

Cultivating Curiosity: Pollinators

Students will be introduced to the parts of a flower and the process of pollination through dissection, exploration, and observation. They will make a claim stating what they think is the relationship between plants and pollinators. They will give evidence for this claim based on reasoning.

For up to and including grade 5.





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Grade Levels: up to and including grade 5

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 protect, preserve and enhance the botanical heritage and natural landscapes of coastal Maine for people of all ages 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: Your students will do a hands-on flower dissection lab and answer questions on a graphic organizer about the parts of a flower. They will have loupes and hand lenses to assist their observations. Then they will go into the field to collect data about pollinators and pollination. When they return to the education center they will make a claim about what they observed based on evidence and reasoning. They will receive the same essential questions graphic organizer as in the pre-activity.

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 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)

- 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 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, 2011.

<p>Understanding(s):</p> <p>Students will understand that...</p> <ul style="list-style-type: none"> • Pollination is essential to life in an ecosystem. • The way plants are designed helps the process of pollination. 	<p>Essential Question(s):</p> <ul style="list-style-type: none"> • 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>Students will know...</p> <ul style="list-style-type: none"> • The names of the parts of a plant. • The designs of plants and how that attracts pollinators. • The claim, evidence, reasoning method of scientific explanations. 	<p>Students will be able to...</p> <ul style="list-style-type: none"> • Identify plant parts through dissection and understand what the parts do to help with pollination. • Observe/record/collect evidence in the field in order to make a claim.

Assessment Evidence	
<p>Performance Tasks:</p> <ul style="list-style-type: none"> • <i>Dissect a plant and examine its parts in order to better understand the process of pollination.</i> • <i>Go on an exploratory walk in the Gardens and record pollination interactions on a map. Note specific data such colors and smells of plants, and types and numbers of pollinators. Make a claim and show evidence based on reasoning as to which plants attract what kind of pollinators.</i> 	<p>Other Evidence:</p> <ul style="list-style-type: none"> • <i>Vocabulary activities</i> • <i>Oral and/or written responses to the Essential Questions</i> • <i>Flower dissection worksheet</i> • <i>Map of Gardens with observations of pollination interactions.</i> • <i>Claim, evidence, reasoning worksheet</i> • <i>K-W-L chart</i> • <i>Drawing of a plant and its parts</i> • <i>Drawing of a pollinator in action</i>

Learning Plan

Learning Activities:

- Examine pictures of pollinators and discuss what pollination is and why it is important.
- Do vocabulary activities to learn the key vocabulary.
- Use a K-W-L chart (what we **K**now, what we **W**ant to know, and what we've **L**earned) to open the session on pollinators.
- Dissect a flower. Students will use a loupe or hand lens to examine the parts.
- Divide into groups and go on an exploratory walk. Each student will have a clipboard, map, and pencil to record observations of pollination.
- Return to the Education Center and share in small groups. Have each group make a claim to show evidence of what pollinators prefer what plants based on evidence. Share these claims.
- Review the essential questions with the group. Add to the L portion of the K-W-L chart.
- Draw a flower and label its parts.
- Illustrate a sentence about a pollinator in action.



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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>Observations What did you observe? What information did you collect?</p>	
<p>Claim After looking for patterns in your observations, what inferences (claims) can you make that address the essential question?</p>	
<p>Evidence What observations support your claim?</p>	
<p>Reasoning 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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KEY IMAGES

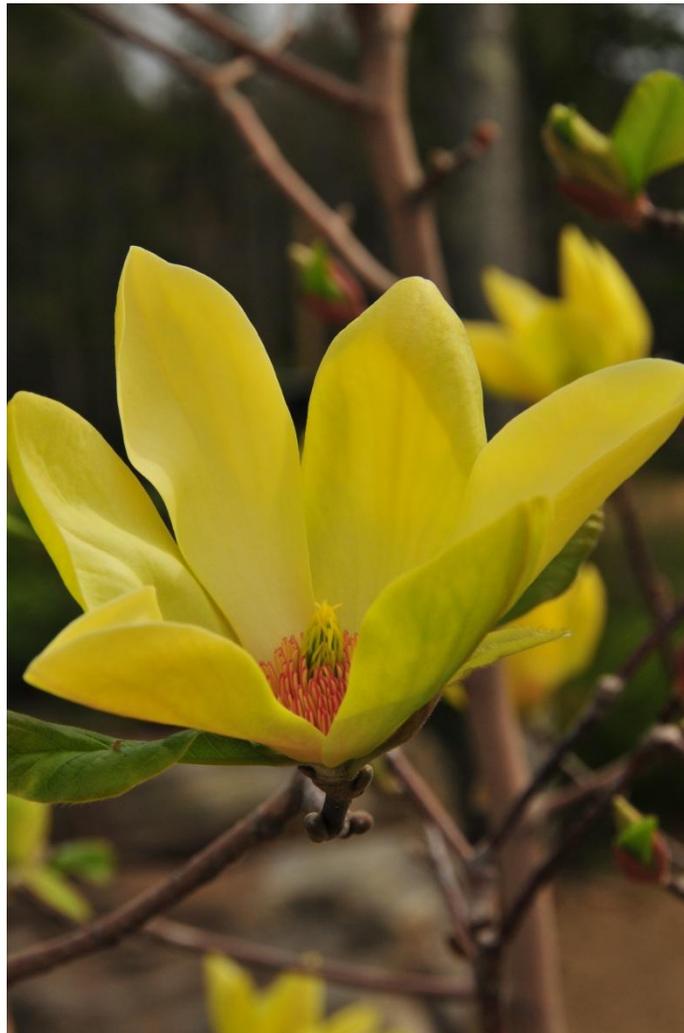


Figure 2 Sunburst Magnolia (W. Cullina photo)

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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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Grade Levels: up to and including grade 5

KEY IMAGES



Figure 6 Blackberries (B. Freeman photo)



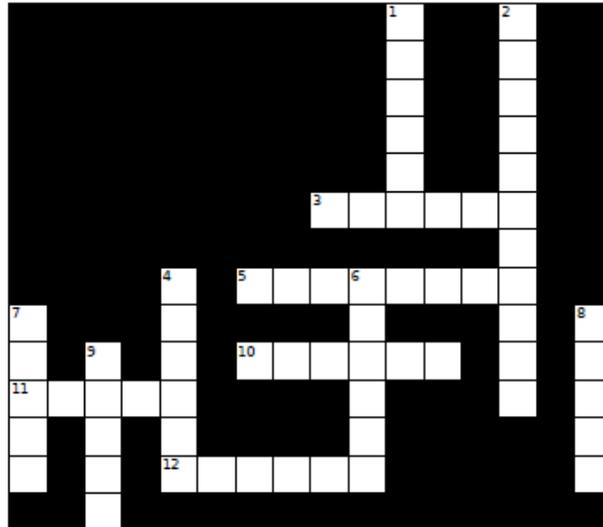
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KEY VOCABULARY

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

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 plant?

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



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Word Wall Vocabulary

Pollination

Style

Sepal

Ovary

Petal

Stamen

Nectar

Filament

Pistil

Anther

Stigma

Pollen



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 tongue like a straw.

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?