pollinators.

Do you see?

- **Food?**
- **Water?**
- **Shelter?**
- **Natural spaces for nesting?**





"BEE" A FRIEND TO POLLINATORS
BEE FRIENDLY HABITAT ASSESSMENT



SCIENTIST: _____ DATE: _____

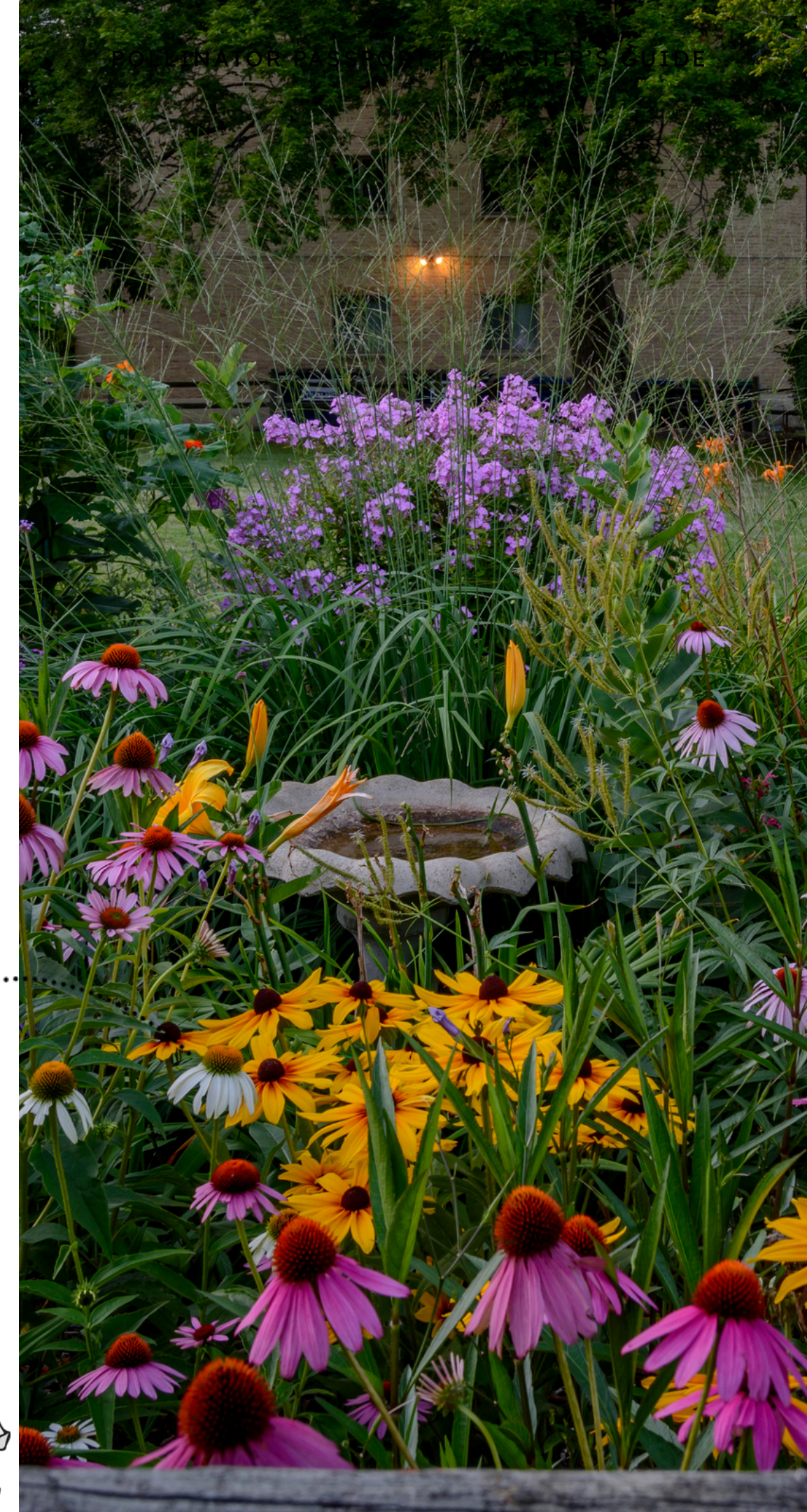
DIRECTIONS: It's time to scope out the area to see if pollinators can live here! Use the questions below to guide your exploration.

LOCATION: Complete the following section to describe the site you're assessing.	Site Name: _____ Site Location (circle one): school yard park playground Season (circle one): summer autumn winter spring																						
WEATHER: Describe today's weather (check one):	☐ Sunny ☐ Partly Cloudy ☐ Cloudy ☐ Rainy																						
OBSERVATIONS: In two minutes, create a tally chart to show the number and types of pollinators you see.	<table><tr><th>TYPES OF POLLINATORS</th><th>NUMBER OF POLLINATORS</th></tr><tr><td>Native Bees</td><td></td></tr><tr><td>Butterflies</td><td></td></tr><tr><td>Hummingbirds</td><td></td></tr><tr><td>Wasps</td><td></td></tr><tr><td>Flies</td><td></td></tr><tr><td>Honey Bees</td><td></td></tr><tr><td>Moths</td><td></td></tr><tr><td>Bats</td><td></td></tr><tr><td>Beetles</td><td></td></tr><tr><td>Ants</td><td></td></tr></table>	TYPES OF POLLINATORS	NUMBER OF POLLINATORS	Native Bees		Butterflies		Hummingbirds		Wasps		Flies		Honey Bees		Moths		Bats		Beetles		Ants	
TYPES OF POLLINATORS	NUMBER OF POLLINATORS																						
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Wasps																							
Flies																							
Honey Bees																							
Moths																							
Bats																							
Beetles																							
Ants																							
SHELTER: Look around. Check all the places you see that pollinators could use to rest and raise their young.	☐ Bee Hive ☐ Native Bee House or Hotel ☐ Logs ☐ Mulched ground ☐ Bare soil ☐ Other: _____ ☐ Natural or weedy areas																						

Clue 5: BEE A FRIEND - ACT

Indoor Activity: Bee a Friend to Pollinators Action Plan

Create an Action plan to help pollinators at home or school.
Use the [Bee Friendly Action Plan](#) or create your own!





Clue #5: THE PLANT LIFECYCLE — CONNECT



JOURNAL PROMPTS

- 1 Why is food diversity important?
- 2 How are flowers connected to honey?



Complete Clue #5 assignment and
receive a sticker for completion!

Did you solve the very important mystery?

CONGRATULATIONS, POLLINATOR DETECTIVES! MISSION ACCOMPLISHED!

You followed the **clues**, gathered **evidence**, and **solved** the mystery for the farmers! You discovered that pollinators are the missing piece—helping flowers become the fruits, seeds, and foods we enjoy every day.

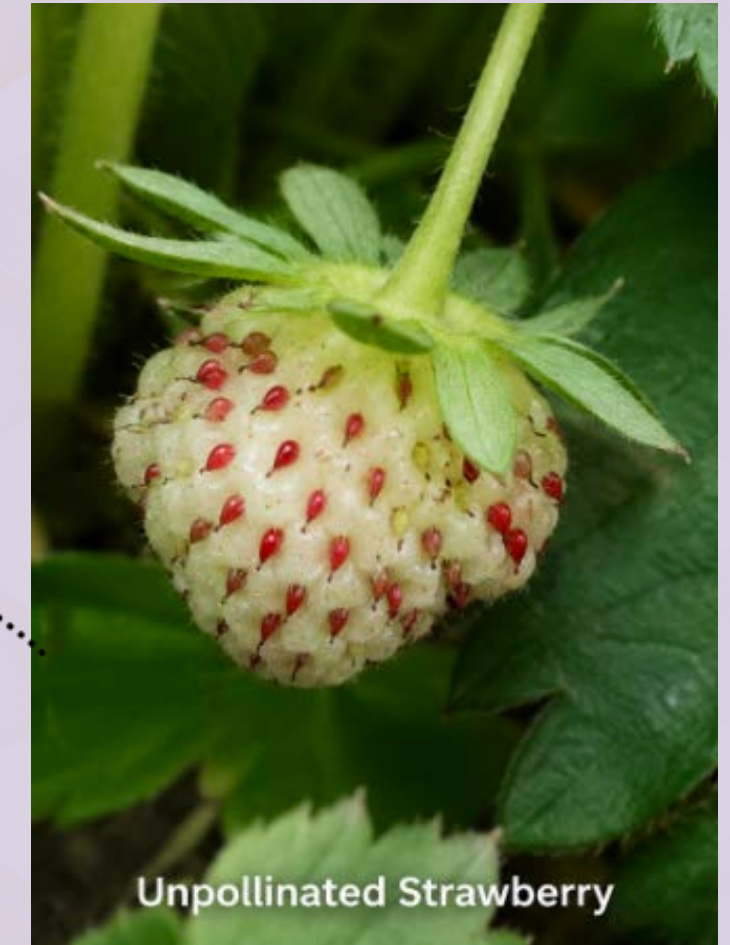


Strawberry Solution Mission:

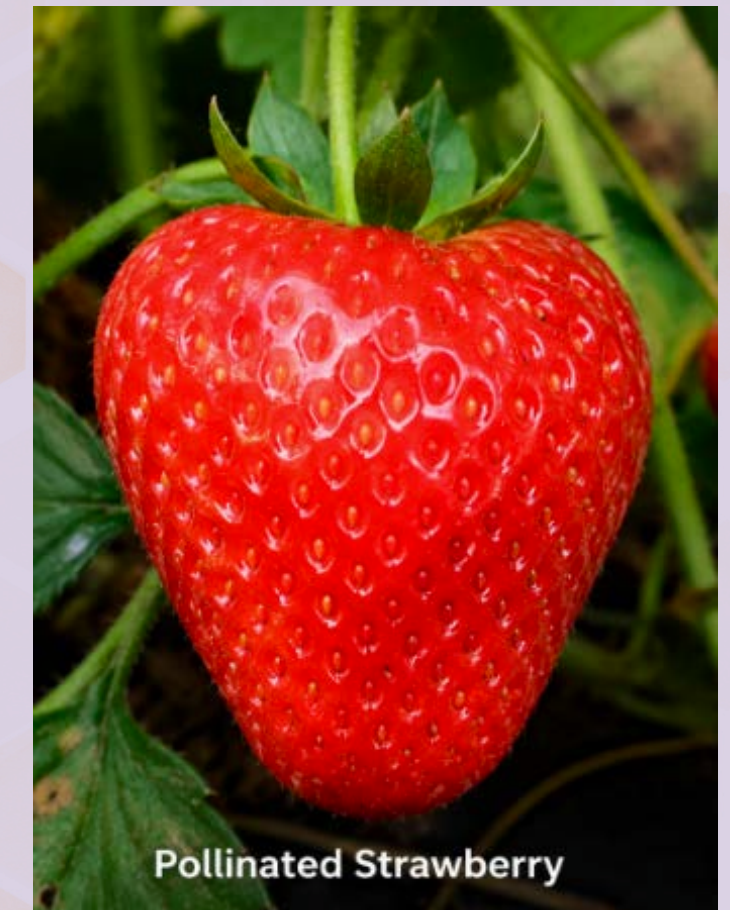
Strawberries can **self-pollinate**; however, **pollination by bees and hoverflies produces better-formed and larger fruit**. Poor pollination makes the berries small and misshapen.

Strawberry flowers have both male parts (stamen) and female parts (pistil). Each pistil must receive pollen grains from the stamen for **full pollination**. The berry forms from the pistil developing an individual seed called an achene. The red, sweet part we eat is a large, juicy carrier for the seeds!

Case closed - Mystery solved! Great work, detectives!



Unpollinated Strawberry



Pollinated Strawberry