

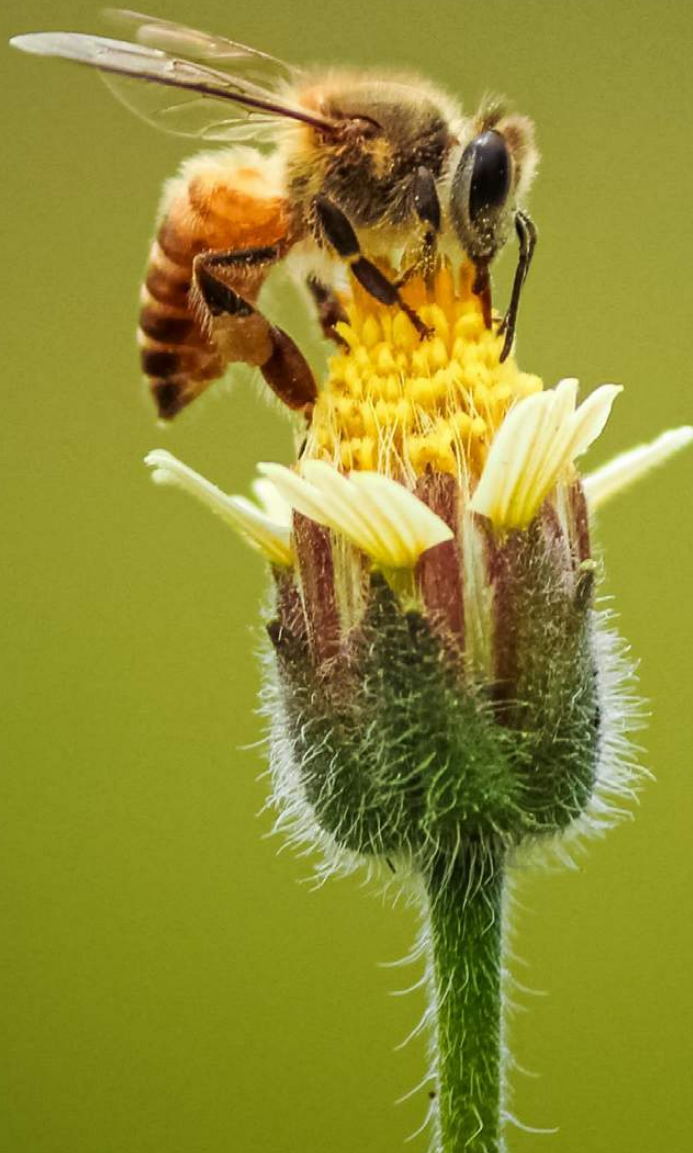
**4-H at
HOME**



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LET'S BUILD A MODEL OF POLLINATION

Learn about pollination and cross-pollination by making a model bee and flower, and seeing how pollen is spread.



Let's Build a Model of Pollination

Learn about pollination and cross-pollination by making a model bee and flower, and seeing how pollen is spread.

About the Activity

Native bees are important pollinators that help plants make fruits and seeds. But how does it all work?

In this activity, you'll create models of a flower using paper materials and tape, and a "native bee" using a spoon and tape. Using your models, you will see how bees pollinate flowers to serve an important purpose in growing food like apples, cherries, tomatoes, watermelon, and cucumbers.

This activity is part of our 4-H At-Home Native Bees Series. See the rest of the activities here. A video showing how to build the models is available here.



Supplies

These simple supplies are all you'll need for this activity.

- Native Bee Worksheet
- 12 white paper cupcake liners
- 2 white paper plates
- 2 index cards (or 1 piece of construction paper, cut in half)
- 3 pieces of paper in different colors to make pollen and nectar (you can also print the grid for pollen and nectar size onto these pages)
- Pictures of flowers, that we will call Flower Models (2 apple, 2 cherry, 2 squash)
- Clear tape
- Plastic spoon
- Scissors
- Pen and marker

Grades: 2-8

Topic: Environmental Science, Life Science, STEM, [NGSS Modeling](#)

Time: 1 hour

Activity Steps

Start by reading about the five different native bees in Native Bee Handout (Doc. 3), and then ask yourself how these bees are similar and different. List three things you learned.

Next, let's make a model of two flowers and a bee.

Start by decorating two paper plates so they look like a flower. The center is often yellow. You can add some detail to your flower models by coloring petals along the edges of each plate with crayons or magic markers. Print the flower photos. You will use these flower photos with your model in Steps 8-10.

DID YOU KNOW? There are 4,000 different species of native bees in North America, but you might be surprised to learn that honey bees are not native to our continent. They were brought here from Europe, and made themselves right at home. Though honey bees may be good pollinators, other native bees are also really important for pollinating food crops like tomatoes, blueberries, almonds, and apples. Mason bees can even help apple and cherry orchards increase yield.



2

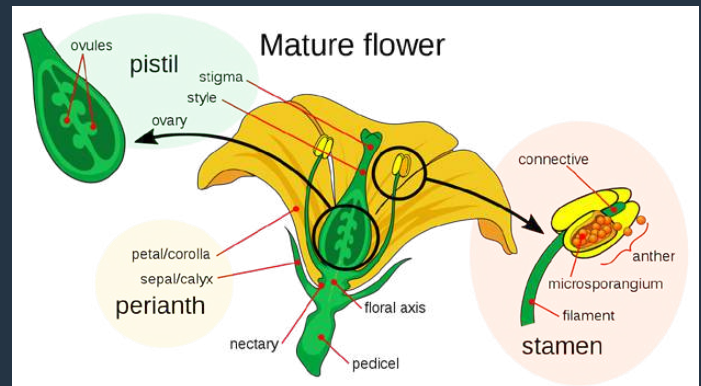
Write the word "nectar" on the inside edge of two of the paper cupcake liners, then attach one to the center of each paper plate using the clear tape.



DID YOU KNOW? Nectar is food for the bees and is found in the center of the flower.

3

For a flower to be pollinated and make fruits and seeds, pollen must land on the stigma.



Create a stigma for each of your two flowers by rolling and taping one index card (or half sheet of construction paper) into a tube that fits in the paper cupcake liner leaving space around.



Tape one end of the tube to the center of the paper cupcake liner so that it stands upright. To close the top of the tube, press the sides together and tape the end. Then, place three loops of tape on the closed end. This "sticky" top represents the stigma.



Activity Steps

4

Choose one color of paper to be nectar for your flowers. You can print the grid onto your colored paper. Use the grid lines or estimate the 5mm squared size to cut the paper into the pollen squares. Divide your squares evenly between the two nectar paper cupcake liners.



5

Next, make anthers to hold the pollen. Label each of the 10 remaining cup paper cupcake liners with the word “pollen,” and using more tape, attach five around each of the nectar paper liners that are already placed on the center of each flower. The parts of your two flowers should still look identical at this point!



DID YOU KNOW? Bees visit flowers to get nectar and pollen for food. When a bee visits a flower, it touches the anthers and the stigma as it tries to get the nectar.

6

This is where your two flowers begin to look different for the model. Choose two new colors of paper to represent pollen, and cut each into 7mm squares, or print the provided grid onto the colored paper. On one flower model, divide one color of pollen between the five anthers. Divide the second color of pollen between the five anthers for the other flower model.



7

Now, make your bee! Write “bee” on the spoon with a marker. Native bees have hairs on their body that pick up the pollen. Create the hairs by attaching loops of tape to cover the back of the spoon.



DID YOU KNOW? Many native bees are solitary bees and do not live in a hive. Instead, the bees make their own nest for their young. Many native bees can't fly very far (100 meters, or a little longer than a football field) when looking for food, but bumble bees can fly up to 2 miles.

Activity Steps

8

Let's use the bee to show how native bees pollinate cherry flowers!

DID YOU KNOW? Native bees make a pollen ball by mixing pollen and nectar. They put the ball into each put in the cavity, lay an egg, and seal the cavity with each of their offspring.



Place the photos of the cherry flowers next to each flower model you created. Take your bee spoon, and choose one of your flower models. Touch the sticky back of the spoon to the nectar in the center of the flower. Next touch the pollen in the anthers, and then touch the stigma.



Now visit your other flower doing the same motions of touching the nectar, pollen, and stigma. Bees visit many flowers before returning to their nests with the pollen and nectar they collected.



Look at your cherry flowers. Some varieties of cherry trees are self-pollinating. They can be pollinated with pollen from the same tree or pollen from a different cherry tree. If you have pollen on the stigma, those flowers are pollinated and that flower will turn into cherry fruit!



Now look at your bee. How much pollen and nectar did you collect? Nectar is food for the bee. The bee also makes food for their young in the nest using pollen and nectar.

Once you have observed the results, you can remove the tape loops from the bee and the top of the flower models, and replace them with new, clean tape loops.

9

Next, let's use the models to explore cross-pollination.

DID YOU KNOW? Some plants can only be pollinated when they receive pollen from a different plant of the same type. This is called cross-pollination. Many apple varieties need cross-pollination between two different trees to make apples.

Activity Steps

Place the photos of the apple flowers next to each model.

Visit one apple flower and then the other apple flower, doing the same motions of the bee touching the nectar, pollen, and stigma at each flower model.

Once the bee has visited both models, look at your apple flowers. Apple flowers must be pollinated with pollen from a different apple tree. For your flower to be pollinated, a different color of pollen than the color on the anthers must be on the stigma. Do you have pollen that landed on the stigma of the two flowers? Did they get pollinated? Why or why not? If the flower is pollinated with the other color pollen, that flower will turn into apple fruit.

Now, look at your bee. How much pollen and nectar did you collect? You can count the number of each different color. Now, once again, remove the tape loops from the bee and the top of the flower models, and replace them with new, clean tape loops.

10

Let's explore plants that have male and female flowers.

DID YOU KNOW? Some plants have different male and female flowers meaning that one flower has anthers with pollen and a different flower has the style with the stigma.

Many plants in the squash family, including pumpkins, zucchini, cucumbers, melons and gourds, have separate male and female flowers.

To create a female flower model, remove the anthers (the five outer paper cupcake liners) from one flower model. The female flower photo has the picture of the pumpkin. Place the female flower photo next to the female flower model.

Now remove the style (paper tube) from the center of the other flower model. That flower is now the model of the male flower, which cannot make fruit. Place the male flower photo next to the male flower model.



Use your bee spoon to visit the flowers, start by collecting pollen and nectar from the male flower. Now visit the female flower. What happens when the bee visits the female flower? What can they collect? Did you have to visit both pumpkin flowers to get both pollen and nectar? Did pollen land on the stigma? Why or why not? If the female flower is pollinated, you will have a pumpkin!

11

Native bees live for six weeks. Apple and cherry trees bloom for two weeks. Where do you think native bees get their food once the apple trees or cherry trees are done blooming? Place the prairie plant photo near your flower models. Prairie plants bloom throughout the growing season. It is important for native bees to have many flowers to gather nectar and pollen. In the next activity we will explore how adding habitat provides more food for native bees.

Test Your Knowledge



See how much you've learned about pollination!

QUESTION 1

How far can most native bees fly?

- a. A few feet at a time
- b. 100 meters, or about the length of a football field
- c. 1 mile
- d. 10 miles

QUESTION 2

How many native bee species are there in North America?

- a. 4
- b. 40
- c. 400
- d. 4,000

QUESTION 3

Why do bees visit flowers?

- a. To help flowers get pollinated
- b. To gather pollen and eat nectar
- c. To find a mate
- d. All of the above

QUESTION 4

Where does the pollen need to land for a flower to be pollinated?

- a. On the anther
- b. On the nectar
- c. On the stigma
- d. On the stem

QUESTION 5

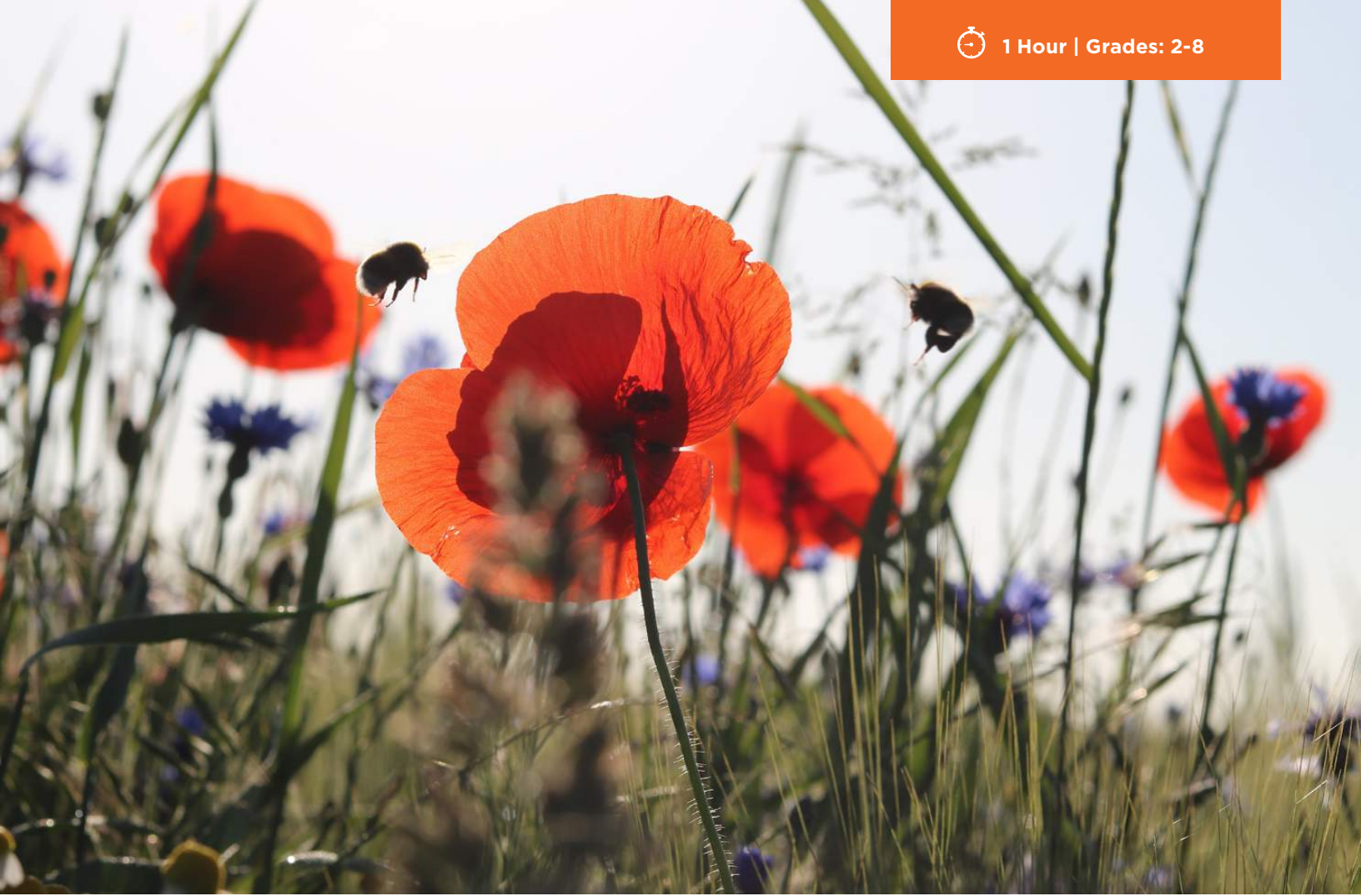
What happens to the flower after it is pollinated?

- a. It turns into fruits and seeds
- b. It grows roots
- c. It grows larger
- d. All of the above

Reflection Questions

Bonus questions to inspire wonder:

- How are some of the native bees different from honey bees?
- How do bees help flowers get pollinated?
- Why are pollinators like bees especially important for plants that need cross-pollination or have separate male and female flowers?
- Why is it important to have flowers blooming at all times during the spring, summer, and fall?
- What is the difference between cross-pollination and self-pollination?



Investigate & Explore

Take your new knowledge to the next level.

Ready to learn more? You can get an incredible, close-up view of many native bees studied by the USGS Native Bee Inventory and Monitoring Lab on their website: https://www.usgs.gov/centers/eesc/science/native-bee-inventory-and-monitoring-lab?qt-science_center_objects=0#qt-science_center_objects

What makes a bee a bee? Listen to this presentation by Dr. Joseph Wilson as he explains the difference between a bee, a wasp, and a fly. You might be surprised!



Watch Video



Career Connections

If you liked learning about how bees help to pollinate plants, you might enjoy a career in STEM. STEM careers are exciting and rewarding, and you can pursue a STEM-related career wherever you live, whether you're in a city, a rural community, or anywhere in between.

Watch this video and learn what it takes to be a field sales representative from Wyatt Jones of Bayer Crop Science.

[Watch Video](#)



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LEAFCUTTER BEE

Generalist: Visits many different flowers

Pollen collection: Dry pollen with scopae on abdomen

Solitary: Lives alone

Nests: Cavity in stems and tubes, where leaves cut in circles are put around each egg

Flight range: 100 meters

Favorite plants to pollinate: *Alfalfa*, garden flowers, prairie plants



SWEAT BEE

Generalist: Visits many different flowers

Pollen collection: Dry pollen with scopae on legs

Solitary: Lives alone

Nesting: Ground tunnels, one entrance to tunnel with individual chambers for each pollen ball and egg

Flight range: 100 meters

Favorite plants to pollinate: Wide range of garden and native flowers and *some crops*



SQUASH BEE

Generalist: Visits mostly squash family

Pollen collection: Dry pollen with scopae on legs

Solitary: Live alone, near their food source

Nesting: Ground tunnels, one entrance to tunnel with individual chambers for each pollen ball and egg

Flight range: 100 meters

Favorite plants to pollinate: Squash, *pumpkins*, zucchini, cucumbers



BUMBLE BEE

Generalist: Visits many different flowers

Pollen collection: Wet pollen in corbicula

Social: Lives in colony with many individuals

Nesting: Burrow usually in ground, young raised in wax pots

Flight range: 1 - 5 miles

Favorite plants to pollinate: *Tomatoes*, cranberries, *cherries*, *apples*, pears, clovers



MASON BEE

Generalist: Visits many different flowers

Pollen collection: Dry pollen with scopae on abdomen

Solitary: Lives alone

Nesting: Cavities in stems and tubes, each nesting chamber made with clayey mud

Flight range: 100 meters

Favorite plants to pollinate: *Cherries*, *apples*, plums, peaches, almonds



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NATIVE BEE HABITAT MAP

Pollinators need habitat with food and nesting space, which you can help to create right in your own neighborhood.



Native Bee Habitat Map

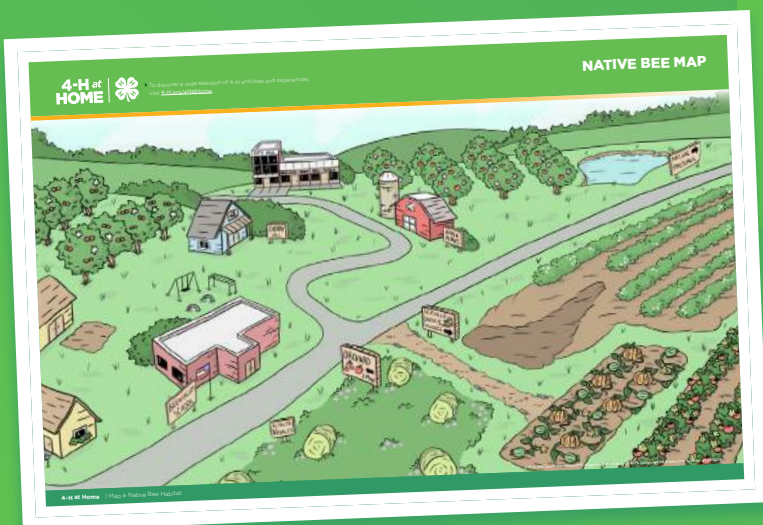
Pollinators need habitat with food and nesting space, which you can help to create right in your own neighborhood.

About the Activity

In this activity, you'll use a map and explore ways to add pollinator habitat in cities and on farms. You'll also learn how increasing habitat can directly help native bees and other pollinators and how pollinator habitat can improve your community.

This activity is part of our 4-H At-Home Native Bees Series.

See the rest of the activities here.



Supplies

These simple supplies are all you'll need for this activity.

- Printed map ([Doc 8](#))
- Icons ([Doc 9](#))
- Tape
- Icon descriptions table ([Doc 5](#))
- Native Bee Guide ([Doc 3](#) and [Doc 4](#))
- Habitat answer key ([Doc 6](#))
- Native bee answer key ([Doc 7](#))

Grades: 2-8

Topic: Environmental Science, Life Science, STEM

Time: 30-60 minutes

Activity Steps

Take a look at the Native Bee Guide. Read about the five different native bees for this activity. How are the native bees similar and different? Think about what you've learned about the flight distance and type of flower that each native bee prefers.

Now, let's make a habitat for pollinators.

- 1 First, look at the map printout. Identify the different places on the map. Did you find the school? Where is the orchard? How far is the orchard from the road? What else do you see? As a member of this community, your goal is to add more habitat for native bees and other pollinators, like this one:



DID YOU KNOW?

Everyone can help their communities increase habitat for pollinators like native bees. Whether you live on a farm or in a large city, there are ways to provide more flowers for native bees. The Conservation Reserve Program (CRP) is a way for farmers to get paid for turning unproductive land into pollinator habitat. Farmers can also plant strips of prairie in their fields to reduce water run-off from fields and help pollinators by adding habitat.

- 2 Review the "Icon Descriptions Table" (Doc 5) to learn more about types of habitat that can be added.

DID YOU KNOW?

Flower gardens and vegetable gardens can provide food for bees. Bees need flowers to collect nectar and pollen to feed themselves and their young.

- 3 Tape habitat icons to your map in the places where it would be helpful to increase a specific type of habitat for native bees in this community. For example,



shows how you could add flowers to a large grassy area. You might consider adding habitat to other large grassy areas without flowers nearby. You could also add flowers that bloom all season and for different types of bees.

- Would the local farms benefit from adding habitat nearby?
- How can schools, businesses, and homeowners increase habitat to help bees?
- How can bees help farmers?

When you are finished adding habitat icons, take a look at the "Habitat Answer Key." There is no one right answer, but the key will help you see if there are areas on your map that you did not consider for opportunities to add habitat.

Activity Steps

(continued...)

DID YOU KNOW?

Native prairie and other native wildlands are good for bees, as they offer flowers and places for them to make nests.

- Review the Native Bee Guide again and use that guide to help you identify places on your map that are most suitable for the different types of native bees. For example,



shows a mason bee being placed near an apple orchard. The Native Bee Guide says that mason bees are good for orchards because they emerge in the spring and can help pollinate apple trees.

When adding your bees, you should consider the time of year, crop pollination needs, blooming season of crops, flower choices of the different bees, and the flight ranges of bees. Specific locations on the map are labeled to help you identify where native bee icons could be added. For example, "Orchard 1 Mile" tells you that the pumpkin patch is a long way from the orchard.

You can attach the native bee icons to your map using tape. When you are finished, look at the "Native Bee Answer Key" to see if you found the right locations for your bees.

DID YOU KNOW?

Squash Bees are specialized to only visit the flowers of plants in the squash family. They visit crops like pumpkin, cucumber, and zucchini.



- Take a look at your map. How did adding habitat for native bees change the community and improve life for local pollinators?

Test Your Knowledge

See how much you've learned about pollination!

QUESTION 1

What is a good place to plant habitat for native bees?

- a. At your house
- b. At your school
- c. At a farm
- d. All of the above

QUESTION 2

True or False: Both flower gardens *and* vegetable gardens are good for native bees.

- a. True
- b. False

QUESTION 3

Which place is best for native bees?

- a. Mowed lawn
- b. Flower patches
- c. Corn fields
- d. Streams and rivers

QUESTION 4

Fill in the blank: The _____ is a way for farmers to get paid for turning unproductive land into pollinator habitats.

QUESTION 5

Which plants would a squash bee visit?

- a. Zucchini and pumpkins
- b. Dandelions and daffodils
- c. Cherry and peach trees
- d. Tomatoes and tomatillos

Reflection Questions

Bonus questions to inspire wonder.

- What do you notice about the difference between the number of bees in town and on the farm?
- Why do farmers need more native bees than a homeowner?
- Why is it important to add pollinator habitat near farms?
- How does the community benefit from having more pollinators and more pollinator habitat?



Investigate & Explore

Take what you've learned to the next level to learn more and explore the possibilities.

Consider what importance biodiversity plays in our prairie lands. Stewardship falls to all of us, not just farmers and organizations. Together, we can make a difference in our community and create rich habitats for bees and other pollinators at our schools and in our own backyards.

To get a better sense of how important bumble bees are to our ecosystem, enjoy this slow-motion footage of a bee dislodging pollen on a common flower in the prairie:



<https://www.youtube.com/watch?v=J7q9Kn1rhRc>



Career Connections

If you liked learning about bee habitats, you might enjoy a career in STEM. STEM careers are exciting and rewarding, and you can pursue a STEM-related career wherever you live, whether you're in a city, a rural community, or anywhere in between.

Watch this video and learn what it takes to be a toxicologist from Kimberly Hodge-Bell of Bayer Crop Science. Like Dr. Joseph Wilson who was featured in the Pollinator Model, Kimberly loves photography too! Dr. Wilson took the photos of the bees you see in the experiences. That would be a fun career too!








[Watch Video](#)

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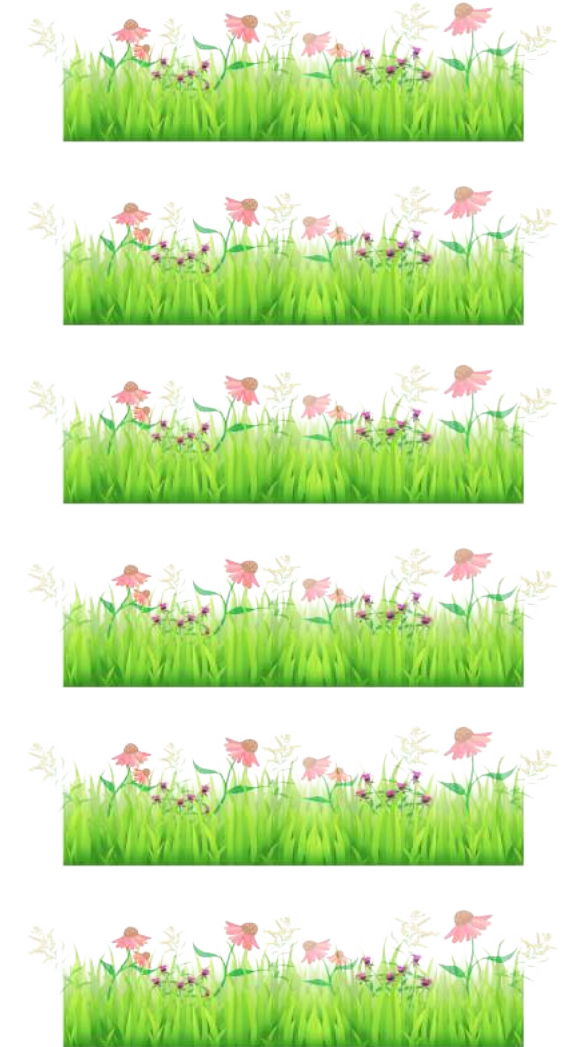
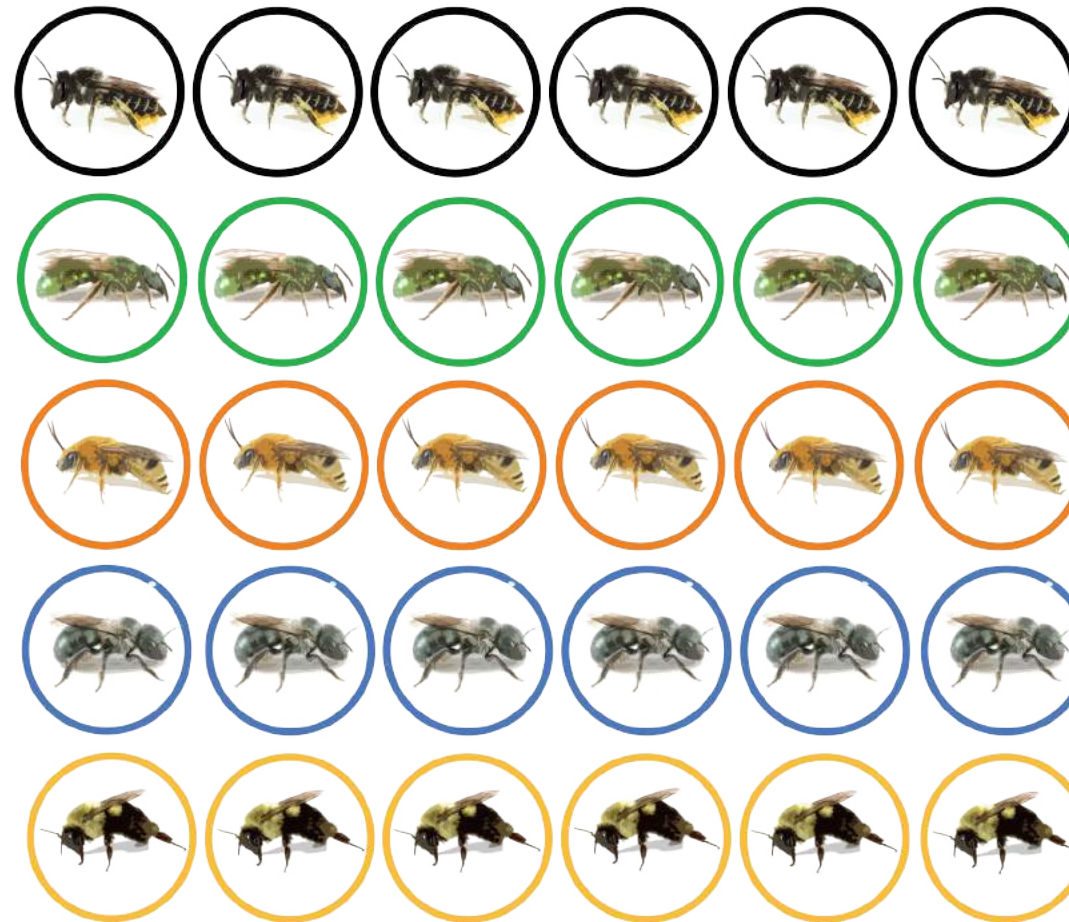
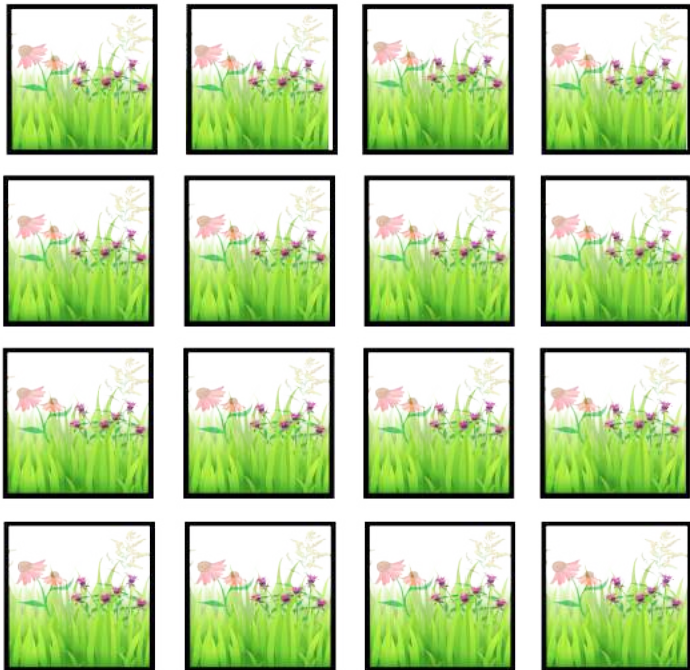
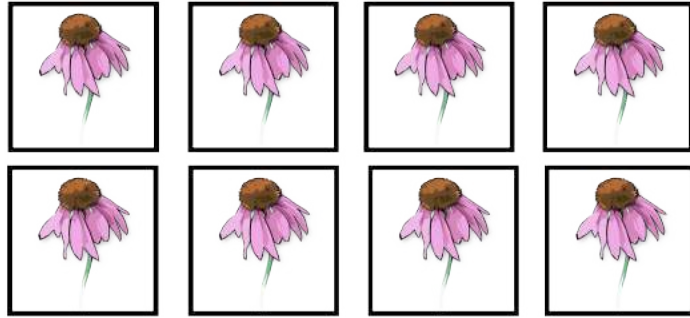


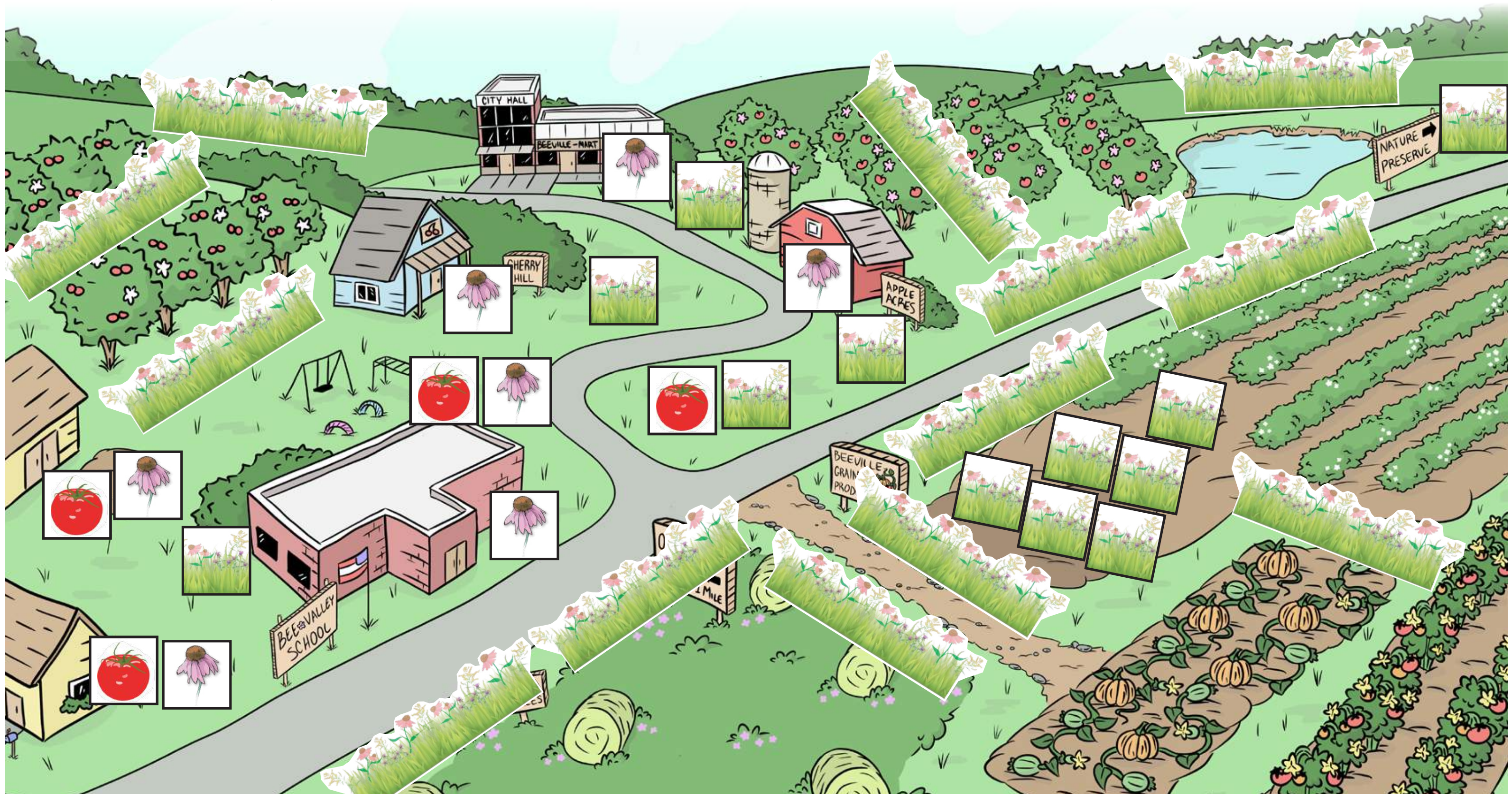
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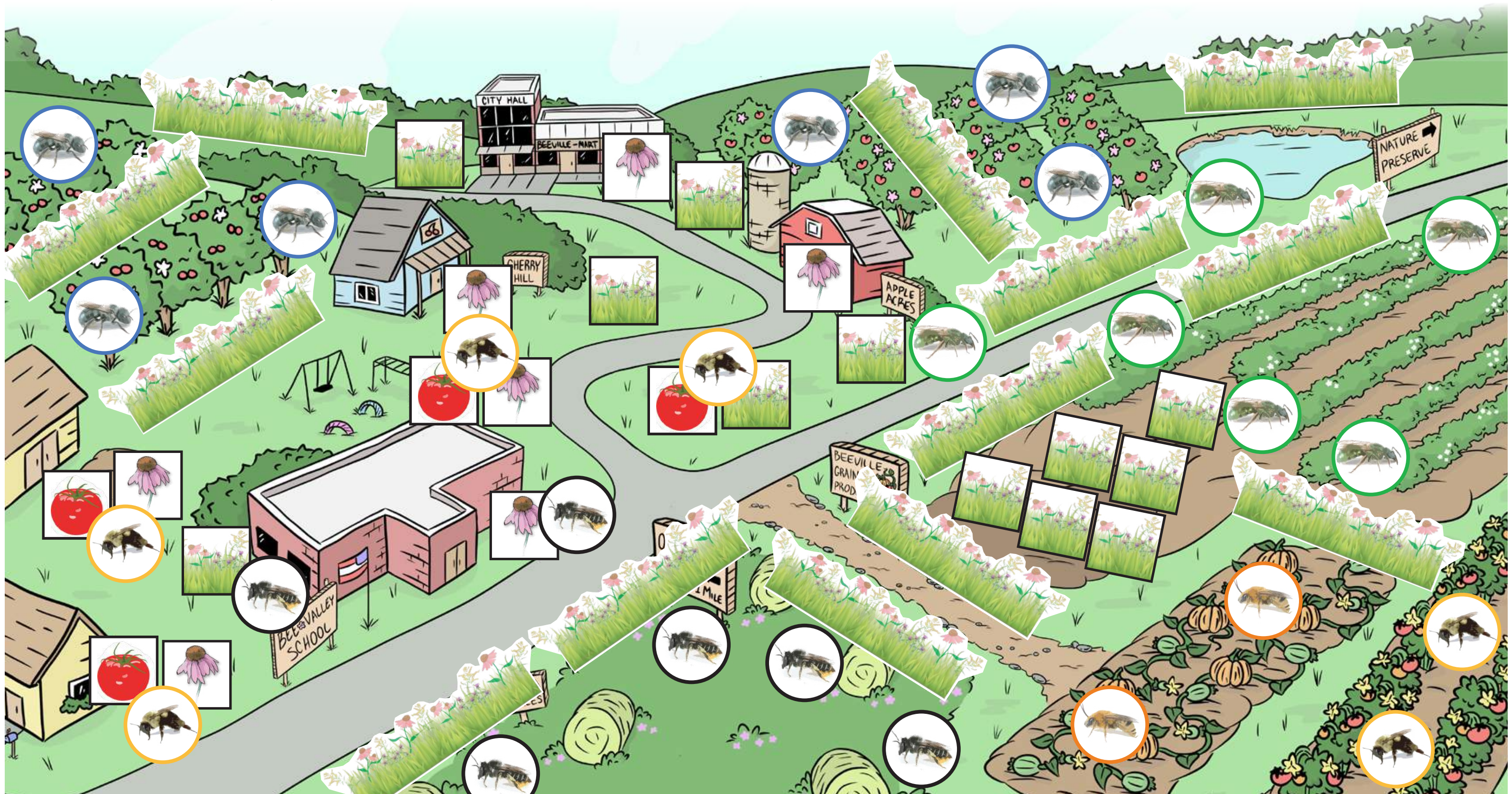


Icon	Graphic	Description
<p>Tomato <i>(square)</i></p>		<p>Vegetable gardens with tomato plants</p>
<p>Coneflower <i>(square)</i></p>		<p>Flower gardens that have a variety of native plants that bloom throughout the season</p>
<p>Pollinator Habitat <i>(square)</i></p>		<p>Prairie habitat and/or CRP land, these icons can be placed together to cover a larger area</p>
<p>Pollinator Habitat <i>(long)</i></p>		<p>Prairie habitat and/or CRP land that cover larger areas of land such as prairie strips</p>
<p>Native Bees <i>(5)</i></p>		<p>Five different native bees added to locations on the map</p>









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DISSECT A FLOWER

Learn about the role of different flower parts and how pollinators assist with plant reproduction.



Dissect a Flower

Learn about the role of different flower parts and how pollinators assist with plant reproduction.

About the Activity

Flowers are beautiful, but plants don't make flowers for our enjoyment. Plants are living things and their flowers serve an important function in the life cycle of the plant: to reproduce by making fruits and seeds.

In this activity you will explore the parts of a flower by doing a dissection or taking the flower apart. You will figure out how the parts of the flower are involved in plant reproduction and how pollinators help increase pollination.

This activity is part of our 4-H at Home Native Bees Series. See the rest of the activities here.



Supplies

These simple supplies are all you'll need for this activity.

- A flower to dissect
- **Flower parts worksheet** (print)
- **Flower diagram** (print)
- Scissors
- Tape
- Tweezers (optional)
- Magnifying glass (optional)

Grades: 2-8

Topic: Environmental Horticulture, Life Science

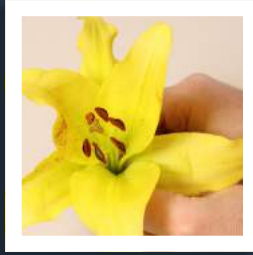
Time: 30 minutes



Activity Steps

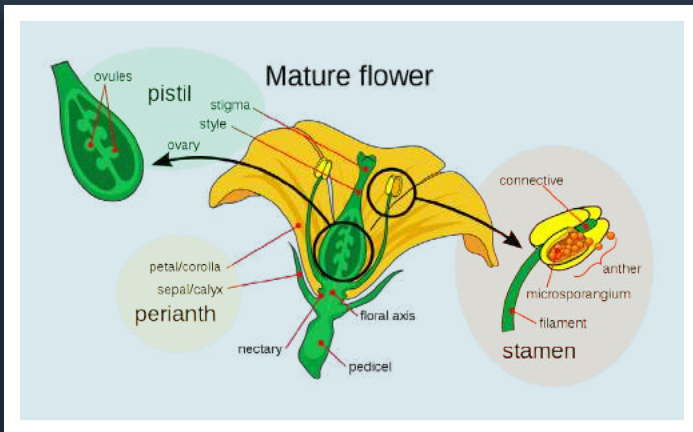
1

First, go outside and find a flower or buy one from a florist. The best flowers to use are lilies like the flower in the photo, but if you can't find a lily, use a large blossom of another similar flower type.



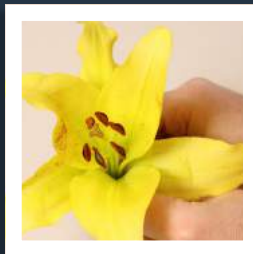
2

Take a look at this flower diagram to learn about the different parts of the flower. As you begin to dissect your flower during the activity, it's helpful to know what pieces you are exploring. Looking at the diagram, can you find the stigma and the ovary? The stigma is the part where the pollen needs to land for the flower to be pollinated. What are the different parts of the stamen? The anthers produce the pollen.



3

Look closely at your flower. Remove the flower from the stem if it is still attached. Can you identify any parts by just looking at it? Which ones?



DID YOU KNOW? Flowers contain the ovary where the fruit and seeds will develop. When pollen lands on the sticky stigma and travels to the ovary, the flower is pollinated and develops into fruits and seeds.

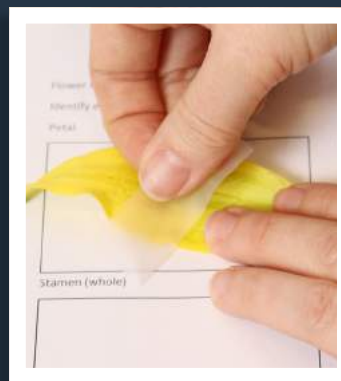
4

Use scissors to cut the flower in half lengthwise from the stem. Use your fingers or tweezers to separate the flower into its different parts. If you have a magnifying glass, this is a great time to look closely at all the different flower parts.



DID YOU KNOW? Some flower petals have signals for pollinators to show that they have nectar and where the nectar is located. The petals look like a landing strip to many pollinators. Nectar is often located in the center of the flower, making it necessary for pollinators to touch the other parts of the flower to get to the nectar. When pollinators visit flowers to get nectar, they pick up pollen (mostly by accident) from the anthers and leave it on the stigma.

5



When you have identified a part, tape it to the correct square on the flower parts sheet. Did your flower have all of the parts? Keep in mind, not all flowers contain the same parts and flowers can differ in the number of each part.

DID YOU KNOW? A flower can have many ovaries and many styles with stigma. For the fruit to develop properly, all the stigmas must be pollinated. Pollinators help not only with moving pollen from one flower to another but also with getting all the stigmas pollinated. If the flower is only partially pollinated the fruit will become misshapen as it grows.

Test Your Knowledge

Let's see how much you've learned about flower parts!

QUESTION 1

What part of the flower develops into the fruit and seeds?

- a. Ovary
- b. Anthers
- c. Stigma
- d. Stem

QUESTION 2

What part of the flower has nectar signals for pollinators?

- a. Anthers
- b. Style
- c. Petals
- d. Ovary

QUESTION 3

What part of the flower makes the pollen?

- a. Roots
- b. Style
- c. Stigma
- d. Anther

QUESTION 4

True or False: A flower can have more than one ovary.

- a. True
- b. False

QUESTION 5

Fill in the blank: What happens if a flower is only partially pollinated?

Reflection Questions

Bonus questions to inspire wonder:

- In many flowers, the anthers are located close to the stigma. What is the advantage for the flower to have these structures close together?
- Flowers and pollinators have coevolved (developed a relationship over time) into a mutually beneficial relationship. How does the plant benefit from the relationship? How do the pollinators benefit from the relationship?
- Why are pollinators important for our food supply?

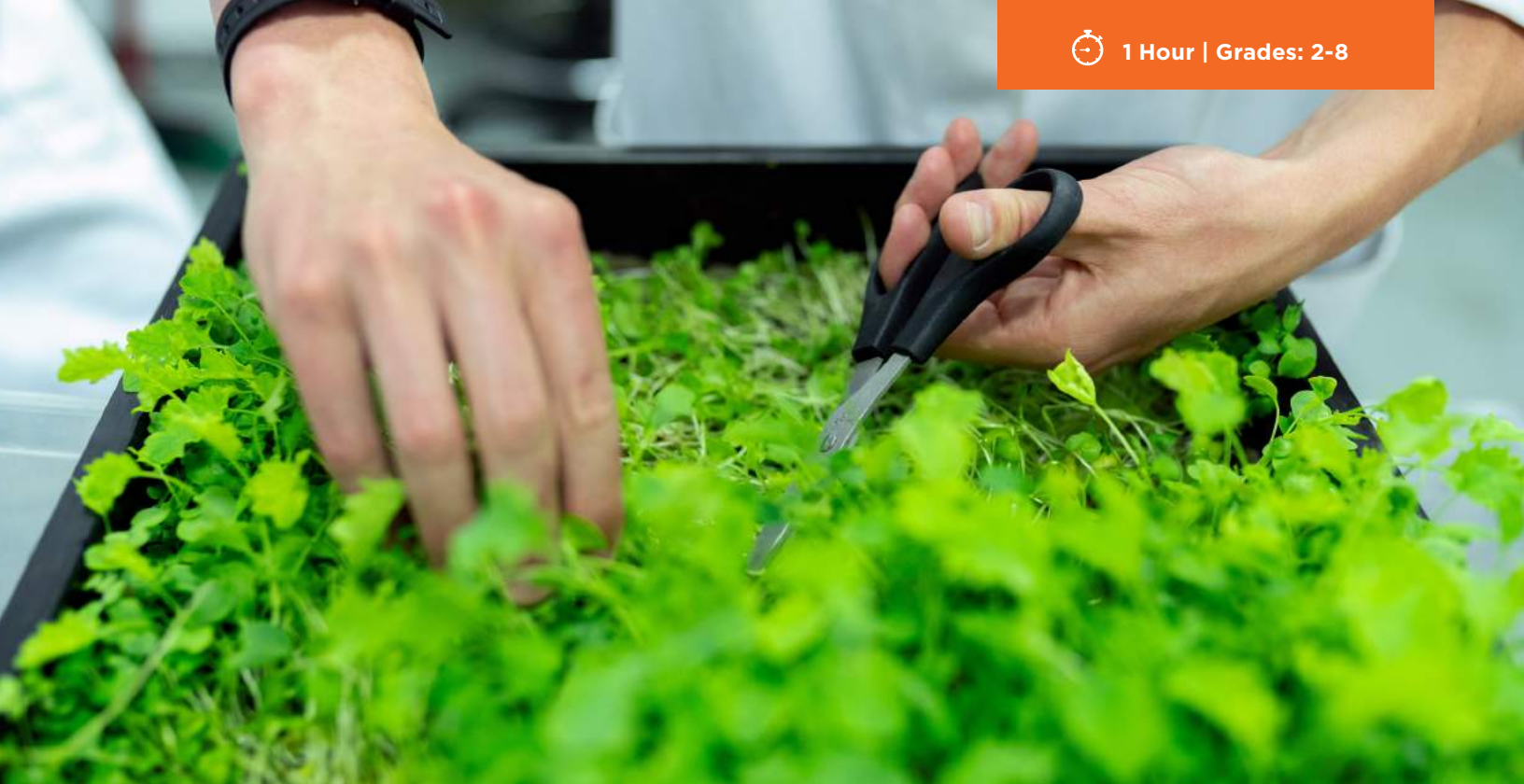


Investigate & Explore

Take your new knowledge to the next level.

Some plants need pollen from a different plant (cross-pollination) like the apple tree, while others can self-pollinate. Some plants also have male and female flowers. Explore the flowers in your community with a magnifying glass to learn more about the plants around you.





Career Connections

If you liked learning about the anatomy of flowers, you might enjoy a career in STEM. STEM careers are exciting and rewarding, and you can pursue a STEM-related career wherever you live, whether you're in a city, a rural community, or anywhere in between.

Watch this video and learn what it takes to be a field sales representative from Wyatt Jones of Bayer Crop Science.

[WATCH VIDEO](#)



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This work is supported by the USDA National Institute of Food and Agriculture, AFRI - Education and Workforce Development project 2021-67037-33376.

**4-H at
HOME**



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LET'S MAKE A VIRTUAL POLLINATOR-FREE ICE CREAM SUNDAE

It's not easy, because pollinators make most ice cream sundae ingredients possible in the first place. But you can try!



Let's Make a Virtual Pollinator-Free Ice Cream Sundae



It's not easy, because pollinators make most ice cream sundae ingredients possible in the first place. But you can try!

About the Activity

Pollinators support our food supply and are responsible for one out of every three bites of food we eat each day, including most of the delicious components of an ice cream sundae. That makes them essential to global food production, but unfortunately, many species of native pollinators are declining at an alarming rate.

This activity is designed to outline just how important pollinators are to the meals and desserts you love.

This activity is part of our 4-H at Home Native Bees Series. See the rest of the activities here.



Supplies

These simple supplies are all you'll need for this activity.

- Printed pictures of ice cream sundae ingredients
- Scissors
- Answer key
- List of pollinated plants

Grades: 2-8

Topic: Environmental Education, Biology, Life Science

Time: 30-60 minutes

Activity Steps

1

Use scissors to cut out the individual sundae ingredients shown on the printout, and lay them all out in front of you.

DID YOU KNOW? One third (one out of three bites, or 33%) of our food needs pollinators to be produced.

2

Now, choose your favorite ingredients and build your own dream ice cream sundae using the photos.



DID YOU KNOW? Do you have a sweet tooth? Chocolate plants (cacao) need tiny pollinators called chocolate midges. These pollinators are a type of fly that visits the cacao flowers which grow on the stems of the plant.



3

After you build your ice cream sundae, use the answer key to remove all ingredients that are made possible by pollinators.

DID YOU KNOW? Animals need pollinators too. Many animals, such as cows, need to eat plants for their food, and some of the plants they eat need pollinators. Dairy cows often eat alfalfa, which is pollinated by bees, and healthy cows use nutrients from their food to produce milk.



4

After you remove all the ingredients that are made possible by pollinators, the ingredients left are the only items available to eat in a world without pollinators.

DID YOU KNOW? Most fruits that we eat require pollinators to transfer the pollen so that the fruit is formed. Crops like apple, blueberry, pear, and almond need or benefit from pollinators. Some crops like grape, peach, and wheat (used to make flour) have flowers that can pollinate themselves.

5

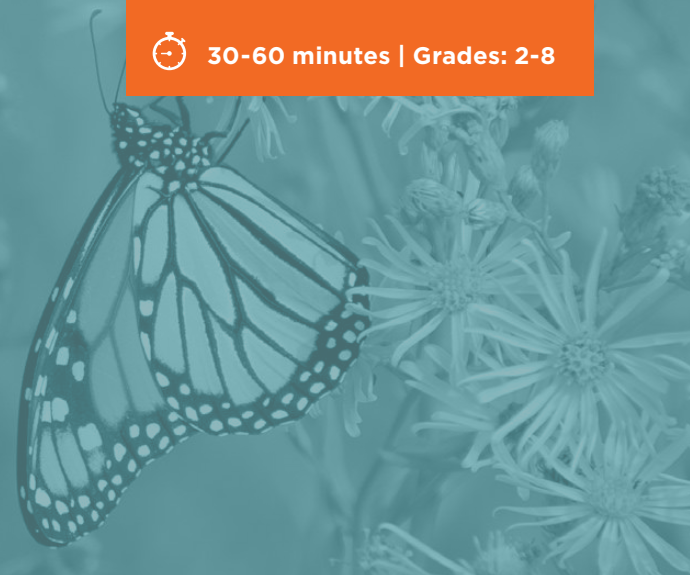
Ice cream sundaes aren't the only delicious food that relies on pollinators. Check out the entire list of pollinated plants so that you can learn about other popular foods made possible by pollinators.

DID YOU KNOW? Insects are not the only pollinators. Birds, bats, lizards and even lemurs can be pollinators. For example, agave, an important crop in the southwest, is pollinated by bats.





Test Your Knowledge



See how much you've learned about pollination!

QUESTION 1

Which of these plants cannot self-pollinate, and needs the help of a pollinator?

- a. Grapes
- b. Pears
- c. Peaches
- d. Wheat

QUESTION 2

How much of the food we eat needs pollinators?

- a. 10%
- b. 22%
- c. 33%
- d. 50%

QUESTION 3

Fill in the blank: How do pollinators help animals, such as cows?

QUESTION 4

Which type of insect pollinates chocolate trees?

- a. Flies
- b. Bees
- c. Butterflies
- d. Ladybugs

QUESTION 5

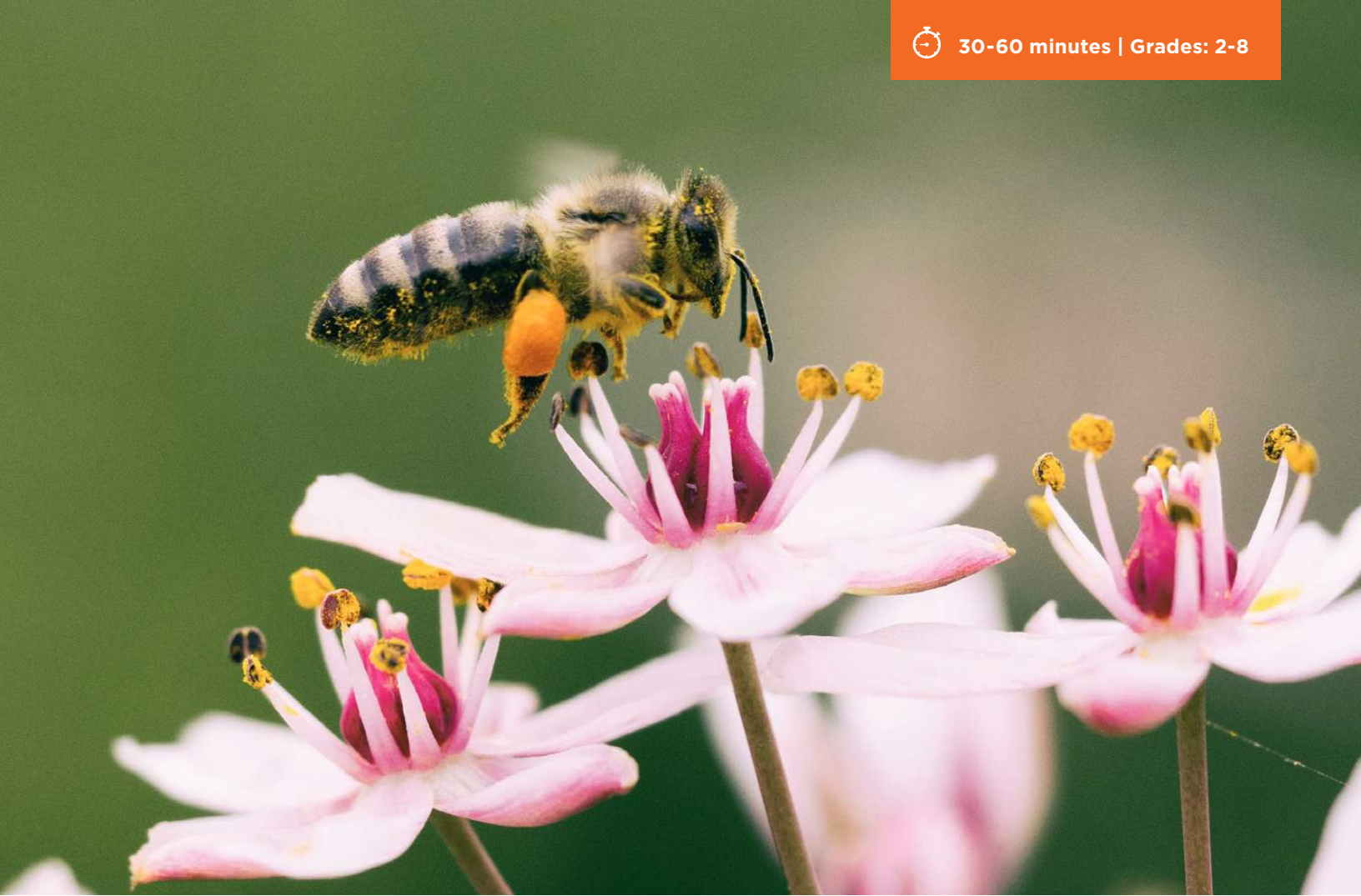
True or False: Bats pollinate agave crops.

- a. True
- b. False

Reflection Questions

Bonus questions to inspire wonder:

- Think about other food that you eat. What would your daily diet be like without pollinators?
- Do all plants need animal pollinators to make fruits and seeds?
- What are some ways you can educate others about the importance of pollinators?
- What are some things you can do to make more habitats for pollinators?
- Which ingredient in the ice cream activity were you most surprised to learn required the help of pollinators?



Investigate & Explore

Take your new knowledge to the next level.

Explore the everyday world around you. See how native bees make a difference in the foods we eat. These two videos are a great place to start, but also take a closer look outdoors, whether in a local pollinator garden, or in your own backyard:

Ice cream and bees video:

[Watch Video](#)

Leafcutter bees video:

[Watch Video](#)





Career Connections

If you liked learning about the many foods that bees help to create, you might enjoy a career in STEM. STEM careers are exciting and rewarding, and you can pursue a STEM-related career wherever you live, whether you're in a city, a rural community, or anywhere in between.

Watch this video and learn what it takes to be a toxicologist from Kimberly Hodge-Bell of Bayer Crop Science.

[Watch Video](#)



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Crops/Food Dependent Upon or Benefited by Insect Pollination

Legumes and Beans

Black-eyed Pea, Broad Bean, Cacao (Chocolate), Coffea (Coffee), Cowpea, Kidney Beans, Lima Bean, Lupines, Mung Bean, Green Bean, Soybean relatives

Vegetables

Artichoke, Asparagus, Beet, Broccoli, Brussels Sprouts, Cabbage, Cardoon, Carrot, Casaba Melon, Cauliflower, Celery, Celery, Chayote, Chervil, Coriander, Crenshaw, Cucumber, Eggplant, Endive, Honeydew, Kale, Leek, Lettuce, Muskmelon, Okra, Onion, Parsnip, Peppers, Persian Melon, Pumpkin, Radish, Rutabaga, Squash, Tomato, Turnip, Vegetable Sponge, Watermelon, White Gourd

Fruits, Berries and Nuts

Acerola, Almond, Apple, Apricot, Avocado, Banana, Blackberry, Blueberry, Cantaloupe, Cashew, Cherry, Chestnut, Coconut, Crabapple, Cranberry, Currant, Date, Elderberry, Fig, Gooseberry, Grape, Grapefruit, Guava, Jujube, Huckleberry, Kiwi, Kola nut, Lemon, Lime, Litchi, Loquat, Macadamia, Mamey Sapote, Mango, Nectarine, Olive, Orange, Papaw, Papaya, Passion Fruit, Peach, Peanut, Pear, Persimmon, Pomegranate, Plum, Prune, Quince, Raspberry, Strawberry, Tangelo, Tangerine, Tung, Vanilla,

Herbs and Spices

Allspice, Anise, Black Pepper, Caraway, Cardamom, Chive, Clove, Coriander, Dill, Fennel, Lavender, Mustard, Nutmeg, Parsley, Pimento, Tea, White Pepper

Clovers, Forage Crops, Oils, Seeds, and Grains

Alfalfa, Alsike Clover, Arrowleaf Clover, Ball Clover, Berseem Clover, Black Medic, Buckwheat, Canola, Cicer Milkvech, Crimson Clover, Crown vetch, Flax, Kenaf, Kidney Vetch, Kudzu, Lespedeza, Oil Palm, Persian Clover, Pigeon Pea, Red Clover, Rose Clover, Safflower, Sesame, Strawberry Clover, Subterranean Clover, Sunflower, Sweet Clover, Sweetvetch, Trefoil, Vetch, White Clover

Other

Cotton & Dairy Products (Dairy cows eat alfalfa pollinated by leafcutter and honey bees)

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Identify each part and tape it in the box.

Petal

A large empty rectangular box for labeling a petal.

Sepal

A large empty rectangular box for labeling a sepal.

Stamen (whole)

A large empty rectangular box for labeling the whole stamen.

Anther (part of the stamen)

A smaller empty rectangular box for labeling the anther.

Filament (part of the stamen)

A smaller empty rectangular box for labeling the filament.

Parts of the Pistil

Ovary

A large empty rectangular box for labeling the ovary.

Style

A large empty rectangular box for labeling the style.

Stigma

A large empty rectangular box for labeling the stigma.



Pollinated Ingredients (All ingredients in this activity require pollination):

- Vanilla Ice Cream
- Chocolate Ice Cream
- Chocolate Syrup
- Strawberries
- Blueberries
- Oreos
- Cherries
- Coconut
- Kit Kat
- Caramel Syrup
- M&M's
- Roasted Almonds



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GET TO KNOW NATIVE PRAIRIE PLANTS

Follow the clues to identify native prairie plants
that thrive there — and in other places, too.



Get to Know Native Prairie Plants

Follow the clues to identify native prairie plants that thrive there — and in other places, too.

About the Activity

One thing we can do to help pollinators is to increase habitat for them to find food and nesting areas. Native prairie ecosystems offer great habitat for insect pollinators including many flowering plants with a good source of nectar (nectar is food for pollinators).

In this activity, you will learn about some different native prairie plants, how to identify them, and consider some ways to add native flowering plants to your own landscape at school, at home, and throughout your community.

This activity is part of our 4-H At-Home Native Bees Series.

See the rest of the activities here.

Supplies

These simple supplies are all you'll need for this activity.

- Native plant descriptions and hints PDF
- Answer sheet PDF
- Answer key PDF
- Pencil

Grades: 2-8

Topic: Environmental Education, Horticulture

Time: 30-60 minutes



Activity Steps

- 1 Work through each “Plant ID” Sheet. Read the description of the plant and look at the photo to see what it looks like. Use the description and hint to figure out the name of the plant. Be sure to try all 14, and write your answers on the answer sheet.

DID YOU KNOW?

Many prairie plants are great sources of nutrition for pollinators. Milkweed plants provide not only nectar for pollinators but are the only food source for caterpillars of the monarch butterfly. The native prairie plant called the cup plant actually holds water that birds drink from.



Additionally, the **Maximilian sunflower** is good for pollinators and as food for wildlife including quail, deer, and livestock.



- 2 Check your work against the answer key. How did you do?

DID YOU KNOW?

In addition to providing habitat for pollinators, prairies provide food and nesting ground for animals like birds, rodents, and other small mammals. For example, the tube-like flowers of foxglove beardtongue are attractive to hummingbirds!



- 3 Try visiting a local prairie or other native habitat and see if you can find any of these plants. While you're there, you might also try using a field guide to see if you can identify others.

DID YOU KNOW?

In a prairie, because there is high diversity of plants, flowers are blooming all season long. Ohio spiderwort blooms in early spring. Western ironweed blooms in late summer until the first frost. These plants provide an important food source for pollinators all through the growing season.

Test Your Knowledge

See how much you've learned about pollination!

QUESTION 1

Which plant is important for monarch caterpillars?

- a. Ironweed
- b. Black-eyed Susan
- c. Milkweed
- d. Dandelions

QUESTION 3

Which native prairie plant holds water that birds can drink?

- e. Cup plant
- f. Compass plant
- g. Leadplant
- h. All of the above

QUESTION 5

Which prairie plant is good food for wildlife?

- i. Milkweed
- j. Larkspur
- k. Maximillian sunflower
- l. All are good for wildlife

QUESTION 3

When do flowers usually bloom in a native prairie?

- m. Summer
- n. Spring
- o. Fall
- p. All seasons but winter

QUESTION 3

Which plant has tube-like flowers that are attractive to hummingbirds?

- q. Illinois bundle flower
- r. Foxglove beardtongue
- s. Canada goldenrod
- t. Maximillian sunflower

Reflection Questions

Bonus questions to inspire wonder.

- What type of ecosystem is native to where you live? Visit a park or preserve with native habitat to see if you can find some prairie plants.
- Why is it important for pollinators like bees and butterflies to have plants blooming all year?
- What are some ways you could add native plants to the landscape around you?
- Why is a mowed lawn not as good for wildlife as a native prairie?
- Why are prairie plants good for the soil?



Investigate & Explore

Take what you've learned to the next level to learn more and explore the possibilities.

Now that you can recognize some of the common plants around the prairie, you'll appreciate seeing how pollinators and other animals interact with them. Pay attention to native bees, too, as they thrive in this habitat. There are many benefits to improving how we manage the land around us.

You can learn more about how our habitats also add value to humans through Ecosystem Services:

<https://ecology.fnal.gov/ecosystem-services/>



Career Connections

If you liked identifying native species of prairie plants, you might enjoy a career in STEM. STEM careers are exciting and rewarding, and you can pursue a STEM-related career wherever you live, whether you're in a city, a rural community, or anywhere in between.

Watch this video and learn what it takes to be a field sales representative from Wyatt Jones of Bayer Crop Science.



[Watch Video](#)

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Plant ID #1

This showy plant is frequently grown from seed in home gardens. Its brilliant orange flowers attract butterflies, and its leaves are eaten by butterfly larvae. Historically, the root of this plant was chewed by as a cure for pleurisy and other pulmonary ailments.



Hint



+



+



Plant Key #1





Plant ID #2

A native prairie perennial, this sunflower is a desirable range plant, eaten by many livestock. These plants often form large colonies. A heavy crop of seeds is produced, thus it is also a valuable plant for wildlife. It was named for the naturalist Prince Maximilian of Wied-Neuwied, Germany, who led an expedition into the American West in the 1830s.



Hint



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+



Plant Key #2





Plant ID #3

This native prairie biennial forms a rosette of leaves the first year, followed by flowers the second year. It is covered with hairs that give it a slightly rough texture. This cheerful, widespread wildflower is considered an annual to a short-lived perennial across its range. Bright-yellow, 2-3 in. Wide, daisy-like flowers with dark centers are its claim to fame.



Hint



+



Plant Key #3





Plant ID #4

This native perennial plant is about 4-10' tall and remains unbranched, except for the panicle of flowering stems near the apex. The central stem is thick, hairless, and four-sided. The large opposite leaves are up to 8" long and 5" across, which join together around the central stem to form a cup that can hold water. Many species of birds will drink water from this plant's leaves.



Hint



+



Plant Key #4





Plant ID #5

The foliage of this robust perennial can be semi-evergreen in the South. Its erect, 2-5 ft. stems are topped with stalked clusters of white, tubular, unevenly five-lobed flowers which rise in pairs from the upper leaf axils. This plant frequented by hummingbirds and bumble bees for its pollen.



Hint



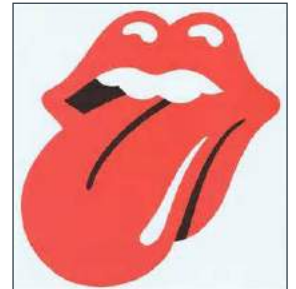
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Plant Key #5





Plant ID #6

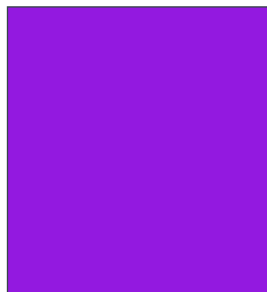
This plant is a native, perennial forb that can grow up to 3 feet in height. Pale pink, drooping petal-like ray florets surround the domed, reddish-brown center of disk florets that are rough and prickly to the touch. You can usually find this plant blooming during the summer months. The Indians used this plants' tap root for many medicinal purposes.



Hint



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Plant Key #6





Plant ID #7

This native perennial plant is 2-5' tall. The alternate leaves tend to occur near the base of the plant, although a few smaller leaves occur along the upper portion of the stem. These leaves are long and strap-like, rather stiff in texture, and up to 2½' long and 2½" across. The entire plant is bluish or greyish green, and quite hairless. The top of the plant consists of several prickly balls of flowers that are individually about ½-1" across. These whitish green balls contain numerous small white flowers that are individually surrounded by prickly bracts.



Hint



+



Plant Key #7



Plant ID #8

This plant's 3-5 ft. stems occur singly or in clumps, and are stout and hairy. Wide clusters of vibrant, red-violet flowers form at the ends of short branches near the top of the plant. Because the flowers are all of the disk variety, the 6 inch wide flower cluster has a fuzzy appearance. Long, lance-shaped leaves line the stems. This plant blooms late in the summer and blooms until frost.



Hint



+



+



Plant Key #8





Plant ID #9

This species is a warm season, perennial bunchgrass with blue-green stems 4-8 ft. tall. The seed head is usually branched into three parts and resembles a turkey's foot. Fall color is maroonish-tan. This species is the star component of the Big Four native grass species that characterize the tallgrass prairies of central North America. Cattle love it so much that some ranchers refer to it as ice cream for cows.



Hint



+



+



Plant Key #9





Plant ID #10

This species is a native warm season perennial grass that is often grown as a forage crop, natural wildlife habitat, or, increasingly, as a bioenergy crop. This species can grow to more than 10 ft. tall and well-managed stands may last for decades. Once this species is established, its bunch-type growth habit makes it very competitive with weeds. However, it is not considered to be invasive. This species makes good roost cover for pheasants and quail.



Hint



+



Plant Key #10





Plant ID #11

This species is a perennial bunchgrass and is prominent in the tall grass prairie region. This species grows to a typical height of 3 feet. Although it has a blue tint in the spring, in fall, its predominant color is more red, which color it may retain throughout winter into spring. This species is one of the most common grasses throughout the Midwest, and it is a very valuable wildlife plant.



Hint



+



+



Plant Key #11





Plant ID #12

The erect or arching stems of this cool-season, short-lived perennial grow 2-4 ft. tall. Terminal, spike-shaped seed heads of oat-like seeds with long, bristly awns, cause the stems to bend and droop. This plant establishes easily, providing quick initial cover. It is a versatile, cool-season plant, requiring little to no maintenance. It provides great nesting cover for pheasants and quail.



Hint



+



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Plant Key #12





Plant ID #13

This species is a thicket-forming shrub or small tree with short trunk, many spreading branches, broad crown, showy large white flowers. Its fragrant, white flowers occur on the plant before the leaves in spring. The fruit that follows ripens to a shiny, bright red in late summer. The short, crooked trunk — with scaly, black bark — supports a graceful, open crown. Fall foliage ranges from electric red to pale yellow. This plants fruit are eaten fresh and used in jellies and preserves, and are also consumed by many kinds of birds.



Hint



+



Plant Key #13





Plant ID #14

This moisture-loving plant grows in sunny patches of wetlands (swamps, marshes, bogs). It has smooth narrow leaves and clusters of pink flowers that are attractive to butterflies. Milkweed is the only food source for monarch caterpillars.



Hint



+



+



Plant Key #14





1. _____

8. _____

2. _____

9. _____

3. _____

10. _____

4. _____

11. _____

5. _____

12. _____

6. _____

13. _____

7. _____

14. _____





American Plum

Little Bluestem

Big Bluestem

Maximilian Sunflower

Black-eyed Susan

Pale Purple Coneflower

Butterfly Milk Weed

Rattlesnake Master

Canada Wildrye

Switchgrass

Cup Plant

Western Ironweed

Foxglove Beardtongue

Swamp Milk Weed





Numbers on this sheet correspond with numbers on the bottom right corner of individual species sheets.

- | | |
|---------------------------|---------------------|
| 1. Butterfly Milk Weed | 8. Western Ironweed |
| 2. Maximilian Sunflower | 9. Big Bluestem |
| 3. Black-eyed Susan | 10. Switchgrass |
| 4. Cup Plant | 11. Little Bluestem |
| 5. Foxglove Beardtongue | 12. Canada Wildrye |
| 6. Pale Purple Coneflower | 13. American Plum |
| 7. Rattlesnake Master | 14. Swamp Milkweed |



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HOME**



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BUILD A NEST FOR NATIVE BEES

Bees need homes too! See how you can repurpose different household materials to create your own nest for cavity nesting bees.



Build a Nest for Native Bees

—
Bees need homes too! See how you can repurpose different household materials to create your own nest for cavity nesting bees.

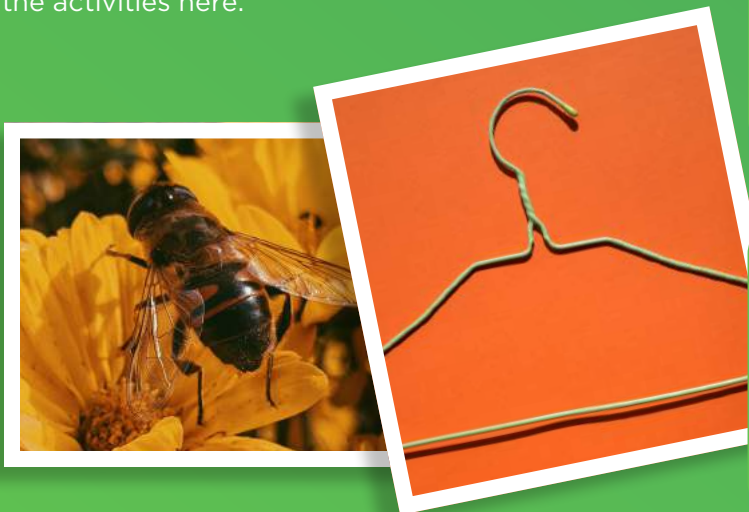
About the Activity

Native bees are important pollinators of many food crops like tomatoes and blueberries. Like other pollinators, they need flowers for food but they also need habitat for making their nests.

Some native bees make their nests in tunnels beneath bare, undisturbed ground. Other native bees make their nests in cavities like the stems of dead plants.

In this activity, you'll make a nest for cavity nesting bees that you can place outside to observe native bees in your own backyard.

This activity is part of our 4-H at Home Midwestern Native Bees Series. See the rest of the activities here.



Supplies

These simple supplies are all you'll need for this activity.

- Scissors
- Several sheets of computer paper (enough to make 10-20 tubes)
- Ruler
- Different size writing utensils to use to roll the paper (like an ordinary #2 pencil, a thin marker, a highlighter, and any other size you would like to try)
- A metal hanger to make very small tubes
- Tape
- Black permanent marker
- Variety of colorful markers
- Sticks
- Any container at least 7 inches deep, that is also waterproof and flexible enough to be cut with scissors
- String or wire



Grades: 2-8

Topic: Environmental Science, Life Science, STEM

Time: 30-60 minutes

Activity Steps

1

It's important to find a good container that will hold your tubes for native bees. Any recycled (or recyclable), waterproof container that is more than seven inches long can be used. Items you may already have around the home include soda bottles, plastic cups, tin or aluminum cans, or milk containers.

DID YOU KNOW? Most native bees are solitary, meaning each bee lives alone and makes its own nest for its young. Some solitary bees make their nest in the ground, while some solitary bees make nests in cavities they find. The cavity might be a hole in a tree or the hollow stem of the plant.

2

Make your native bee tubes by rolling computer paper around a pencil or pen. Find different size utensils to make tubes in a variety of sizes so you can house both big and small bees. The type of bees that will make their nest in a tube depends on the size of that tube. Bees prefer tubes between 4-10mm diameter.

- Tightly roll the paper around the pencil, and continue wrapping until it is four layers thick.
- Tape the edge of the paper in place. Remove the pencil.
- Using the scissors and ruler, cut the tube to a length of 6.5 inches.
- Pinch one end of the tube together. Tape the tube so that it is closed, and color that end black using the permanent marker.
- Continue making tubes until you have enough to fill your selected container.

DID YOU KNOW? Native bees are many different sizes. Smaller bees prefer smaller cavities, and larger bees look to build their nests in larger cavities. That means the type of bees that nest in your tubes depends on the size of the tube. If you hope to find small bees, make rolls of paper with smaller holes, such as with the end of the wire hanger.

3

Use the colorful markers to make the open end of each tube a different color. The different colors will help the female bee know where to return to continue making her nest.

4

Gather all the tubes together, and set them in the container with the closed end towards the bottom of the container. The tubes should fit tightly in the cup, so if they seem loose, make a few more tubes to fill the gaps. Make sure the tubes do not stick out past the edge of the container.

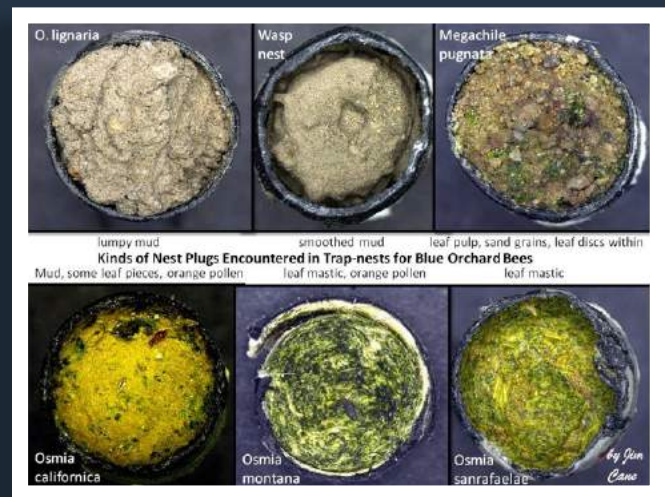
5

Use the heavy string or wire to hang the nest outside near flowers in an area with lots of sunlight. If you can reach a horizontal branch that isn't too shaded, that is a great place to hang your bee nest. It needs to be positioned sideways, and sloping slightly downward so that it doesn't collect rainwater. It also needs to be secure, so that it isn't disrupted by wind, and off the ground, but no higher than a second story.

DID YOU KNOW? Native bees need their nests to be located close to flowers so they can get enough food (nectar and pollen) to ensure that they have enough food for themselves and to feed their young.

6

Keep an eye on your nest to observe who visits. You can also learn clues about the type of native bee (or maybe even wasp) living in each tube by looking at the end cap.



DID YOU KNOW? Each native bee young inside the cavity has their own compartment or room. In each room, female native bees also place a ball of food made of pollen and nectar. They then lay an egg on the food. Bees make walls of leaves or other materials to separate each developing native bee. Native bees live about 6 weeks. Flowers bloom for about two weeks. It is important that native bees have a variety of flowers available throughout their lifespan.

Test Your Knowledge

See how much you've learned about pollination!

QUESTION 1

What kind of lifestyle do solitary bees have?

- a. They are aggressive and like to fight other bees
- b. They live alone
- c. They are likely to sting you
- d. They share their spaces

QUESTION 2

What size cavity is best for native bees?

- a. 1mm width
- b. 3mm width
- c. 5/8-inch width
- d. It depends on the bee

QUESTION 3

Where is the best place to put your bee nest?

- a. Way up in a tree
- b. In your garage to protect from weather
- c. In a sunny spot with flowers nearby
- d. In the shade

QUESTION 4

How many eggs are laid in each "room" in a solitary native bee nest?

- a. 1
- b. 5
- c. 10
- d. 20 or more

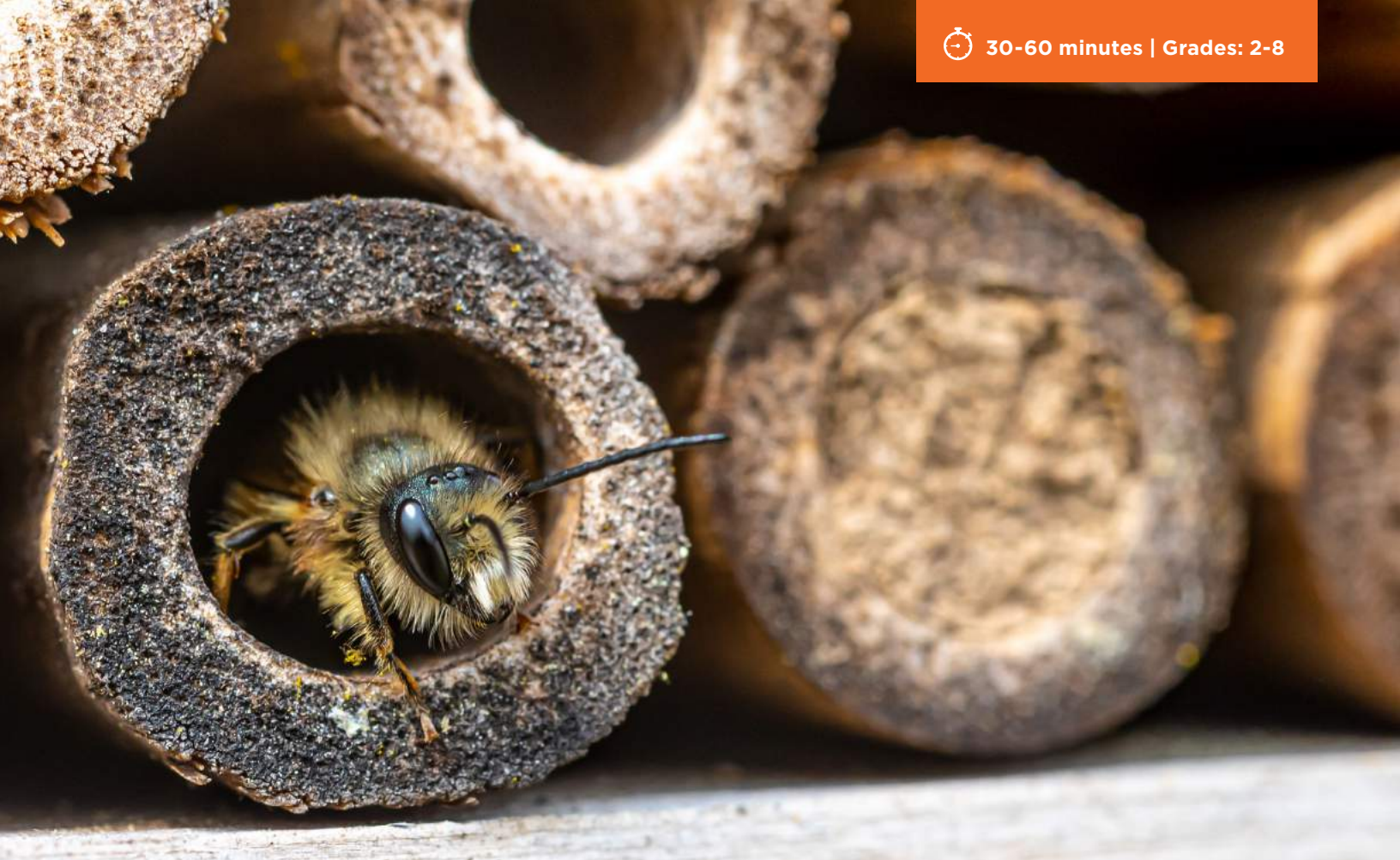
QUESTION 5

Fill in the blank: Native bees have short lives and only live for about __ weeks.

Reflection Questions

Bonus questions to inspire wonder:

- Does the area where you live have good habitat for native bees? Why or why not?
- How might a city neighborhood benefit from having bee nests like the one you created?
- How might some farmers benefit from having bee nests like the one we created?



Investigate & Explore

Take your new knowledge to the next level.

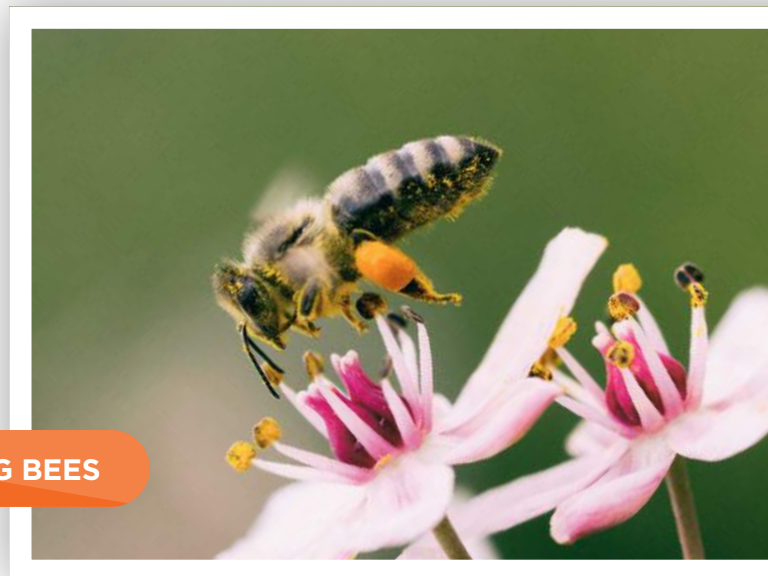
Now that you know more about native bee nests, you might be better able to spot natural nests in your own community! Here's some additional information that can make it easier to identify the different types of bees that thrive in the prairie:

WHAT IS A BEE?

NESTING AND MATING CROWN BEES

CAVITY NESTING BEES

GROUND NESTING BEES



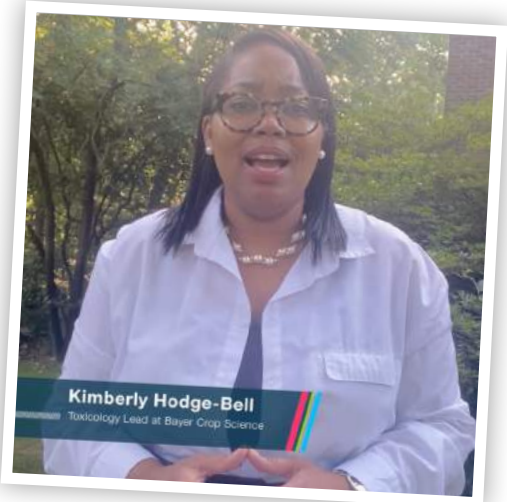


Career Connections

If you liked building a bee's nest, you might enjoy a career in STEM. STEM careers are exciting and rewarding, and you can pursue a STEM-related career wherever you live, whether you're in a city, a rural community, or anywhere in between.

Watch this video and learn what it takes to be a toxicologist from Kimberly Hodge-Bell of Bayer Crop Science.

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Brought to you by:



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