

**Start Up:** (5-10 min) **Name tags-**Have students write their name on a craft foam shape, then thread a clip or string through the slit at the top for easy wearing.  
Bee coloring sheet, plastic insects, insect puppets

**Welcome/ Introduction:** 5 min. Staff/Volunteer Names  
Give a brief overview of your nature center or park.  
Go over guidelines for acceptable behavior.

**Today's Topic-Honeybees**

**Question: What is a day in the life of a honeybee like?**

**Opener:** 10-20 min. **Name Game** (Sanborn)-Each student gives his/her name plus one detail about themselves (e.g. favorite way to eat honey). The other students take turns repeating each introduction and adding their own name and detail.

**The Pretzel** (Sanborn)-Students stand in a circle & hold hands across the circle with two different people, then try to untangle the human knot into a regular hand-holding circle. This works best with 5-10 students. Make two or more "knots" with a larger group.

**Background/ Exploration:** 20 min. Bees are insects. Ask the students to describe the parts of an insect.  
**Basic Insect Parts-**Head, thorax, abdomen, 6 legs, 2 antennae, hard shell, wings  
Spiders are not insects, they have eight legs and only two body parts.  
Insects and spiders don't have backbones like other animals, they have a hard shell covering the outside of their body (exoskeleton).  
Show students some plastic insect models and ask them to find their parts.

**What Makes a bee?** There are thousands of types of bees, but they all have:

- Sucking and chewing mouthparts (tubelike tongue or proboscis)
- Stingers for defense (the only insects that do)
- Yellow and brown or black stripes on abdomen
- Hair on body and legs

A bee's food is flowers (nectar, pollen).

Show pictures of different kinds of bees and/or a bee model to students.  
Many bees live alone (are solitary), like bumblebees living in holes in the ground.

**Bee Relatives-**

- Wasps are related to bees; some are yellow w/black stripes.  
Wasps eat other insects (meat-eaters, carnivores).
- Ants are also related to bees.
- Many flies look like bees and can be mistaken for them.
- Bees and wasps have four clear wings and a slender waist, but flies have just two wings and a thicker body.

How big is your family?

**Honeybees** are social bees that live together in a large group called a colony, in their nest called a “hive”.

- A colony or hive can have up to 50,000 bees!
- Honeybees can fly as fast as 15 mph, which isn't fast compared to other flying insects.
- Bees have a good sense of smell, which helps them find flower nectar.
- They have 5 eyes: 3 simple and 2 large compound.  
The simple eyes see how strong the light is, the compound eyes help the bee see movement.
- Bees see colors in a different way than we do (can see ultraviolet light).  
They can't see red, but they see patterns on flowers that we don't.

**Activity:**  
5 min.

Let students use handheld prisms, or “bug eyes” to look around.

Show some pictures of flower nectar guide patterns.

Discuss what bees see vs. humans. Why would bees see flowers differently?

**Bee life cycle- egg—larva (grub)—pupa—adult**

The change from pupa to adult is called **metamorphosis**.

This is like a caterpillar changing into a butterfly.

It takes 21 days for a **worker bee** to become an adult, only 15 for a **queen**, and 24 for a **drone** (male bee). Show pictures or models of the life stages.

**Activity:**  
10-15 min.

**Bee Hive-**Look at pictures of bees in their hive from a book or magazine.

Identify bee larvae, honey cells, wax cells, workers, pollen baskets, and the queen.

(Look at a live hive under glass if one is available at your site.)

Describe the three types of honeybees in the hive: queen, worker, drone (see below).

**Honey-**

- ♣ Bees store the nectar they suck up in their crop, an extra stomach (honey stomach).  
Ask students to stick out their tongues and slurp. Try to roll your tongue!
- ♣ Bees spit out the nectar they collect when they get back to the hive to feed other bees and store in the hive's cells. A healthy hive can make 2 pounds of honey a day.
- ♣ Different flowers/nectars make different tasting kinds of honey.
- ♣ The bees fan the regurgitated (spit out) nectar with their wings, which dries it into honey.
- ♣ Nectar is a sweet liquid, honey is very sugary, and gives the bees lots of energy.
- ♣ Bees also get protein, minerals, and vitamins by eating flower pollen.
- ♣ Bees' stiff leg hairs are used like combs to collect pollen off their bodies.

**Beeswax-**

- The nectar and pollen bees eat causes them shed to wax in flakes on their bodies.
- Bees collect the flakes, then soften the wax with their saliva, and shape it with their front legs and jaws.
- This wax is used to make the cell walls in the hive, or comb.  
The comb is very strong. It is made of 6 sided cells (hexagons).

**Game:**  
15 min.

**Worker Bee Game-**

Read *Busy, Buzzy Bee*, then play the game (see below).

**Prepare to go Outside:** Restroom break.  
10 min. Apply: Sunscreen, Bug Repellant (if necessary)  
Bring: Water bottles, hats, jackets (if necessary), clipboard/clip  
**Trail Rules** (see The First Program).  
**What we will do/What to look for**-Bees on flowers in prairie, bee hives  
**Predictions**-What animals, plants will we find? What will it be like?

**OUTDOOR EXPLORATION:** Observe insects and bees in a prairie or meadow.  
30 min. What flowers can the bees be found on?  
Hike to see some nearby bee hives if available (observe from a safe distance).

**Game:** **Do a bee dance**-Teach students the two dances worker bee scouts use to communicate where to find nectar:  
15 min. **Round Dance** (flowers less than 100 yds away from hive)-Walk in a large circle while wiggling your behind. When you arrive at the starting point, turn around and retrace your circle in the opposite direction.  
**Waggle Dance** (flowers more than 100 yds away)- This dance pattern forms a figure eight. Walk in a large semi-circle, turn and run down the center while wiggling your behind, then walk a semi-circle in the other direction.

After students learn the dances, have them follow you in a dance that indicates a hidden bag of goodies. Use the center straight waggle line of the figure eight to point toward the hiding place. You found the food, have a snack!

**Activity:** Students can play **Insect Bingo** (*Ranger Rick*) during the return hike. Hand out bingo sheets and overhead markers. The students mark off insects they see to try for a "bingo".

**Back Inside:** **Beekeeper**- Show the parts of a modern frame hive and explain how they help us get honey and care for the bees. Show beekeeper clothing-white suit, net hat, gloves.  
10 min. Tell students what duties a beekeeper has throughout the year (see below).

**Closing:** **Why bees are good**- Bees pollinate flowers and trees while getting nectar and pollen. This means they spread pollen from one flower to other flowers, which makes the seeds and fruit better. Our gardens and farms wouldn't make as much food without bee pollination. We like and use honey and beeswax for many things. Iowa has many hives which make lots of honey to sell each year. The honey we buy in stores comes from beekeeper's hives.  
5 min.

**Bee problems**-Not as many flowers to get food from (habitat loss)

- Hard to find good hive/nest sites
- Mites hurt bees and their eggs
- Chemicals sometimes kill them

There are fewer bees in the last few years than there were. You can help bees by protecting parks and planting trees and flowers, and using fewer chemicals on your garden and yard.

**Send Off:** Goodbye!  
1 min. **Next Month-Magnificent Mushrooms**

**Take Home:** Parent Outline  
Honey candy

## Vocabulary

Honeybee, head, thorax, abdomen, antenna, compound, metamorphosis, hive, colony, swarm, nectar, pollen, solitary, cell, hexagon, beekeeper, honeycomb, crop, ultraviolet

## Background and Activity References for Naturalists and Parents

- [www.nationalgeographic.com/kids/](http://www.nationalgeographic.com/kids/) neat site for all kinds of animal and nature information and photos  
[www.pbs.org/wgbh/nova/bees](http://www.pbs.org/wgbh/nova/bees) illustrated descriptions of bee life and behavior  
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[www.cals.ncsu.edu/course/ent591k/nectar\\_guide.html](http://www.cals.ncsu.edu/course/ent591k/nectar_guide.html) nectar guide photos, human and bee views  
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*Ranger Rick Naturescope: Incredible Insects*. 1989. National Wildlife Federation, Washington, D.C.  
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Introductory botany textbook, pp. 602-603 information on nectar guides, photos  
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Sisson, Edith A. 1987. *Nature with Children of All Ages*. The Massachusetts Audubon Society-Prentice Hall Press, New York. P. 62 Bees  
*The Honey Files: A Bee's Life, A Teaching Guide Grade Levels 4-6*. 2001. National Honey Board, Longmont, CO. [www.honey.com](http://www.honey.com) Companion Video; Pp. 21-22 Worker bee dance activities  
*The New Starting Right with Bees*. A.I. Root Co., Medina, OH 44256.  
Wallace, Karen. 1999. *Busy Buzzy Bee*. DK Publishing, Inc., NY.

**Queen**-The “mom” bee, lives 3 -5 years. Lays eggs for workers, drones, and new queens, 500-2000 a day! Workers feed and take care of the queen so she can lay eggs. She is the only bee who can lay eggs.

**Worker bees**-Most bees in a hive are workers. They are sisters, the queen’s daughters. They do a dance after come back to the hive. This tells the other bees where to find good nectar.

A round dance means food is nearby, a figure eight dance means it is farther away.

Bees wiggle and wag their abdomens as part of the dance to tell the others how far away and what direction the flowers are.

Bees keep their hive warm or cool by beating or fanning their wings.

Worker bees live for about a month.

Adult worker bees clean the hive for a few days, then becomes a nurse bee, feeding the larvae.

Next they help build the hive, then guard the hive. After that, they work gathering nectar and pollen for the hive.

A group of bees fly 55,000 miles collecting nectar to make one pound of honey! In summer, several thousand from the hive will be out finding nectar at one time.

**Drones**-The “son” male bees. They mate with a new queen so she can lay eggs, and die after mating or over the winter. Drones have no stinger.

### **Nectar, “honey”, or “pollen” Guides-**

Bees see ultraviolet light as a color. The flowers look different to bees, as they can see patterns made by ultraviolet light that we can’t. We see a yellow flower, bees see a purple flower (“bee’s purple”) with yellow in the center, which attracts them to the nectar and pollen. Bees don’t see red, which is at the longer wavelength end of the spectrum. These patterns appear on the flowers when nectar is available.

### **Beekeepers-**

People have kept bees for wax and honey for 4.000 years. They make a container for the bees to nest in. Traditional structures are called skeps, made of clay or straw. Now wooden frame hives are square, and the frames can be taken out without destroying the whole hive.

Beekeepers wear white suits to protect themselves from stings (white calms bees).

### **Beekeeper jobs-**

**Harvest**-Take frames out of hive and cut wax caps off to get honey out. An extractor machine helps get the honey out. The honey is strained and put in jars. Wax is collected for candles and other things. The frames are put back for the bees to use next year.

**Winter**-Wrap the hive in black paper to help it stay warmer. Feed the bees during the winter if needed, and check on the hive on warm days. Order new bees and queens in the spring if a hive died over the winter. Give the bees medicine to keep off bugs that will bother them.

**Swarming**-If there are too many bees for the hive, the queen and many of the other bees will leave the hive and go to find a place to make a new one. They leave behind a new queen and some workers. Beekeepers try to get the swarm into an empty hive to keep them.

**Fall**-Wrap hives in black tar paper, make entrance smaller to keep out cold.

**Winter**-Make new frames for hives, check hives on warm days, feed bees if necessary.

**Spring**-Order new bees/queens for hives that didn’t survive the winter, medicate the hives.

**Summer**-Check hives regularly, add supers to hives, harvest honey until end of August.

## Extensions/Alternate Activities/Rainy Day

Read a book about insects, e.g. *Looking at Insects* (Glover, 1998.).

Assist students in collecting a few insects to look at more closely while outside.

Female bees **sting** to defend themselves and their hive. They die after using their stinger once (except the queen). The stinger pokes into the victim and puts in venom, or poison. This is what makes it sting, or itch. Some people are allergic to the venom. Stingers can stay in a person's skin, and must be carefully taken out.

Teach the students the **Metamorphosis Cheer** (*HS EE-1: K-2 Creepy Crawlies*) to help illustrate the process insects go through to reach adulthood.

**Butterflies vs. moths**-Use seasonal displays or insects outside to explain and observe the butterfly/moth life cycle (Monarchs).

Different types of nectar make different tasting and different colored honey. Get some different kinds and do a taste test (*Ranger Rick*). (wildflower, clover, buckwheat, orange blossom)

Compare a natural (tree cavity) beehive to a modern square frame hive.

<b>Supplies:</b> Craft foam nametag shapes	"Bug eye" handheld prisms	Beehive frame or pictures
Nametag clips or yarn/string	Bee hive and/or wasp nest	Insect Bingo sheets
Permanent markers for nametags	Honey candy treat	Clipboards (optional)
Plastic bee & insect models	Bag for wrappers	
Overhead markers	Pictures of bee metamorphosis	

### Worker Bee Game-

Poster/pictures of bee eggs, larvae, & pupae  
Empty egg cartons (divided/bottom halves)  
5 medium sized bowls  
Gold pony beads  
Yellow pony beads

Picture of emerging bees  
Dust cloths  
Rice or white pony beads  
Cut up pieces of sponge  
Sheets of paper  
Honey to taste

**Advance Preparation:** **Name tags:** Cut out nature-related shapes from various colors of a durable material like craft foam. Cut a slit in the shapes near the top. Have students leave their nametags at the end of the program for future use. (You may be able to use a press at your AEA to mass-produce animal/plant shapes for the program season.)

\*Invite a beekeeper to visit your program with some of their equipment.  
Find out if there is a live hive under glass you could visit on a field trip.

Prepare materials for the worker bee game and set up the stations (below).

Copy some honey recipes for students to take home.

Make **Insect Bingo** (*Ranger Rick*) cards, copy them and put each into a plastic page protector for use with wipe-off markers.

## Worker Bee Game

Set up a game area as follows, including the eight stations:

**Introduction**                      Poster of eggs, larvae, and pupae  
**Center of game area**            Egg cartons (hive/honey comb cells) on a low table  
**Around the room**                Three bowls with mixed gold and yellow beads, eight chairs for stations

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|--|--|--|
| <b>1</b> picture of emerging bees<br>dust cloths<br>instruction card | <b>4</b> sheets of paper<br>instruction card           | <b>7</b> instruction card                    |
| <b>2</b> bowl with rice or beads in it<br>instruction card           | <b>5</b> instruction card<br>(bowls nearby with beads) | <b>8</b> bottle of honey<br>instruction card |
| <b>3</b> bowl with sponge pieces<br>instruction card                 | <b>6</b> instruction card                              |  |

**Cards for Worker Bee Game** (Read italicized portions to student ‘bees’) :

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**Introduction-**Have the students sit down. Show them the pictures of bee eggs, larvae, & pupae. Explain that baby bees come from eggs laid by the queen. Encourage students to be bee eggs.

*Curl up on the floor and pretend to be bee eggs.*

Explain that bee eggs hatch into larvae, which look like little white worms.

*Hatch into a larvae and crawl around.*

Tell how bee larvae spin a cocoon, go dormant (sleep), and change into adult bees.

*Larvae, it's time to curl up and go to sleep.*

Tell the students that they will go to each station in order when they emerge from their cocoons.

*Wake up! It's time to come out of your cells and get to work.*

Direct the students to station #1.

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**Station #1-Hive Cleaning:** Show students the picture of emerging bees.

Read the instructions, hand out the dust cloths, and have them dust the egg carton ‘hive cells’.

*One of your first jobs as an adult worker bee is to clean the empty cells in the honeycomb. So grab a dust cloth and dust away. Put the dust cloth back at station #1 when you're done!*

Remind students return the dust cloths to station #1 when finished.

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**Station #2-Egg Laying:** Read the instructions to the students.

*After spending three days cleaning, you're ready to help with the eggs and larvae. The queen has been very busy laying eggs! Take one of the bee eggs from the bowl and put it into an empty cell in the honeycomb.*

Ask students to get one grain of rice and place it into an empty cell in the ‘honey comb’ (egg carton).

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**Station #3-Feeding Larvae:** Read the instructions to the students.

*The eggs have hatched! The larvae have been fed royal jelly, but it's time to switch them to bee bread, a mixture of pollen and honey. Take a bit of "bee bread" from the bowl and put it into the cell where you put the egg.*

Each student gets a piece of sponge (bee bread) and places it in a hive cell (egg carton section) with a grain of rice (larva).

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**Station #4-Ventilation:** Read the instructions to the students.

*We're having a heat wave and it's getting too hot in the hive!*

Give each student a sheet of paper and show them how to fold it into a fan (four folds are enough).

The fan is their pair of wings. Have them go to the honeycomb (egg cartons) and fan the cells to keep them cool. Ask them to keep the wings when they're done.

*Fan the honeycomb with your wings to cool things down!*

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**Station #5-Gathering Nectar and Pollen:** Read the instructions to the students.

*It's time to learn to be a field worker. Go out of the hive to look for blooming flowers (bead-filled bowls), and bring back nectar and pollen. Gold beads are nectar, yellow beads are pollen.*

*Put the pollen and nectar in separate, empty cells. Fill up one cell before you start a new one.*

Students can make multiple trips until their cells are filled. If some are filled before others, new cells can be started. Bring them to station #6 after 5 or 6 trips.

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**Station #6-Turning Nectar into Honey:** Read the instructions to the students.

*Let's turn that nectar into honey! Fan the cells containing nectar with your wings to the moisture evaporate. Soon it will dry into honey.*

Student bees fan their "wings". (They can keep their "wings" to take home.)

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**Station #7-Cold Weather Hits:** Read the instructions to the students.

*It's November, and it's much colder. Huddle together in a group around the honeycomb to keep warm.*

Student bees huddle together and move wings to heat their hive.

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**Station #8-Reward for Good Workers:** Read the instructions.

*Thanks for being such a good bee! Here's a bit of honey to reward you for your hard work.*

**Give each student a drip of honey on a clean finger to taste.**

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**Game Labels:**

**BEE EGGS**

**FLOWER**

**BEE BREAD**

**FLOWER**

**FLOWER**

**HONEYCOMB**