

2016

Teen Facilitator Guide



HoneyBee Challenge



NATIONAL 4-H
COUNCIL

MONSANTO 

 **THE OHIO STATE UNIVERSITY**
COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES



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Honey Bee Challenge

The *4-H Ag Innovators Experience Honey Bee Challenge* focuses on a critical component—honey bees—to growing food and feeding the world. Approximately one in every three bites we eat is the result of these pollinators at work. Apples, pumpkins, strawberries, alfalfa, sunflowers, oranges, buckwheat, and almonds are just some of the crops that rely on honey bee pollination.

As the Teen Facilitator for this activity, you will help youth learn that:

- Honey bees and other pollinators are essential contributors to growing food and feeding the world.
- Honey bees utilize a combination of natural and agricultural habitats to maintain healthy hives.
- Preserving and maintaining the natural foraging habitats of honey bees is important.
- Commercial beekeepers transport honey bees all across the country to boost crop yield, since there is not enough managed honeybees or native pollinators to maximize agricultural production.
- Youth can contribute to honey bee health in their own communities.

The *4-H Ag Innovators Honey Bee Challenge* is an ideal activity for 3rd to 8th grade youth at summer reading programs, summer camps, summer childcare settings, festivals, and fairs.



Did you know?



National Pollinator Week
is June 20 to June 26, 2016.



National Honey Bee Day
is August 20, 2016.

Background

Many fruits and vegetables, and even foods like chocolate and coffee, need animal pollinators. About 75% of all plants depend on animal pollinators to move pollen from plant to plant. Native plants—and the animals who eat their seeds and fruit—also depend on pollinators. Seeds and fruit from native plants provide essential food sources for many mammals and birds.

Honey bees are among the most important pollinators, helping farmers to grow a variety of crops from almonds to apples to alfalfa. North America is home to about 4000 species of native bees, but there are not enough native bees to adequately pollinate many fruit, vegetable, and nut crops. For this reason, many migratory beekeepers travel across the country with thousands of honey bee hives to help farmers boost crop yield. These businesses transport honey bee hives across the country to wherever they are needed most. California's almond industry is heavily dependent on these mobile, rentable bee hives. In February, more than 80 billion of bees are hired to pollinate 2.5 trillion flowers on almond trees! Orchards, citrus groves, cranberry bogs, and sunflower fields also depend on trucked-in bee hives for pollination.

Like all bees, honey bees are vegetarians. They survive on a diet of pollen and nectar. Their bodies are specially adapted for this diet, allowing the worker bees to collect and transport food to feed the young. As honey bees travel from flower to flower gathering pollen and nectar, they inadvertently transfer pollen from flower to flower, allowing plants to make seeds and fruit.

Pollen easily sticks to the honey bees because of the unique way their bodies are designed. First, a bee's body has hairs branched like feathers to hold pollen. Second, the bodies of bees in motion gather static electrical charges, which attract pollen. Third, a bee's hind legs have pollen baskets that hold the pollen they gather and transport it back to the hive.

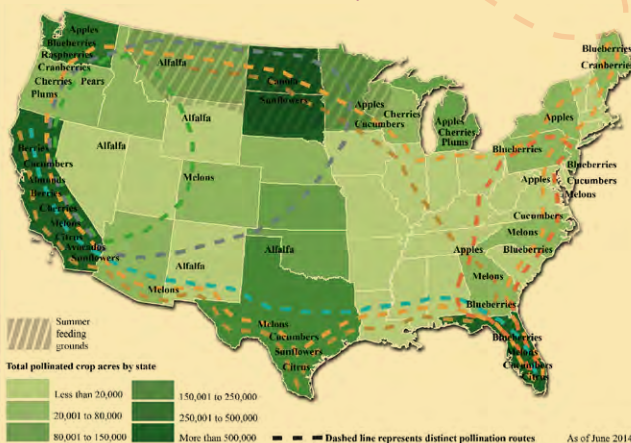
Honey bees forage for food close to their nesting sites, a practice called **central place foraging**. Bees often visit only one flowering species during each foraging trip, even when other flowers are available. This behavior, called **flower fidelity**, makes honey bees especially reliable carriers for moving pollen between flowers of the same species.

Honey bees face many threats to their health and survival, including pests, disease, and pesticides. Finding enough flowers for food is also a problem for honey bees. While many gardeners plant pretty flowers, these flowers might not offer the quality of food that bees need. To help, people can plant more flowers bees prefer, such as asters, clover, goldenrod, purple coneflowers, and sunflowers. Preserving natural meadows and maintaining roadside plantings are other important ways to help honey bees. By learning more about these important creatures and taking steps to protect their health and habitat, we can help ensure the survival of these essential pollinators.

A speck of pollen enlarged



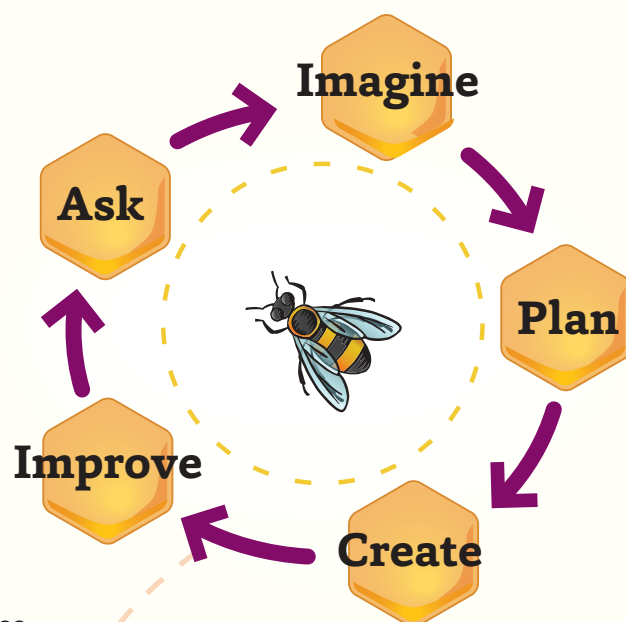
Pollinator movement and crops in the U.S.



Source: USDA, Economic Research Service; Sautzman (2011), with input from commercial beekeepers and apiculture experts, including Dr. Jeff Pettis and Dr. David Epstein, an entomologist and authority on pollinators with the USDA's Pest Management Policy. Crop production acres are from USDA, National Agricultural Statistics Service, 2012 Agricultural Census.

Activity Preparation and Facilitation

The *4-H Honey Bee Challenge* introduces youth to the critical role that “hired” honey bees play in food production. Youth begin with a Farm-to-Table warm-up activity based on the USDA MyPlate model. This activity helps youth connect honey bees to the MyPlate food groups. Working in teams, youth then assemble model bees using bristle bot kits and construct foraging routes for their model bees to follow. Teams are evaluated on the efficiency of their material use in designing foraging routes, the amount of pollen their bees collect, and the time their bees spend foraging. A wrap-up discussion underscores the importance of honey bees in agriculture and outlines ways youth can help bees in their own communities.



Objectives

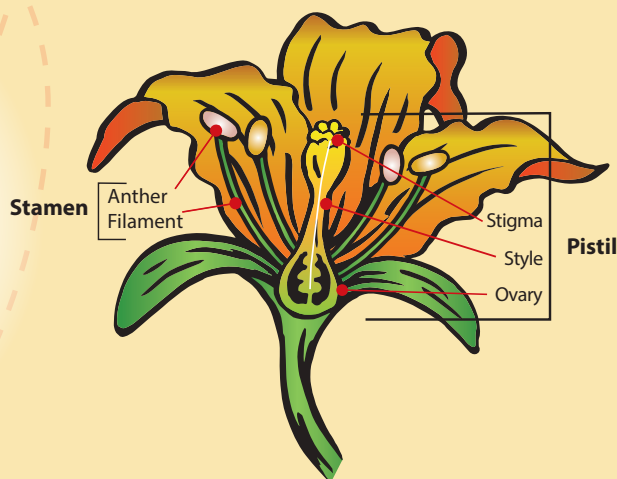
As the facilitator of this activity, you will help youth:

- Understand the important role of “hired” honey bees and migratory commercial beekeepers in agriculture.
- Investigate the foraging behavior of honey bees, which includes **flower fidelity** and the **waggle dance**.
- Learn that modeling is one way to explore and understand the world.
- Practice problem-solving, critical thinking, and team work skills.
- Identify ways to help bees and increase their foraging habitat.
- Collaborate to address real world issues and foster a sense of accomplishment.



Did you know?

Pollination is the movement of pollen from the male part (stamen) of one flower to the female part (pistil) of another flower. Many plants are wind-pollinated, but others rely on animals—such as bees, beetles, birds, and butterflies—to carry pollen from flower to flower.



Preparing for the Activity

(1 – 2 hours)

Step 1. Familiarize yourself with the challenge

(30 minutes – 1 hour)

- Watch the 4-H Honey Bee Challenge video: www.4-h.org/about/partners/monsanto/
- Review the contents of the 4-H Honey Bee Challenge Kit as well as the other items needed for the activity that are not included in the kit (listed in red).
- Read through this Facilitator Guide, thinking through how you will facilitate each step of the activity.
- Plan how you will gather all the necessary items for the activity, including copies of the worksheets, construction materials, and cleanup supplies.



Materials List

Note: Items listed in red are not included in the 4-H Honey Bee Challenge Kit.

Each team needs:

- Three Farm-to-Table Warm-Up Activity worksheets (page 11)
- One Modeling a Honey Bee worksheet (page 12)
- One Modeling a Forage Route worksheet (page 13)
- Materials for three Honey Bee bristlebots (one Honey Bee Modeling Kit provides enough materials for five teams of three)
- Two to three Honey Bee Modeling Kits (1 kit per person)
- One 4-H Honey Bee Challenge Mat
- Ten 3 oz. paper cups
- Twenty straws
- One roll of clear tape
- One pair of scissors
- One tube of glitter to simulate pollen

Facilitator needs:

- Timer
- Small broom and dustpan (for cleanup)
- **OPTIONAL:** Poster paper and markers or a white board and dry erase-markers (for conducting the Farm-to-Table Warm-Up Activity as a group)



Activity Items Checklist

Number of youth participating: _____

Number of teams (divide number of youth by 3): _____

1 **Farm-to-Table Warm-Up Activity worksheet** per person x _____ youth = _____ copies
of the Farm-To-Table Warm-Up Activity worksheet

1 **Challenge Mat** per team x _____ teams = _____ Challenge Mats

1 **Modeling a Honey Bee worksheet** per team x _____ teams = _____ copies
of the Modeling a Honey Bee worksheet

1 **Modeling a Foraging Route worksheet** per team x _____ teams = _____ copies
of the Modeling a Foraging Route worksheet

1 **Honey Bee Modeling Kit** per 15 youth x _____ youth = _____ Honey Bee Modeling Kits

10 **paper cups** per team x _____ teams = _____ paper cups

20 **straws** per team x _____ teams = _____ straws

1 **roll of tape** per team x _____ teams = _____ rolls of tape

1 **pair of scissors** per team x _____ teams = _____ pairs of scissors

1 **tube of glitter** per team x _____ teams = _____ tubes of glitter

OPTIONAL:

1 **The “Buzz” About Bees information sheet** per person x _____ youth = _____ copies
of The “Buzz” About Bees

Step 2. Organize materials and set up the room

(30 minutes – 1 hour)

- Sort contents of the 4-H Honey Bee Challenge Kit into the specified quantities for each team.
- Set out the other necessary materials that are not included in the 4-H Honey Bee Challenge Kit, such as the glitter, straws, cups, scissors, and tape. You may also wish to get a timer to track the amount of time it takes for the model bees to complete their foraging route. Finally, get a broom and dustpan to clean up spilled “pollen” after the activity.
- Make sure each team has a flat workspace big enough to accommodate the Challenge Mat, worksheets, and construction materials.



Facilitating the Activity

(60 minutes)

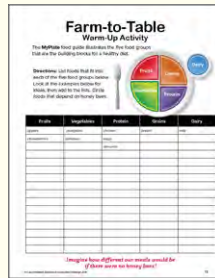
Step 1. Set the stage for the activity by illustrating the importance of honey bees through a Farm-to-Table warm-up activity (5 minutes)

- Ask youth to brainstorm plants that honey bees pollinate.
- Ask youth to estimate how much of the food we eat relies on pollination by honey bees.
- Distribute the *Farm-to-Table Warm-Up Activity* worksheet (page 11). Explain that the MyPlate food guide illustrates the five food groups that make up a healthy diet.
- Provide time for youth to complete the worksheet by adding to the lists of sample foods within each of the MyPlate food groups.
- Briefly discuss youth's responses and reveal that three of the MyPlate food groups—fruits, vegetables, and dairy—benefit directly from honey bee pollination. Point out that in the US, honey bees are the most important pollinators of crops including almonds, apples, berries, squash, and cucumbers.
- Ask youth to circle all the food items on their worksheet that depend on pollination by honey bees.
- Ask youth to adjust their estimates regarding the amount of food that honey bees help produce.
- Reveal that approximately one out of every three bites of food we eat comes to us because of bees... and that doesn't include foods like grains (corn, wheat, oats, rice, and soybean) which are wind-pollinated.
- Prompt youth to consider how their meals would be different if there weren't migratory beekeepers to provide honey bee pollination services. Ask them to cross off all food items on their worksheets that depend on honey bee pollination. Then, ask questions to inspire a short discussion about how our diet would be different without "hired" honey bees to pollinate crops:

What foods would become scarce if there weren't businesses to truck honey bees across the country to the farms and orchards where they are needed?

How would breakfast, lunch, or dinner be different?

What parts of a healthy diet would become harder to get?



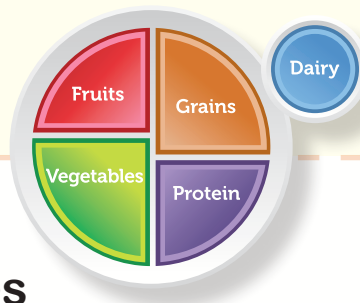
TIP

To avoid distractions, hand out activity items to youth only as needed for completion of each step instead of distributing the materials to youth all at once.



ALTERNATIVE: Instead of providing *Farm-to-Table Warm-Up Activity* worksheets for each participant, draw a large diagram of the MyPlate food groups on poster paper or a white board. Then, do the Farm-to-Table warm-up activity as a group.





Learn more about the
MyPlate nutrition guide at:
www.choosemyplate.gov

Meals With Fewer Bees

If honey bees weren't available to pollinate crops, production of the following foods would suffer:

- Almonds
- Apples
- Apricots
- Avocados
- Beans
- Blueberries
- Broccoli
- Cauliflower
- Cabbage
- Cantaloupe
- Cherries
- Cucumbers
- Grapefruit
- Kiwis
- Lemons and limes
- Milk
- Nectarines
- Oranges
- Pears
- Peaches
- Peppers
- Plums
- Pumpkins
- Raspberries
- Strawberries
- Squash
- Watermelon
- Zucchini



Step 2. Demonstrate the waggle dance

(5 minutes)

- Explain that when a honey bee finds a good food source (such as a field of alfalfa), she returns to the hive and performs a “waggle dance” that tells the other bees exactly where the flowers are located. The specific way in which she moves her body lets the other bees know how far, and in what direction, to fly.
- Perform a waggle dance for the youth. Explain that the *orientation* of the dance conveys the direction of the food source in relation to the sun. The *duration* of the “waggle” phase indicates the distance of the food source from the hive.
- Invite youth to join you in doing the waggle dance!

Step 3. Present the challenge and guide youth as they build model bees

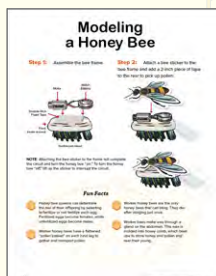
(10 minutes)

- Divide the group into teams of two or three, pairing younger participants with older participants.
- Provide background information about the migratory commercial beekeeping industry that provides essential pollination services to farms and orchards. Explain that there are not enough native pollinators to ensure large crop yields, so businesses truck valuable honey bees across the country to wherever they are needed. Some of the crops these commercial migratory bees pollinate include vegetables, fruits, and alfalfa.
- Introduce the story of Polly’s Pollination Service. Explain that Polly’s Pollination Service is one of many businesses that carefully transports honey bee hives to any farm or orchard that needs “hired” bees to pollinate flowering crops. Today, Polly’s Pollination Service is bringing bees to a farm with cucumbers, an orchard, and an alfalfa field. The youth’s teams have been hired to help design an efficient foraging route for Polly’s bees.
- Describe the goal of the challenge and the criteria upon which teams will be evaluated.

Goal: Construct a foraging route that allows Polly’s bees to collect the most pollen in the least amount of time.

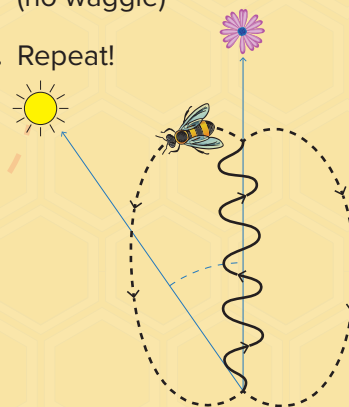
Criteria:

1. Efficiency of materials used in designing foraging routes
2. Quantity of “pollen” collected
3. Speed in completing the foraging route



How to Do the Waggle Dance

1. Shake your behind as you move forward a few steps.
2. Turn to the right and circle back to your starting position. (no waggle)
3. Shake your behind as you move forward a few steps.
4. Turn to the left and circle back to your starting position. (no waggle)
5. Repeat!



To learn more about the waggle dance, go to: www.pbs.org/wgbh/nova/sciencenow/ and search for “The Waggle Dance” video, published by NOVA scienceNOW in 2012, featuring David Pogue.



- Hand out Honey Bee Modeling Kits (one per person) and the *Modeling a Honey Bee* worksheet (one per team).
- Guide teams as they assemble bristle bot “bees” using the materials provided. Ask questions to help youth identify similarities between real honey bees and these bristle bot models:

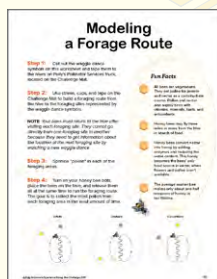
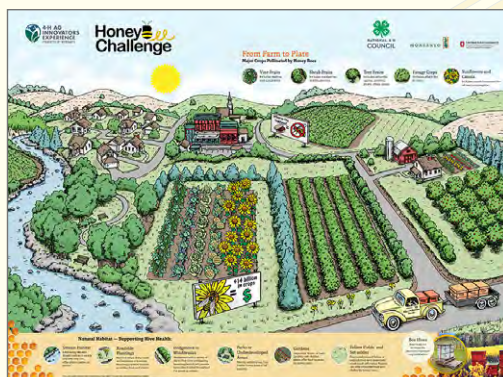
What parts of honey bees do the materials model or imitate?

How does the model bee behave like a real honey bee?



Step 4. Guide youth as they model forage routes (30 minutes)

- Hand out the 4-H Honey Bee Challenge Mat (one per team) along with the Modeling a Forage Route worksheet.
- Direct youth to cut out the orchard, alfalfa, and cucumber waggle dance symbols from the Modeling a Forage Route worksheet. Then, ask youth to tape these waggle dance symbols to Polly’s Pollination Service truck on the Challenge Mat. These waggle dance symbols represent the information about specific food source locations that “scout” worker bees convey to other bees through a waggle dance.
- Ask questions to inspire brainstorming about how to build a foraging route using the materials provided:



NOTE TO FACILITATOR

- Each team of 3 youth gets its own challenge mat.
- Each team member assembles his/her own bristle bot honey bee.
- Each team collaborates to build a single foraging route for all of their bees to run together.
- All bees must “pollinate” the three foraging areas, returning to the hive in between their visit to each site.
- The goal is to *maximize* the amount of pollen collected from each foraging area and *minimize* the time spent on route.

How can you create physical barriers to guide the bees to each foraging site?

How can you design your route to help the bees collect a lot of pollen in a short amount of time?

- Remind youth that teams are evaluated on the efficiency of their forage route design, the amount of “pollen” their bees collect, and the time it takes the bees to complete the foraging journey.

- Distribute the supplies youth will use to build their foraging route. Each team needs:

- Ten 3 oz. paper cups
- Twenty straws
- One roll of clear tape
- One pair of scissors
- One tube of glitter (or other similar material) to simulate pollen

- Encourage youth as they experiment with designs for their team’s foraging route.
- As each team is ready, time the bees’ trip along the foraging route and back to the hive. Remember, the bees have to return to the hive in between visiting each foraging site!

Step 5. Compare and Celebrate Results (5 minutes)

- Call everyone to attention and discuss the teams' results. Ask questions to prompt discussion:

What features of forage routes worked the best?

What factors helped the bees complete their foraging quickly and efficiently?

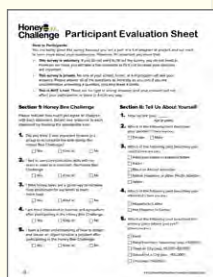
How did teams get their bees back to the hive in between trips to each foraging site?

- Remind youth of the importance of honey bees to food production. Then, brainstorm ways that youth can help bees in their own communities.

OPTIONAL: Hand out *The "Buzz" about Bees* (pages 14 - 15). Explain that youth can use this information sheet to learn more about honey bees and share their knowledge with others.

Step 6. Wrap-Up (5 minutes)

- Recognize and thank Monsanto and the National 4-H Council, sponsors of the Honey Bee Challenge. (See contact information inside back cover.)
- Direct youth to complete the required student evaluations.
- Fill out the 4-H Honey Bee Challenge Participant Group Data Collection Sheet.
- Congratulate yourself on a job well done!



How can you help bees in your own community?

- **Plant a variety of flowering plants and trees.** Select plants that bloom throughout each of the three active bee seasons (spring, summer, and fall) to provide a wide variety of continuous food sources for bees.
- **Set up "no-mow" zones.** Leave some areas of lawn unmowed so that wildflowers, a key food source for bees, have a chance to grow.
- **Preserve native plant areas.** Native plants weather local climate conditions better than non-native plant species. They require less watering and less maintenance, providing more benefits for you *and* the bees.
- **Reduce or avoid use of pesticides.** Avoid spraying pesticides around plant bloom time to reduce bees' contact with poisons. If using, apply insecticides in the evening when bees aren't as active.
- **Spread the word about the importance of bees.** Have a Pollination Party and serve foods pollinated by bees. Talk about how important honey bees are to agriculture and food production.

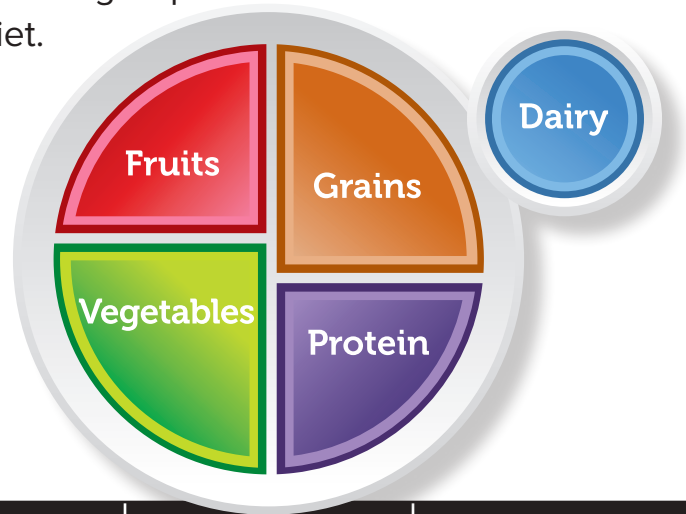


Farm-to-Table

Warm-Up Activity

The **MyPlate** food guide illustrates the five food groups that are the building blocks for a healthy diet.

Directions: List foods that fit into each of the five food groups below. Look at the examples below for ideas, then add to the lists. Circle foods that depend on honey bees.

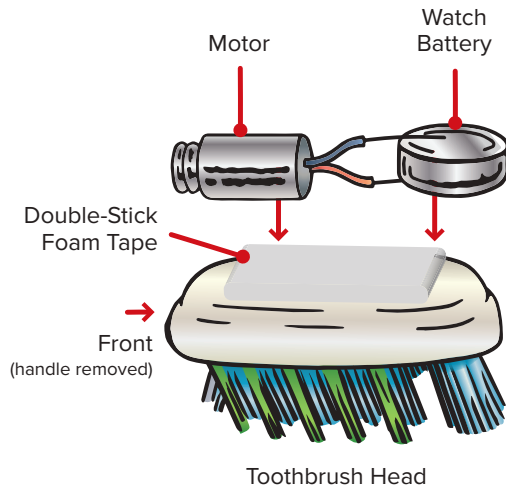


Fruits	Vegetables	Protein	Grains	Dairy
apples	pumpkins	chicken	bread	milk
strawberries	potatoes	eggs		
		almonds		

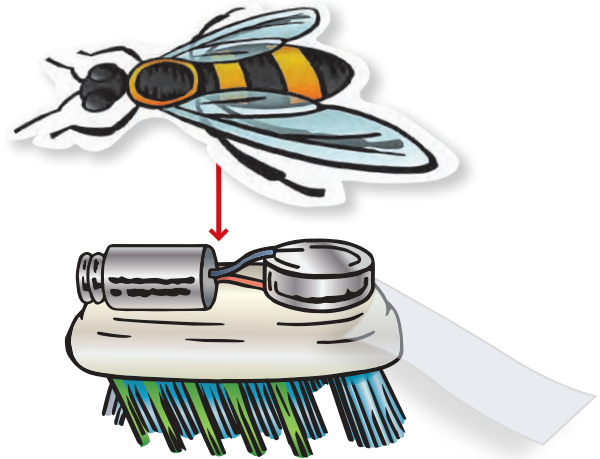
**Imagine how different our meals would be
if there were no honey bees!**

Modeling a Honey Bee

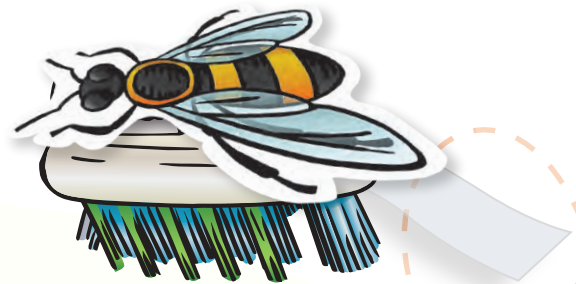
Step 1: Assemble the bee frame.



Step 2: Attach a bee sticker to the bee frame and add a 2-inch piece of tape to the rear to pick up pollen.



NOTE: Attaching the bee sticker to the frame will complete the circuit and turn the honey bee “on.” To turn the honey bee “off,” lift up the sticker to interrupt the circuit.



Fun Facts



Honey bee queens can determine the sex of their offspring by selecting to fertilize or not fertilize each egg. Fertilized eggs become females, while unfertilized eggs become males.



Worker honey bees have a flattened “pollen basket” on each hind leg to gather and transport pollen.



Worker honey bees are the only honey bees that can sting. They die after stinging just once.



Worker bees make wax through a gland on the abdomen. This wax is molded into honey comb, which bees use to store honey and pollen and rear their young.

Modeling a Forage Route

Step 1: Cut out the waggle dance symbols on this worksheet and tape them to the hives on Polly's Pollinator Service truck, located on the Challenge Mat.

Step 2: Use straws, cups, and tape on the Challenge Mat to build a foraging route from the hive to the foraging sites represented by the waggle dance symbols.

NOTE: *Your bees must return to the hive after visiting each foraging site. They cannot go directly from one foraging site to another because they need to get information about the location of the next foraging site by watching a new waggle dance.*

Step 3: Sprinkle "pollen" in each of the foraging areas.

Step 4: Turn on your honey bee bots, place the bees on the hive, and release them all at the same time to run the foraging route. The goal is to collect the most pollen from each foraging area in the least amount of time.

Fun Facts



All bees are vegetarians. They eat pollen for protein and nectar as a carbohydrate source. Pollen and nectar also supply bees with vitamins, minerals, lipids, and antioxidants.



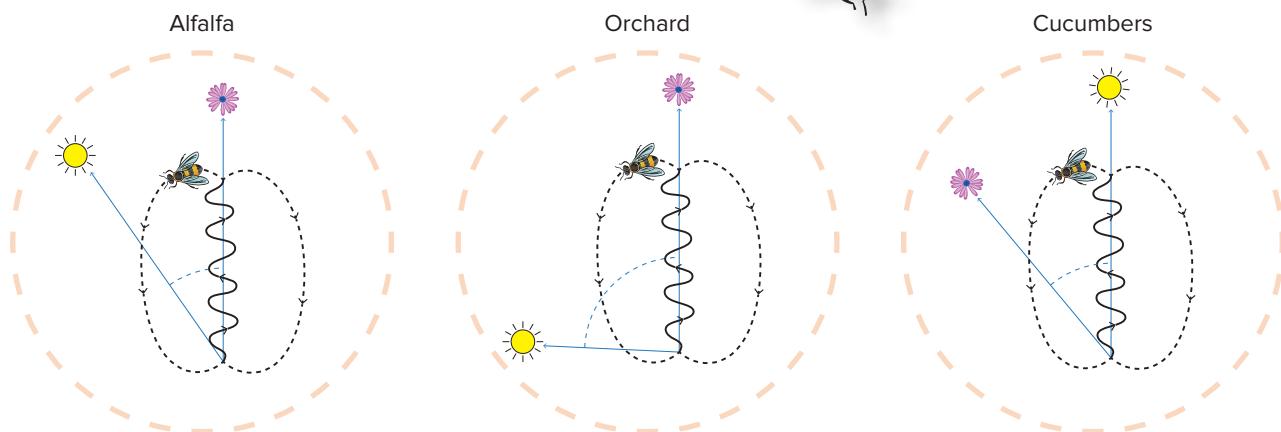
Honey bees may fly three miles or more from the hive in search of food.



Honey bees convert nectar into honey by adding enzymes and reducing the water content. This honey becomes the bees' only food source in winter, when flowers and pollen aren't available.



The average worker bee makes only about one-half teaspoon of honey in her lifetime.



The “Buzz” About Bees

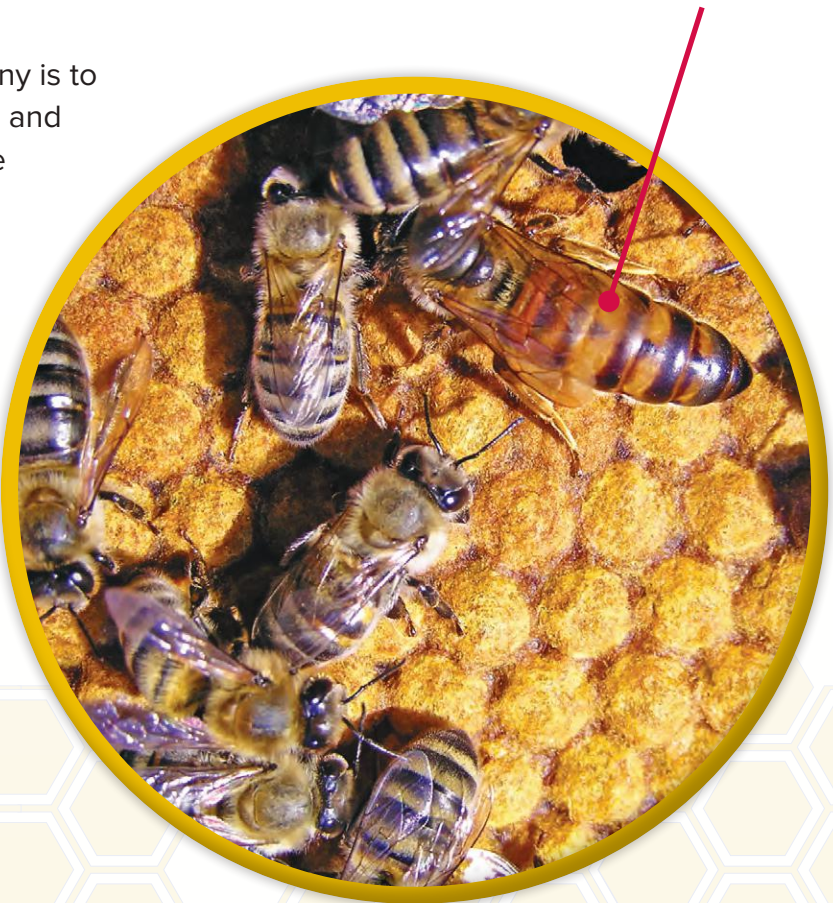
Honey bees are social insects that live together in colonies. The colony members include the queen, thousands of female worker bees, and the male drones. As many as 50,000 to 90,000 bees can live together in one colony at the height of the season. Because honey bees live together in colonies, they can be loaded onto trucks and transported to farms where they provide the pollination that is essential for the production of almonds, apples, berries, squash, sunflowers, and many other crops.

The queen’s role in the honey bee colony is to lay eggs. She may live for several years and lay as many as 2,000 eggs per day. The drones are male bees whose role is to mate with virgin queens. Drones are not adapted to gather and transport pollen or nectar. This duty goes to the female worker bees, who—in addition to foraging for food—carry out many important maintenance tasks, including building the comb, cleaning the hive, converting nectar to honey, feeding immature bees, caring for the queen, and guarding the hive. Worker bees born during the spring, summer,

and early fall live only about 4 to 6 weeks, but workers reared in late fall may live through the winter, or about 4 months total.

Like all bees, honey bees are vegetarians, surviving on a diet of pollen and nectar. Their bodies are specially adapted for this diet, allowing the workers to collect and transport food to feed the young.

Queen Bee



Worker bees communicate the location of flowers through a waggle dance. The way they move their bodies in the waggle dance tells other worker bees the location, distance, and quality of food they have found. Other worker bees understand this symbolic dance “language” and use the information to find the food source. More worker bees will then visit these flowers and return to the hive with pollen or nectar, helping to ensure a steady food supply and the colony’s survival.

Honey bees face many threats to their health and survival. Pests and diseases can kill or weaken bees. Pesticides can harm or kill bee adults and larvae. Finding enough flowers for food is also a problem for honey bees. While

many gardeners plant pretty flowers, these flowers might not offer the quality of food that bees need.

To help honey bees, everyone can plant more flowers—such as asters, clover, goldenrod, purple coneflowers, and sunflowers—that bees like.

Meadows, gardens, and roadside plantings are other ways to increase flower habitat and protect honey bees. Even dandelions provide an important honey bee food source. By learning more about these important creatures and taking steps to protect their health and habitat, we can help ensure the survival of these essential pollinators.



As honey bees travel from flower to flower gathering nectar, they inadvertently transfer pollen from flower to flower, allowing plants to make seeds and fruit. Pollen easily “sticks” to the honey bees because of the unique way their bodies are designed.



First, a bee’s body has hairs branched like feathers to hold pollen.

Second, the bodies of bees in motion gather static electrical charges, which attract pollen.

Third, a worker bee’s hind legs have pollen baskets that hold the pollen they gather and transport it back to the hive.



Participant Evaluation Sheet

Note to Participants:

You are being given this survey because you are a part of a 4-H program or project, and we want to learn more about your experiences. However, it's important you know that:

- **This survey is voluntary.** If you do not want to fill out the survey, you do not need to. However, we hope you will take a few moments to fill it out because your opinions are important.
- **This survey is private.** No one at your school, home, or 4-H program will see your answers. Please answer all of the questions as honestly as you can. If you are uncomfortable answering a question, you may leave it blank.
- **This is NOT a test.** There are no right or wrong answers, and your answers will not affect your participation or place in 4-H in any way.

Section 1: Honey Bee Challenge

Please indicate how much you agree or disagree with each statement. (Select one response to each statement by marking the appropriate box).

1. Did you think it was important to work in a group to accomplish the task during the Honey Bee Challenge?
☐ Yes ☐ Kind of ☐ No
2. I had to use communication skills with my team in order to accomplish the Honey Bee Challenge.
☐ Yes ☐ Kind of ☐ No
3. I think honey bees are a good way to increase food production for our world to have more food.
☐ Yes ☐ Kind of ☐ No
4. I am more interested in science and agriculture after participating in the Honey Bee Challenge.
☐ Yes ☐ Kind of ☐ No
5. I have a better understanding of how to design and create an object to solve a problem after participating in the Honey Bee Challenge.
☐ Yes ☐ Kind of ☐ No

Section II: Tell Us About Yourself

1. How old are you? _____
Age (in years)
2. Which of the following best describes your gender? *(Check one box.)*
☐ Female ☐ Male
3. Which of the following best describes your race? *(Check one box.)*
☐ American Indian or Alaskan Native
☐ Asian
☐ Black or African American
☐ Native Hawaiian or other Pacific Islander
☐ White
4. Which of the following best describes your ethnicity? *(Check one box.)*
☐ Hispanic or Latino
☐ Not Hispanic or Latino
5. Which of the following best describes the primary place where you live?
(Check one box.)
☐ Farm
☐ Rural (non-farm residence, pop. <10,000)
☐ Town or City (pop. 10,000–50,000)
☐ Suburb of a City (pop. >50,000)
☐ City (pop. >50,000)

MONSANTO



Monsanto is a sustainable agriculture company that delivers technology-based solutions and agricultural products that support farmers all around the world. As the population increases and access to land and water for agriculture decreases, Monsanto remains focused on enabling farmers to produce more from their land while conserving the world's natural resources. Monsanto is supporting the 4-H Ag Innovators Experience because today's participants will provide tomorrow's foundation for a prosperous, knowledgeable, and innovative agricultural workforce.

Visit www.monsanto.com for more information, read the company blog at www.monsantoblog.com, and follow us on Twitter: twitter.com/MonsantoCo

Thank you notes should be addressed to:

Jerry Hayes

Monsanto Bee Health Lead
Monsanto, 800 N. Lindbergh Blvd., A2S
St. Louis, MO 63167





Honey Challenge

The 4-H Pledge

I pledge

My Head to clearer thinking,
My Heart to greater loyalty,
My Hands to larger service, and
My Health to better living,
For my club, my community,
my country, and my world.



4-H is the youth development organization of our nation's Cooperative Extension System and USDA.

