

# Cultivating Curiosity: Pollinators

**Unit Overview:** Students will be introduced to the process of pollination, pollinator preferences and the parts of a flower through dissection, exploration, and observation. Students will answer essential questions and be introduced to scientific explanation.

**Grade Levels:** up to and including grade 5



COASTAL MAINE  
BOTANICAL  
GARDENS 

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**Dear Teachers:** Welcome to the world of pollinators! This unit was developed by the Education Department at Coastal Maine Botanical Gardens. Our goal is to provide a high quality, standards-aligned field trip in keeping with our mission to inspire meaningful connections among people, plants, and nature through horticulture, education and research. It is designed for students up to and including grade 5 and can be modified by you, the teacher, to fit your curricular needs.

**Before your visit:** The pre-visit activities provided will enhance your field experience. Please use our visuals, vocabulary, and essential questions to begin your study of pollinators. Expectations for written answers to the essential questions can be modified to meet the needs of learners. If you have a projector, project the visuals onto a screen and enlarge them for close study.

**During your visit:** Students will review the role of pollinators in nature, learn about flower preferences and do a hands-on flower dissection lab. They will use a hand lens and other tools to assist in their observations. Then they will go into the field to collect data about pollinators and their flower preferences. When they return to the education center they will make a claim about what they observed based on evidence and reasoning.

**After your visit:** Back in your classroom, review the claims and if students need to revise their claims, allow them to do so. Please use the post-activities to review what they have learned. Further exploration of the topic is encouraged.

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## Desired Results

### Established goals:

#### Core Idea LS1: **From Molecules to Organisms: Structures and Processes**

*How do organisms live, grow, respond to their environment, and reproduce?*

- **LS1.A: STRUCTURE AND FUNCTION**

*How do the structures of organisms enable life's functions?*

- **By the end of grade 2.** All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive, grow, and produce more plants.
  - **By the end of grade 5.** Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (Boundary: stress at this grade level is on understanding the macroscale systems and their functions, not microscopic processes)
- **LS1.B: GROWTH AND DEVELOPMENT OF ORGANISMS**  
*How do organisms grow and develop?*
  - **By the end of grade 2.** Plants and animals have predictable characteristics at different stages of development. Plants and animals grow and change. Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.
  - **By the end of grade 5.** Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles that include being born (sprouting in plants), growing, developing into adults, reproducing, and eventually dying.

**Core Idea LS2: Ecosystems, Energy, and Dynamics**

*How and why do organisms interact with their environment, and what are the effects of these interactions?*

• **LS2.A: INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS**

*How do organisms interact with the living and non-living environment to obtain matter and energy?*

- **By the end of grade 2.** Animals depend on their surroundings to get what they need, including food, water, shelter, and a favorable temperature. Animals depend on plants or other animals for food. They use their senses to find food and water, and they use their body parts to gather, catch, eat, and chew the food. Plants depend on air, water, minerals (in the soil), and light to grow. Animals can move around, but plants cannot, and they often depend on animals for pollination or to move their seeds around. Different plants survive better in different settings because they have varied needs for water, minerals, and sunlight.
- **By the end of grade 5.** The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals that eat plants. Either way they are “consumers.” Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plant parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil for plants to use. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.

Source:

National Research Council. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press, 2012.

**Understanding(s):**

Students will understand that...

- Pollination is essential to life in an ecosystem.
- The way flowers are designed helps the process of pollination.
- Without pollinators, we would not be able to enjoy many of the foods we eat and drink every day.

**Essential Question(s):**

- What is pollination and why is it important to an ecosystem?
- How does the design of a flower attract an animal to pollinate it?

<p><b>Students will know...</b></p> <ul style="list-style-type: none"> <li>• The names of the parts of a flower.</li> <li>• How a flower's shape, color, smell attract different pollinators.</li> <li>• The claim, evidence, reasoning method of scientific explanations.</li> </ul>	<p><b>Students will be able to...</b></p> <ul style="list-style-type: none"> <li>• Identify flower parts through dissection and understand how those parts help with pollination.</li> <li>• Observe/record/collect evidence in the field in order to make a claim.</li> </ul>
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<p style="text-align: center;"><b>Assessment Evidence</b></p>	
<p><b>Performance Tasks:</b></p> <ul style="list-style-type: none"> <li>• <i>Dissect a flower and examine its parts in order to better understand the process of pollination.</i></li> <li>• <i>Go on an exploratory walk in the Gardens and record pollination interactions on a data sheet. Make a claim and show evidence based on reasoning as to which flowers different pollinators prefer.</i></li> </ul>	<p><b>Other Evidence:</b></p> <ul style="list-style-type: none"> <li>• <i>Vocabulary activities</i></li> <li>• <i>Oral and/or written responses to the Essential Questions</i></li> <li>• <i>Flower dissection worksheet</i></li> <li>• <i>Data sheet with observations of pollination interactions.</i></li> <li>• <i>Claim, evidence, reasoning worksheet</i></li> <li>• <i>Drawing of a plant and its parts</i></li> <li>• <i>Drawing of a pollinator in action</i></li> </ul>

<p style="text-align: center;"><b>Learning Plan</b></p>
<p><b>Learning Activities:</b></p> <ul style="list-style-type: none"> <li>• Examine pictures of pollinators and discuss the process of pollination, why it is important and how the design of a flower attracts different pollinators.</li> <li>• Do vocabulary activities to learn the key vocabulary.</li> <li>• Dissect a flower and answer investigative questions.</li> <li>• Divide into groups and go on an exploratory walk. Pairs of students will record observations of pollinators in action in the garden.</li> <li>• Have students make a claim based on evidence as to what flowers different pollinators prefer.</li> <li>• Review the essential questions with the group.</li> <li>• Draw a flower and label its parts.</li> <li>• Illustrate a sentence about a pollinator in action.</li> </ul>

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How do we help young students with inquiry? How do we encourage curiosity? How can we help them to think like scientists? As you present the following essential questions to your class, it helps to help them frame their answers using the claim, evidence, reasoning approach. A **claim** is a statement of conclusion that answers the original question. **Evidence** is scientific data that supports the claim. The data needs to be appropriate or sufficient to support the claim. Students will then use **reasoning**, a justification that connects the evidence to the claim. It shows why the data counts as evidence by using appropriate and sufficient scientific principles. By using this vocabulary and modeling how to construct a scientific explanation, you are preparing young students for thinking critically about science. To begin your studies, use the vocabulary, show the visuals, and ask these questions.

**Essential Question:** How does the design of a flower attract an animal to pollinate it?

**Essential Question:** What is pollination and why is it important to an ecosystem?

**Observations, Claims, Evidence & Reasoning Prompt**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

<p><b>Observations</b> What did you observe? What information did you collect?</p>	
<p><b>Claim</b> After looking for patterns in your observations, what inferences (claims) can you make that address the essential question?</p>	
<p><b>Evidence</b> What observations support your claim?</p>	
<p><b>Reasoning</b> What science big ideas help you connect the claim and evidence? How do your ideas compare with those of others?</p>	

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### KEY IMAGES

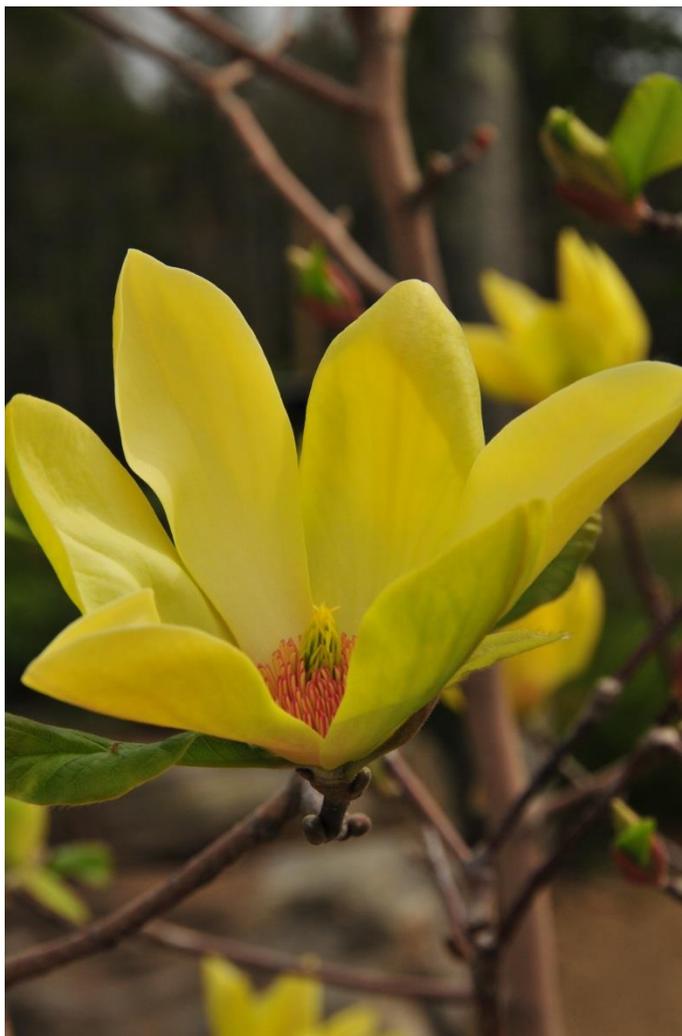


**Figure 1 High Bush Blueberries (W. Cullina photo)**

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**Figure 2 Sunburst Magnolia (W. Cullina photo)**

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### KEY IMAGES



**Figure 3 Pears (B. Freeman photo)**

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### KEY IMAGES

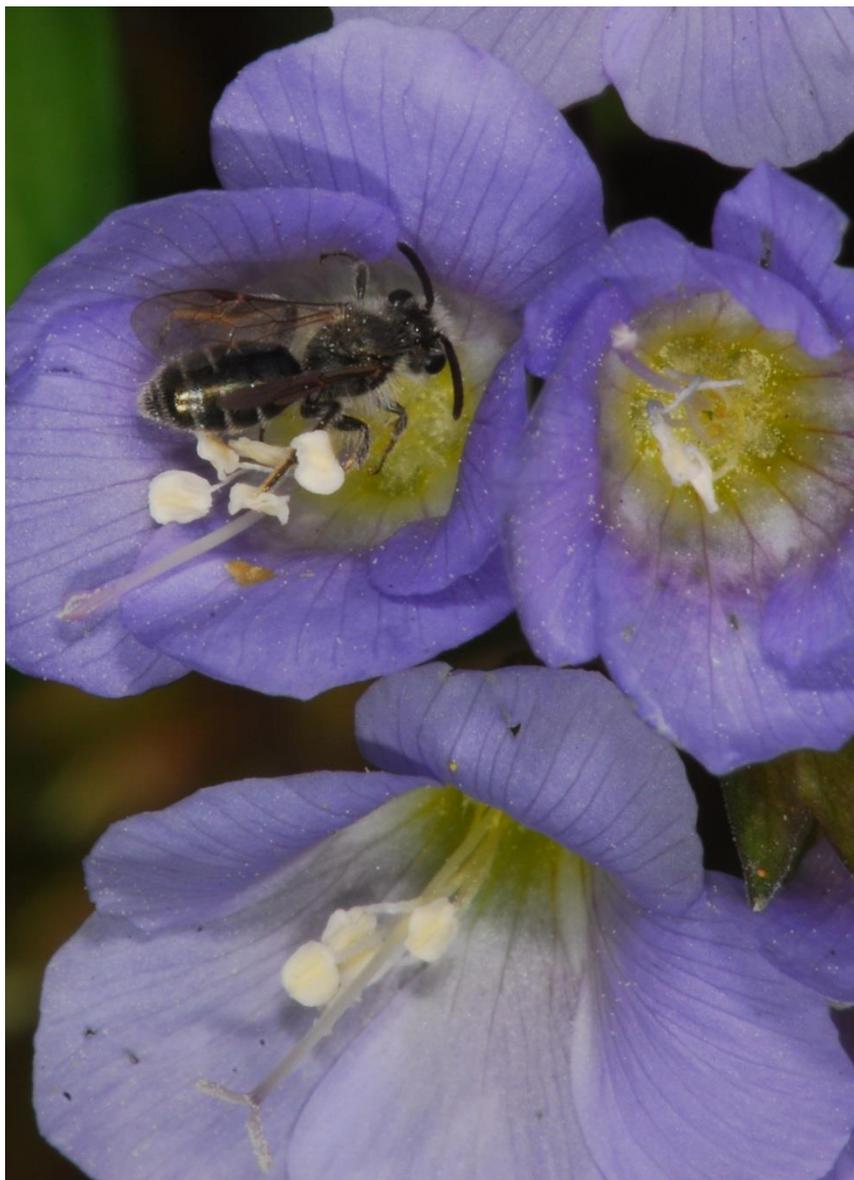


**Figure 4 Lavender with butterfly (B. Freeman photo)**

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### KEY IMAGES



**Figure 5 Jacob's Ladder with bee (W. Cullina photo)**

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### KEY IMAGES



**Figure 6 Blackberries (B. Freeman photo)**

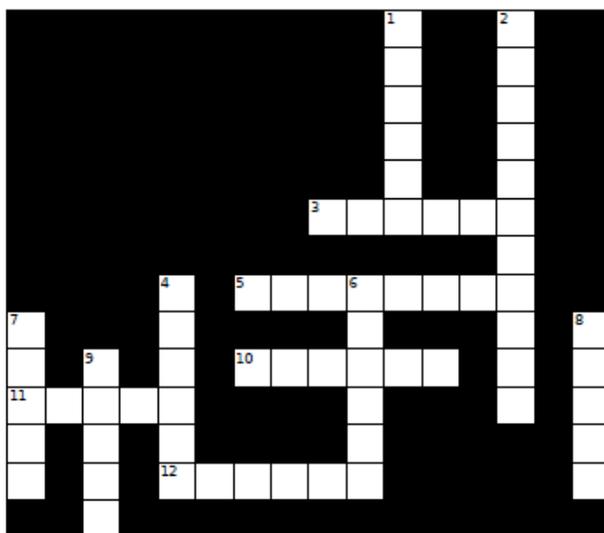
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### KEY VOCABULARY

1. Pollination: the transfer of pollen from the male to the female part of a flower
2. Sepal: this is a small leaf that protects the flower before it blooms, found at the base of the flower
3. Petal: this is the part of the flower that can be brightly colored (but not always) and can have a smell (but not always), attracts insects, surrounds the pistil and the stamen
4. Nectar: the sweet smelling and tasting liquid inside a flower
5. Pistil: found in the center of the flower, this is the female part of the flower, and it has three parts, the stigma (top of the pistil), the style (middle of the pistil) and the ovary (bottom of the pistil)
6. Stigma: this is at the top of the pistil and connects to the style, can be sticky or feathery to catch pollen
7. Style: this is in the middle of the pistil and it connects the stigma to the ovary, it has pollen tubes in it that move the pollen to the ovary
8. Ovary: this is at the bottom of the pistil and has *ovules* inside it that become seeds; it is the part of a flower that becomes the fruit
9. Stamen: found on the outside of where the pistil is located, this is the male part of the flower and it has three parts, the anther (the top of the stamen), the filament (the part that holds up the anther), and the pollen (found on the anther)
10. Filament: this is the stalk of the stamen that holds up the anther, and the name comes from a Greek word meaning “thread”
11. Anther: this is the part of the stamen where the pollen is made and it is covered in pollen
12. Pollen: these are the tiny grains on top of the anther that go to the stigma for pollination
13. Proboscis: an elongated mouthpart, much like a straw, that is used by a butterfly or moth for drinking nectar.

Name: \_\_\_\_\_ Date: \_\_\_\_\_



- Across**
- 3 found on the outside of where the pistil is located, this is the male part of the flower and it has three parts, the anther (the top of the stamen), the filament (the part that holds up the anther), and the pollen (found on the anther)
  - 5 this is the stalk of the stamen that holds up the anther, and the name comes from a Greek word meaning "thread"
  - 10 found in the center of the flower, this is the female part of the flower, and it has three parts, the stigma (top of the pistil), the style (middle of the pistil) and the ovary (bottom of the pistil)
  - 11 this is the part of the flower that can be brightly colored (but not always) and can have a smell (but not always), attracts insects, surrounds the pistil and the stamen
  - 12 the sweet smelling and tasting liquid inside a flower

- Down**
- 1 this is at the top of the pistil and connects to the style, can be sticky or feathery to catch pollen
  - 2 the transfer of pollen from the male to the female part of a flower
  - 4 these are the tiny grains on top of the anther that go to the stigma for pollination
  - 6 this is the part of the stamen where the pollen is made and it is covered in pollen
  - 7 this is a small leaf that protects the flower before it blooms, found at the base of the flower
  - 8 this is at the bottom of the pistil and has ovules inside it that become seeds; it is the part of a flower that becomes the fruit
  - 9 this is in the middle of the pistil and it connects the stigma to the ovary, it has pollen tubes in it that move the pollen to the ovary

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Can you find the parts of a flower?

A L U B T Q I D F I J L U I S  
P Q D E P V U G G O A J K N J  
I L A P E S I Y L T Y O P X P  
S Z J D A G V S E N N L O L J  
T K K X N Q F P B E X F L X O  
I R L D V S T I G M A R L F N  
L Z O Y Y N E C T A R U I K Q  
K Y C N V Y K U C L E O N G H  
P T S T Y L E L J I H M A Q Y  
Y R A V O S O C B F T O T S D  
P S I G R I W Z E I N E I T F  
R Q N D A U I A K F A U O A V  
O P O L L E N H A J U X N M K  
A R Q Z Z L B P T Y W P P E X  
P B A G C O F C Q U C M E N X

ANTHER  
FILAMENT  
NECTAR  
OVARY  
PETAL  
PISTIL  
POLLEN  
POLLINATION  
SEPAL  
STAMEN  
STIGMA  
STYLE

### Can you find all the different types of pollinators?

Q N Q L R M Q G W I F D W O A  
Y Y L F R E T T U B W M A Q O  
T K A G P K B F M H A Y X N F  
T B E E T L E Z R U G G F L T  
C V B P V W I P G M C T Y E G  
E E S A G R Q D O M O S B B B  
E A X J V O H P F I M S K W J  
W Z J T E W K O Q N F G Y T S  
V V O B D C Y A X G J R A M J  
Z J T F M U F Y W B L D Q G F  
R U Z G Z Q Z D G I M Q B M R  
V E M O G C W E O R V I T K K  
Q H T O M L B I B D P Y K V A  
D S G A U O V A N Z I Y Q H Q  
L J T R W N T C I D P U T Z Y

ANT  
BAT  
BEE  
BEETLE  
BUTTERFLY  
FLY  
HUMMINGBIRD  
MOTH  
WASP  
WATER  
WIND

Word Wall Vocabulary

Pollination

Style

Sepal

Ovary

Petal

Stamen

Nectar

Filament

Pistil

Anther

Stigma

Pollen

Proboscis

**Pollinators**

**Post-visit Activity**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Directions:** Draw a picture to illustrate the sentences below.

**A bee lands on a flower to get nectar.**

**The bee helps pollinate the flower and uses the nectar to make honey.**

**Pollinators**

**Post-visit Activity**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Directions:** Draw a picture to illustrate the sentences below.

**A hummingbird flies from flower to flower drinking nectar.**

**The hummingbird helps pollinate the flower, and the sugar in the nectar gives the  
hummingbird energy to fly all day.**

**Pollinators**

**Post-visit Activity**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Directions:** Draw a picture to illustrate the sentences below.

**A butterfly sips nectar from a flower using its proboscis.**

**The butterfly helps pollinate the flower, and the nectar feeds the butterfly.**

**Pollinators**

**Post-visit Activity**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Directions:** Draw and label a flower and its parts. Use the vocabulary you have learned. You may use your imagination or draw a real flower. Answer the question based on your field observations at Coastal Maine Botanical Gardens.

Sepal

Petal

Pistil

Stigma

Style

Ovary

Stamen

Filament

Anther

Pollen

What kind of pollinator would land on your flower? Why?