



Pollinators

Noticing Friends of the Garden

Day 3 of Cultivating Connections Spring Sequence

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Target Grade Level

1st – 5th grade

Essential Questions

What do pollinators do?
How do they do it? Why
is it important?

Objectives

By the end of this lesson
students will be able to:

- Identify three different pollinators
- Articulate the codependent relationship of plants and pollinators

STE(A)M Integration

Art: journals, mapping
Science: observations
& data tracking,
pollinator identification,
mapping

NGSS Performance Expectation

2-LS2-2. Develop a
simple model that
mimics the function of
an animal in dispersing
seeds or pollinating
plants.

Materials

- Pollinator cards
- Journals
- Writing utensils
- Clipboards
- Blank paper
- Hand lenses
- Thermometer
- Rain gauge

Lesson Length

60 minutes

Summary

In the previous lesson about pollination students were introduced to the process of pollen transfer, plant parts, and seed generation. Friends of the Garden will introduce 1st-5th grade students to specific types of pollinators such as, bats, bees, beetles, birds, butterflies, flies, moths, and wind. Through activities such as identification, role playing, story mapping, and inquiry lead discussions, students will be able to identify pollinators and articulate their role in the garden.

Rationale

Spring is a vital time of year for new growth in our environment, especially the garden. With the help of pollinators, our gardens are able to grow plants that eventually become edible fruits and vegetables. Humans and animals depend on pollination as a mechanism of the growing process for flowers, fruits, and vegetables. Therefore, understanding the many types of pollinators and their role is not only a fun way to learn in the garden, it's also very important to understand the process.

Background

In the spring plants and animals are responding to the warmer temperatures and longer daylight hours by coming to life in search of food and reproduction for survival. Pollinators assist in the reproduction of plants by transporting pollen. Flowers that are not pollinated are not able to produce fruits and seeds. In return, flowering plants attract pollinators by producing nectar, a highly nutritious, sugar-based substance as a significant source of food. Plants have developed scents, colors, and shapes that make them attractive to pollinators who, in turn, have developed physical characteristics that allow them to gather and transport pollen as they seek food. The most well-known pollinators are bees. In the U.S. there are nearly 4,000 native species of ground and twig nesting

Preparation for Lesson

- Print pollinator cards (laminated cards are recommended)
- For grades 1-2, create a story map
- Gather materials
- Create your own story map as an example for students

Key Vocabulary

Pollinators
Pollen
Nectar

Garden Related Activities

Ability to identify types of pollinators and their roles and relationships in the garden

bees. Some form colonies while others live and work a solitary life. Bees make great pollinators when their needs of nectar, pollen, and water are available. Although the varying tongue length of bees determines which flower they can obtain nectar and pollen from, they are generalists. Meaning they will pollinate a wide range of crops.

Honey bees are the most commonly known bees, but contrary to popular belief, not all bees belong to a honey making colony with a queen bee in a hive. For example, mason bees live in solitude, tending to their own brood (young). Although mason bees live alone, they prefer to nest near other mason bees. They make great pollinators, as they are among the first pollinators going to work in early spring from March to May, when other pollinators have yet to leave their nests/hives. Mason bees also make for great pollinators, as they are typically non aggressive bees since they live alone and have no need to protect a hive. They are also efficient, and they find food within a 300-foot radius of their nest, compared to that of four miles for the honey bee. Flying short distances in a zig zag pattern makes them especially efficient pollinators. Their primary source for nectar is from fruit trees, for example an apple tree. Mason bees collect nectar, bring it to their nests,

knead it into a ball, mix it with saliva and save it in the holes of their nest. After enough food is stored mason bees lay eggs and close the holes sealed with mud.

Butterflies need sun to warm their bodies to fly. Therefore, they are attracted to the leaves, flowers, bare earth, and stones within a garden as resting sites to bask in the sun. They typically prefer open space to receive this warming effect but also prefer protection from the wind as they are easily affected by this force. Host plants are susceptible to damage as larvae feed on the leaves. They also like to be close to soil as a nutrient and water source.

Moths are distinguished from butterflies, as they have antennae that feather at the tip. Moths are also more active at night, but are still attracted to light. They may be less colorful, but are attracted to strong and sweet smelling flowers that open in late afternoon or night. Flowers that are white or pale colored are often most commonly associated with moths.

Beetles may be less attractive than birds and butterflies, but they do help with pollination. Although eating plant parts gives them a bad reputation, they are attracted to strong scented flowers with their sexual organs exposed. They pollinate magnolia, sweet shrub, paw paws, and yellow pond lilies.

Flies are generalist pollinators. They typically pollinate small flowers that bloom under the shade in seasonally moist habitats, and are attracted to annual and bulbous ornamental flowers. These include: paw paws, dead horse arum, skunk cabbage, goldenrod, and members of the carrot family such as Queen

Anne's lace.

Birds in general forage plants for fruit and seed. The primary bird pollinator is the hummingbird. With long beaks and tongues, they are capable of drawing nectar from tubular flowers. Pollen is carried by both the beak and feathers. Brightly colored flowers attract hummingbirds, as they are able to see the color red, whereas bees cannot.

Procedure

Journals (5 minutes)

Inform students we will be measuring plant growth, rainfall, and temperature for the day. We will rotate between measuring stations, then come together to discuss our findings.

1. Have students open their journals to page 1.
2. Have students write in the date on the data log.
3. Ask students if they have any questions.
4. Split the students into groups appropriate to your class size, one group for each measuring station.
5. Give each group 2 rulers and assign each group to a station.
6. Have students document their findings at each station.
7. Once the groups have rotated through all of the stations, have students come back to the circle to discuss the data.
8. Ask for a volunteer with a quiet hand to share the data they measured and open the discussion to the group.
9. Take a rough group average and either assign a role or ask for a volunteer to help graph the data on the flip-chart. Do this for all four graphs.

To Simplify

For younger age groups, consider making the measurements and recording results as a whole group, taking volunteers to perform each task.

To Add Complexity

Provide the following prompt for students to answer in a blank page in their journals.

- *“Can you see/hear any friends of the garden (pollinators)? What types of plants are they interacting with? Where in the garden are they?”*

Introduction (5 minutes)

Begin by opening awareness of the group. Lead by example, having feet firmly on the garden floor to feel rooted, engage their senses encouraging them to listen, see, touch, and smell, but not taste. Cycle through a few deep breaths.

Share the energy in the garden and use this moment to allow students to get present in the space. While breathing, encourage each student to express gratitude by thinking to themselves about what they are thankful for; if anyone is willing, offer them a chance to share with the group.

After the quick awareness exercise, gain a sense of pre-lesson knowledge by asking students if they know anything about pollinators. The essential questions to answer by the end of the lesson are: what do pollinators do? How do they do it? Why is it important? Students should have a basic understanding of pollination from the previous lesson "Purpose of Pollen". Define vocabulary words.

Pollinator- an animal that transfers pollen from the male anther of a flower to the female stigma of a flower

Pollen- powder grains of flower that are used for reproduction

Nectar- sugary fluid secreted by plants to encourage pollinators

Connect the vocabulary words to the process of pollination. Using the matching cards show the different type of pollinators and briefly explain their unique role in the garden. To enhance this learning moment show the picture side of the matching card, ask: does anyone know what this is? Why is this animal a friend of the garden? Reinforce the mutual benefiting coexistence of pollinators in and around the garden. Ask if anyone has any questions before moving on to the activities.

Matching (10 minutes)

Pair students together. Have the pairs face each other. If you have an odd number of students, have a group of three. Pollinator cards are part of a pollination set. For this activity you will only need the 8 pollinator cards. The remaining cards are available and encouraged for creative adaptations as they are all very relevant.

For grades 1st-2nd

- 1) Pass out pollinator cards face up. Be sure to give them at least two different types of pollinator cards
- 2) Allow each group to look at the pollinator and make observations of the image on the card
- 3) Give them a chance to read the characteristics and develop questions about their pollinator
- 4) Ask: "what is similar/different about your pollinators?" Allow everyone to share.

For grades 3rd-5th

- 1) Pass out pollinator flash cards. Identify which student will be the reader and which student will be the guesser. Make it clear that students will switch roles. Each student will have a turn to read and each student will

- have a turn to guess.
- 2) Have the cards organized so that the reader has the description in a readable position, but does not show the pollinator picture to the guesser.
 - 3) The student with the characteristic side will read the characteristics to the guesser. If needed, the guesser is allowed to ask 1-3 hinting questions that are yes and no answers only. The reader can only answer yes or no.
 - 4) After reading the characteristics and, several questions have been asked the guesser must take his/her guess.
 - 5) The guesser is allowed up to three guesses. If the guess is not right after three guesses the reader must tell the guesser which pollinator has those characteristics
 - 6) Switch roles and repeat. Make sure each student has a chance to guess a pollinator. Make sure each pair receives at least two different types of pollinators.

Mason Bee Story Mapping (20 minutes)

- 1) Begin by role playing as mason bees. Decide a location in the garden that will act as our mason bee nests. Choose a place where all mason bees can gather to listen and understand the instructions, are safe from predators such as robins, crows, starlings, and woodpeckers, and are building an appetite for sweet nectar.
 - a) Although mason bees live alone, which is known as living in solitude, they tend to nest near each other for safety reasons.
- 2) Begin the pollinator story mapping exercise in the nest. Before handing out clipboards, maps, and hand lenses explain the task:
 - a) *"You (the student) are going to pretend to be a mason bee and are currently in your nest"*
 - b) *"Our mission is to collect as much nectar as possible and store it in our nest"*
 - c) *"To accomplish the task, bees must peek our eyes out of our nests, check for predators, make sure it is safe to leave and then fly away"*
 - d) *"After we are done 'collecting' we will gather as a group to share our flying journey"*
- 3) Hand out materials: clipboards, map, pencils (hand lenses if needed).
 - a) For grades **1st-2nd** , clipboards with an outlined map that show them where to go and how to get there
 - b) For grades **3rd-5th** , clipboards with blank paper for them to draw their own map and story. On the blank sheet of paper students will create a map, marking the location of the nest, orientation of the sun, north arrow, locations in the garden that they stopped at, paths taken to arrive at each location.
- 4) Once students have their materials ready, send the bees from their nest and encourage students to use the hand lenses to find detail in the plants/garden beds.
- 5) Write observations on a separate sheet of paper behind the map. Guiding questions: was there nectar, pollen, both, neither?
 - a) To encourage observations, students should engage sensory awareness

(see, hear, smell, feel, not taste.)

- b) Make sure students are not destroying plants/flowers, if they need to touch do so delicately and leave plants carefully as they were in place
 - c) Make observations on the type of the flower, where it was, how it was oriented, what it's neighbor was, were there any other pollinators, or friends of the garden (i.e. earthworms, beetles, etc.)?
- 6) When time is nearing completion give students a 5-minute warning, 1-minute warning, and when time is up all pollinators will return to their nests
 - 7) Once all have returned, circle up and allow students to share where they went, why they went there, what observations were made, and if anyone has questions
 - 8) Use this time for students to reflect on their experience

Wrap (10 minutes)

To assess understanding

- 1) Remain in a circle
- 2) Ask for a quiet hand to name a pollinator. Repeat at least three times or as many times until all pollinators have been identified.
- 3) Ask for a quiet hand, how do pollinators work? Why is it important? (Seek answers from students that haven't had a chance to share/answer)

To wrap the lesson briefly review the different types of pollinators, their role in the springtime and their relationship to the garden/plants. Allow students to ask questions and reflect on what they are grateful for in terms of pollinators.










Adapted From

Ley, E. L., Buchmann, S., McGuire, K., & Holmes, R. (2008). *Selecting plants for pollinators: a regional guide for farmers, land managers, and gardeners: in the pacific lowland mixed forest province including the states of Oregon and Washington*. San Francisco, CA: Pollinator Partnership/North American Pollinator Protection Campaign.


















Moisset, B., Wojcik, V., & Pollinator Partnership. Blue Orchard Mason Bee (*Osmia lignaria*). Retrieved March 22, 2017, from https://www.fs.fed.us/wildflowers/pollinators/pollinator-of-the-month/mason_bees.shtml

Image: "Flowers & Pollination." *School Garden Project of Lane County*. N.p., n.d. Web. 22 Mar. 2017. <<https://www.schoolgardenproject.org/download/pollinator-matching-cards/>>.

Materials: Pollinator Cards

		
borage	sunflower	tomato
		
squash	nasturtium	calendula
		
strawberry	potato	onion

Created by School Garden Project of Lane County: www.schoolgardenproject.org

		
corn	evening primrose	cactus
		
kale	honeysuckle	wheat
		
lettuce	carrot	pea
		
bee	butterfly	moth
		
fly	beetle	bat
		
hummingbird	wind	

<ul style="list-style-type: none"> • Bright blue flower • Has lots of nectar • A favorite of many pollinators 	<ul style="list-style-type: none"> • Brightly colored flower • Large, flat topped cluster of flowers • A favorite of many pollinators 	<ul style="list-style-type: none"> • Smells spicy • Dull, pale flowers • Small flower
<ul style="list-style-type: none"> • Large flower • Smells spicy • Dull colored • Smells fruity 	<ul style="list-style-type: none"> • Brightly colored • Tubular shaped flower • Has lots of nectar 	<ul style="list-style-type: none"> • Bright orange, yellow, or pink • Large, flat topped flower
<ul style="list-style-type: none"> • Bowl shaped petals • Has lots of nectar • Small, white flower 	<ul style="list-style-type: none"> • Pale colored flower • Smells unpleasant to humans 	<ul style="list-style-type: none"> • Smells strong! • A ball made of many tiny flowers • Green and white flowers
<ul style="list-style-type: none"> • Not much color or smell • Has two kinds of flowers, - a male and female type • Tiny flowers 	<ul style="list-style-type: none"> • Opens in the evening • Strong floral scent 	<ul style="list-style-type: none"> • Opens at night • Smells strong and fruity • Large flower
<ul style="list-style-type: none"> • Smells sweet • Petals in landing pad formation • Small flower 	<ul style="list-style-type: none"> • Very brightly colored flower • Smells very strong (sweet) • Tubular shaped flower • Has lots of nectar 	<ul style="list-style-type: none"> • Cluster of tiny flowers • Tiny flowers are colorless • Tiny flowers are odorless
<ul style="list-style-type: none"> • Dull or pale flowers • Not much smell • Small flower 	<ul style="list-style-type: none"> • Cream or white colored clusters of tiny flowers • A favorite of many pollinators • Humans may find the scent unpleasant 	<ul style="list-style-type: none"> • Smells sweet • Flower has nice landing pad • Flower explodes pollen when opened!

<ul style="list-style-type: none"> • Attracted to sweet smelling flowers • Prefer petals to be a "landing pad" • There are 20,000 bee species in the world and each are attracted to different flowers. Thus, many flowers are popular with bees. 	<ul style="list-style-type: none"> • Attracted to sweet smelling flowers • Likes orange, yellow, pink, and blue flowers • Prefers flat-topped clusters of flowers because butterflies need to land before feeding 	<ul style="list-style-type: none"> • Prefers light colored flowers because they only fly at night • Attracted to strong floral scents • Look for flowers that open in the evening
<ul style="list-style-type: none"> • Prefers flowers that are green, white, or cream colored • Often likes bowl shaped flowers or clusters of small flowers • Enjoys smells that humans may find unpleasant 	<ul style="list-style-type: none"> • Cannot see colors • Attracted to spicy or fruity smelling flowers <ul style="list-style-type: none"> ◦ Often these flowers are dull or pale colored 	<ul style="list-style-type: none"> • Flies at night • Attracted to flowers with a strong and fruity scent • Prefers large flowers
<ul style="list-style-type: none"> • Prefers red, orange, and purple flowers • Likes tubular flowers with a lot of nectar • Not great sense of smell, so attracted to bright, showy, flowers. 	<ul style="list-style-type: none"> • Helps pollinate the flowers that animals aren't attracted to: <ul style="list-style-type: none"> ◦ Odorless flowers ◦ Colorless flowers ◦ Small flowers 	