

4-H

Natural Resource

Club



Beekeeping

BEEKEEPING

The 4-H Beekeeping project is divided into three divisions. Division I, *Understanding the Honey Bee*, covers information on the basic facts of beekeeping: the types of bees, the honey and wax they produce, the plants that attract bees, and the equipment a beekeeper needs. The Division 1 Beekeeping manual is intended for youth in grades 3-5. Three activities were selected from this manual to introduce a group of youth to the hobby of beekeeping. You can enhance these activities by inviting a local beekeeper to your club meeting or taking the youth to visit an apiary (collection of bee hives).

The higher level manuals, Division II and III, introduce beekeeping methods. In Division II, *Working with Honey Bees*, youth need to acquire a colony of bees (purchase or lease) and learn how to care for their beehive throughout the year. This includes basic beekeeping operations that result in the production of extracted, chunk, or cut comb honey. When the youth are experienced and knowledgeable enough in the basic care of a beehive, they should move on to *Advanced Beekeeping Methods*. The advanced topics include: increasing the number of your honey bee colonies, increasing honey production, producing special kinds of honey, and learning more about the bee societies.

The learning experiences have been planned to initiate “experience centered” activities. Youth are encouraged to take responsibility for their beekeeping projects. They can enhance their learning by talking with another beekeeper and consulting resources (Internet, school, library). The Purdue Bee Hive (www.entm.purdue.edu/Entomology/research/bee/) is a great place to start.

Indiana 4-H Beekeeping manuals

Online only: available at Purdue’s, *The Education Store*, www.the-education-store.com

- Understanding the Honey Bee, [4-H 571-W](#)
- Working with Honey bees, [4-H 586-W](#)
- Advanced Beekeeping Methods, [4-H 593-W](#)
- Indiana Beekeeping Project Leader’s Guide (online only, #[4-H-576](#))

Invited Speaker Suggestions

- Local Beekeeper (contact Dr. Greg Hunt, ghunt@purdue.edu, Purdue beekeeping specialist, for recommendations in your area)
- Ag Business and Science teacher with beekeeping knowledge
- County Ag & Natural Resources Extension Educator with beekeeping knowledge

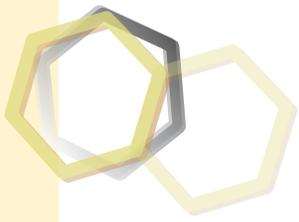
Resources

- Purdue *Bee Hive* website: www.entm.purdue.edu/Entomology/research/bee/
- Book: *The New Starting Right with Bees* (21st Edition), A.I. Root, at (800) 233-7929 or A.I. Root, 623 West Liberty, Medina, OH, 44256. The 2013 Amazon price was about \$8.
- Indiana 4-H Beekeeping webpage: www.four-h.purdue.edu/natural_resources/, click on beekeeping
- Foundation for The Preservation of Honey Bees, Inc., www.honeybeepreservation.org/
- American Beekeeping Federation, www.abfnet.org/
- Pesticide Drift (pesticides have been found to have a significant impact on bees): www.agriculture.purdue.edu/agricultures/past/summer2012/spotlights/spotlight2.html
- The Value of Honey Bees as Pollinators of U.S. Crops: www.masterbeekeeper.org/pdf/pollination.pdf, 2000
- Varroa Mites: <http://extension.entm.purdue.edu/publications/E-201.pdf>

Activities

The following activities were selected from the Indiana 4-H Beekeeping Division I manual to introduce beekeeping to your 4-H Natural Resources club.

Pages	Activity Suggestions	Materials Needed	Time (min.)
Observing the Hive Entrance			
14-15	Read page 14 with the youth and discuss how watching bees can help them learn about bee behavior. Visit a local beekeeper to watch bees and take notes (if possible). If any youth are interested in learning more, suggest that they use the chart on page 15 to learn which flowers bees visit near their home.	Make copy of page 15 for interested youth	20 (plus optional apiary)
Beeswax and Honeycomb			
16-18	Ask youth to try and sketch pictures of bees or hives while you read pages 16 and 17. Ask youth to share their pictures. Discuss the questions on pages 17-18 with the group.	Paper, pencils, and crayons or markers	20-30
Beekeeping Equipment			
19-20	Explain that beekeepers need special equipment to work with bees. Read pages 19 & 20 (except paragraph 2). If youth enjoy drawing, they can try and draw a beekeeper with proper clothing and their equipment. This activity will have a greater impact if you can invite a local beekeeper to attend your club meeting with some of their equipment. Help club members prepare for the beekeeper's visit by developing questions (for example, Why do you keep bees? What challenges do you face? How does this equipment protect you from being stung?).	Paper, pencils, and crayons or markers	30
Glossary			
26-28	The beekeeping glossary is included to help you with questions that may come up. Youth who seem very interested in beekeeping might like to have a copy of the glossary.		



Observing the Hive Entrance

The hive entrance of a honey bee colony is very much like the front door of your house. Just as you go through it on your way to and from school, the field bees must exit and enter through the hive entrance on their trips to visit flowers. By watching a hive's entrance, beekeepers can learn a great deal about the levels of activity of their bees. Observing the hive entrance not only tells about the honey plants in bloom that are attracting the field bees, but it also tells about the work going on inside the hive. The more nectar and other supplies the field bees bring in, the busier the house bees will be, storing away and using supplies to build new comb and to care for the young bees.

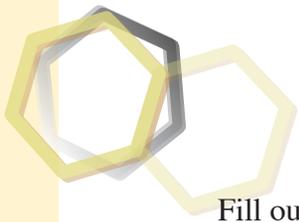
What is happening at the hive's entrance can also tell beekeepers about the health of their bees. For example:

- If you are too hot in your house, you may sit outside your front door. Bees do the same thing.
- When you are cold, you close the front door. Although the bees cannot close their hive entrance, they will remain inside, away from the entrance, when they are cold.
- When you do not feel well, you stay inside to rest. Sick bees do not leave their hives, either. However, if they are very sick they will crawl out of the hive and die.

Observe the entrance to a hive, watching closely for at least 15 minutes at least once every three weeks. Do this at different times of the day. Sit as close to the entrance as possible so that you have a clear view of the activities taking place. **Do not** sit in front of the entrance! The bees will become confused if they see you in front and won't know where to go. For each observation period, write a report of what you saw. Describe what they were doing there and what, if anything, they were carrying in or out of the hive. Make certain to include the information listed below in your reports:

- the date and time of day of your observation
- the weather conditions while you were watching
- a summary of the activities you observed at the hive entrance
- the types and approximate number of bees you saw

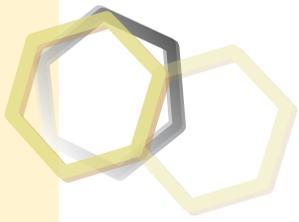
Staple your completed report to the back of this manual.



Fill out the chart below to identify the flowers blooming in your area. Begin your observations early in the spring when flowers start blooming, and continue until late autumn when you can find no more blooming flowers. Remember that you'll find blooms on many trees and vines, as well as the smaller plants you usually call flowers. Bees will fly a mile or two if they do not find what they need near their hive.

Name of Plant	Description (Type of plant, size of bloom, color of bloom, etc.)	Location	Blooming Dates (from – to)	Bees on Blooms? (If so, describe their activities.)

Bees get most of the nectar they use from wildflowers, especially clover in Indiana. It is important to know how much wild land is within a mile of your house. Visit these patches and watch for bees.



Beeswax and Honeycomb

The honeycomb is the inner house of honey bees. It is where young bees are raised and where the hive's food is stored. Comb is built out of beeswax, which is produced only by young worker bees. Glands on the undersides of the bodies of these young bees can produce tiny pieces of wax. Worker bees chew these small flakes of wax and work them to form the comb. Generally, the newly constructed comb is beautifully white in color. It may be light yellow when bees are getting nectar from goldenrod or other similar flowers. The comb becomes darker over time, because as each new bee is born, it sheds its skin and this becomes part of the cell. Also, bees collect propolis, which can make the comb darker.

The comb (Figure 5) consists of many small, six-sided tubes (cells) built side by side. The floor of the cells slopes slightly downward to the bottom and is shaped like a three-sided pyramid pointing away from the cell opening. This small slope is necessary so that the substances put into the cell do not slide out of it.

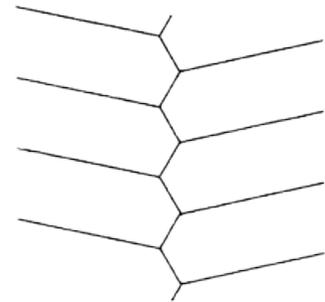
There are three different cell sizes. The large drone bee is hatched from an egg and grows to adulthood in the larger of the two cells (drone cell). The smaller, worker bee grows in the slightly smaller worker cell. Worker cells that are full of eggs, developing larvae, and pupae are usually found in the central part of the comb (brood area). The third cell size is the queen cell.

Bordering the brood area is a narrow strip of worker cells where pollen is stored. Pollen is an important food for the larva growing in the brood area cells, because it is the source of the bees' protein and because it is rich in fat. The field bees collect pollen in the form of tiny pellets from flowers and carry it back to the hive by putting it in small, basketlike pouches on their back legs. This pollen varies in color, depending on the type of flower from which it came.

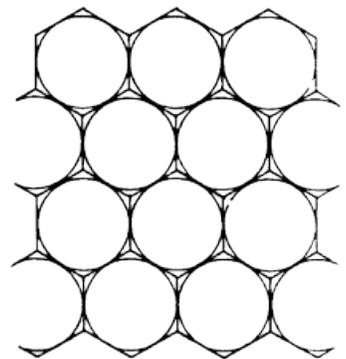
A cell is never completely filled with pollen (Figure 6). Bees generally pack the pollen in a cell until it is about 3/4 full. Sometimes they add a little honey to the pollen to preserve it. This makes the pollen look wet. This storage method maintains the freshness of the pollen for a long time. The outer edges of comb beyond the narrow pollen storage area are used for ripening and storing honey.

Between each comb, the bees leave a space about 3/8-inch wide. If the space between combs is much wider or narrower, the bees will close it up with wax and bee glue.

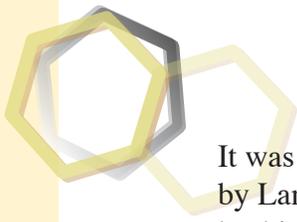
Figure 5.



Slope of cells from front to middle of comb.



The economy of the hexagonal shape for making honeycomb cells.



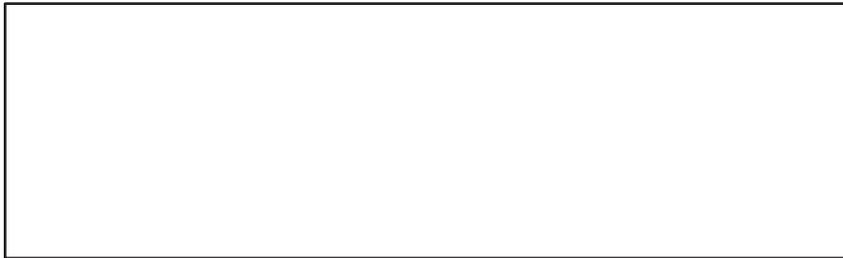
It was the discovery of this important space, the bee space, by Langstroth that led to the development of the modern beehive. In the modern beehive, all the frames of comb are specially built so that they are surrounded on all sides by bee space. Because of this, the bees do not clog up the area between the frames of comb. Then the frames can be taken out and put back into the hive easily.

Besides the honeycomb, you are certain to find another important substance in the hive. This is bee glue (propolis). Propolis is a very sticky brown material that the bees use for many purposes: holding down the hive lid, covering the inside walls of the hive, fastening frames, strengthening comb, plugging holes, and, sometimes, narrowing the entrance. Field bees gather propolis from various plant buds, picking up such sticky substances as pitch from pine trees.

Name three different substances that can be found in the cells of honeycomb.

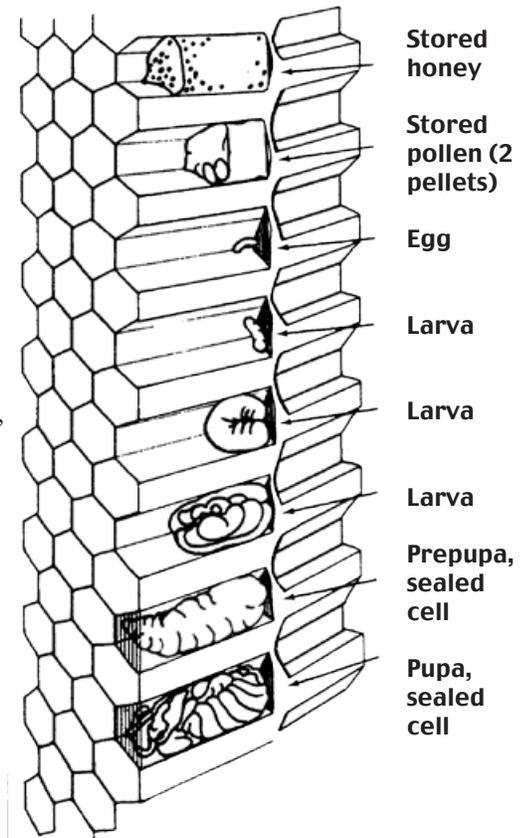
1. _____
2. _____
3. _____

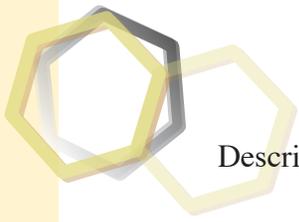
Draw a simple picture of honeycomb.



Why is it true that the older the comb is, the darker it is?

Figure 6.





Describe how bees build comb.

Why is a drone cell larger than a worker cell?

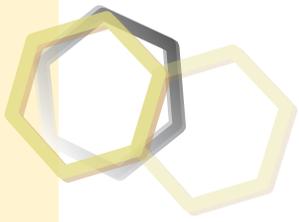
What is the brood, and where is it found?

Why is the brood area surrounded by pollen storage cells?

Give five uses of propolis.

1. _____
2. _____
3. _____
4. _____
5. _____

Name another substance besides pine pitch that honey bees could probably use as propolis.



Beekeeping Equipment

Now that you have a good basic understanding of honey bees and their activities, you are ready to begin gathering the equipment that you will need to operate your own beehive in Division II.

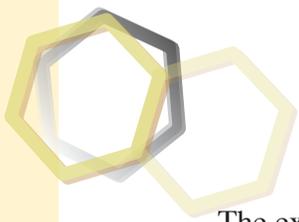
As in any business, you will find that you must make an initial investment to get the equipment to begin beekeeping. However, an advantage of beekeeping is that the amount of equipment you need is limited. And once you have it, assuming that you take good care of it, your later expenses will be small. If you are not sure you are interested enough in beekeeping to purchase your own equipment, you may be able to lease a hive from a beekeeper. Check with your county Extension educator, the bee specialist at Purdue, or the Indiana bee associations listed on the “Purdue University Beehive Website” for referrals to beekeepers who are willing to lease a hive to a 4-H'er. You can find this Web site listed in the Resources section at the end of this manual.

For a good explanation of most of the equipment you will need, read Chapter 2, “Before You Start, Equipment” and Chapter 5, “Your First Honey Flow, Other Equipment” in *The New Starting Right with Bees*.

A valuable tool of the beekeeper is a hive tool. This is a chisel-like instrument slightly curved at one end. It enables the beekeeper to pry up hive lids, supers, or frames glued tightly together with propolis. It is also a handy tool because you can use it as a scraper and a nail puller.

A beekeeper must take care to wear suitable clothing. First, you should have a good pair of leather gloves. This is especially important for the beginning beekeeper until they are experienced enough to know how to work without angering the bees and to know when the bees are unlikely to sting. Many beekeepers prefer special beekeeping gloves that cover the forearm past the elbow. Others like to wear regular gloves along with gauntlets, which are sleeves with elastic in each end extending from the wrist to above the elbow. All the beekeeper's clothing should be white or light in color. It should not be made of rough, wool-like material. Bees are angered by dark-colored and/or fuzzy material, especially if it smells like an animal!

The experienced beekeeper is careful to cover his or her ankles with light-colored socks. Because ankles are on about the same level as a hive entrance, they are often attacked first by angry bees. Even gentle bees may crawl up your pants by mistake!



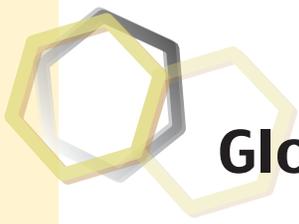
The experienced beekeeper will fasten down pant legs using bicycle clips, large rubber bands, or string to keep bees from crawling up their pant-legs. Many beekeepers like to wear white coveralls to protect their clothes and to give them added warmth on cooler days in early spring or late autumn.

Beekeeping equipment is available from several convenient sources. There are several bee supply manufacturing companies in neighboring states. Write to one, asking for their current supply catalog and the addresses of equipment dealers in Indiana. (There may be one near you.) From the catalog you can order equipment through the mail. Beekeeping equipment manufacturers are listed at the Purdue University Bee Hive site. See the Resources section for more information.

You will need the following equipment to start your hive:

Item	Number Needed
Bottom board and entrance cleat	1
Hive body and frames	2
Extracting supers with frames	2-3
Foundation	1 sheet per frame
Inner cover	1
Hive cover	1
Queen excluder	1 (optional)
Smoker	1
Bee veil	1
Hive tool	1
Gloves	1 pair
Long sleeve white shirt	1 (recommended)
Overalls	1 (recommended)

Complete the beekeeping inventory to have a record of your purchases.



Glossary

Afterswarms – Swarms that leave a colony with a virgin queen after a swarm of the same season has already left the hive.

American foulbrood – An extremely contagious disease of bees that affects them in the larval (worm) stage of development; caused by the bacteria *Bacillus larvae*.

Apiary – A collection of colonies of honey bees; also, the yard or place where bees are kept.

Apiculture – Beekeeping.

Bee escape – A device to remove bees from supers or buildings; constructed to allow bees to pass through in one direction but to prevent their return.

Beehive – A box or other structure for housing a colony of honey bees.

Bee space – An open space (1/4 to 3/8 inch) in which bees build no comb and/or deposit a minimum of propolis.

Beeswax – The wax secreted by honey bees from eight glands within the underside of the abdomen and used in building their combs.

Bee veil – A wire screen or cloth enclosure worn over the head and neck for protection from bee stings.

Bottom board – The floor of a beehive.

Box hive – A plain box without movable frames used for housing a colony of honey bees.

Brace comb – Small pieces of comb built between combs and the hive.

Brood – Young developing bees found in their cells in the egg, larval, and pupa stages of development.

Burr comb – Small pieces of wax built upon a comb or upon a wooden part of a hive because more than 3/8 inch space was left.

Castes – The different kinds of adult bees in a colony: workers, drone, and queen.

Cell – A single compartment in a honeycomb in which brood is reared or food is stored.

Chunk honey – A piece or pieces of comb honey packed in a jar with liquid extracted honey.

Clarification – The removal of foreign particles from liquid honey or wax by the straining, filtering, or settling process.

Cluster – The hanging together of a large group of honey bees, one upon another.

Colony – A community of honey bees having a queen, thousands of workers, and, during part of the year, a number of drones.

Comb foundation – Thin sheets of beeswax or plastic used to form a base on which the bees can construct a complete comb of worker cells.

Cut comb honey – Squares of honey in the sealed comb in which it was produced; cut from a shallow super-size frame of sealed honeycomb and then packaged in clear plastic.

Drifting – The return of field bees to colonies other than their own.



Drone – A male honey bee.

Dysentery – A disease of honey bees causing an accumulation of excess waste products that are released in and near the hive.

European foulbrood – An infectious disease affecting honeybees in the larval (worm) stage of development; caused by the bacteria *Streptococcus pluton*.

Extracted honey – Liquid honey.

Extractor – A machine using centrifugal force for removing honey from the comb without destroying the combs.

Field bees – Worker bees, usually at least 10 days old, that leave the hive to collect nectar, pollen, water, and propolis.

Frame – Four strips of wood joined at the end to form a rectangular device for holding honeycomb.

Granulated honey – Honey that has crystallized, changing from a liquid to a solid.

Hive – Worker bees furnished by man. As a verb, to put a swarm in a hive.

Hive body – A single wooden rim or shell that holds a set of frames. When used for the brood nest, it is called a brood chamber. When used above the brood nest for honey storage, it is called a super.

Hive cover – The roof or lid of a hive.

Hive tool – A metal tool with a scraping surface at one end and a blade at the other; used to open hives, pry frames apart, clean hives, etc.

Honeycomb – The mass of six-sided cells of wax built by honey bees in which they rear their young and store their food.

Honey flow – A time when nectar is plentiful and bees produce and store surplus honey.

House bee – A young worker bee, 1 day to 2 weeks old, that works only inside the hive.

Inner cover – A thin wooden board placed just beneath the hive cover for added protection and insulation from the elements, and to keep the hive lid from being glued to the hive body.

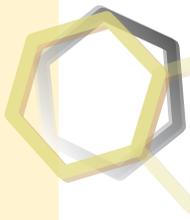
Job shadowing – Learning from others by following, watching, and studying what they do in their jobs.

Larva – The grublike or wormlike immature form of the honey bee in its second stage of metamorphosis.

Metamorphosis – The series of changes in form through which an insect passes; egg to larva to pupa to adult.

Movable frame – A frame of comb that can be easily removed from the hive. It is constructed to maintain a proper bee space, which prevents the bees from attaching comb or fastening it too securely with propolis.

Nectar – A sweet liquid secreted by plants, usually in their flowers, and converted into honey by bees.



Nosema – An infectious disease of the adult honey bee that infects the mid-gut, or stomach. It is caused by a protozoan parasite. Symptoms of this disease closely resemble those of dysentery.

Observation hive – A hive made mostly of glass or clear plastic to permit observation of the bees at work.

Pesticide – A general name for materials used to kill undesirable insects, plants, rodents, or other pests.

Pollen – Dustlike grains formed in the flowers of plants in which the male elements are produced. Honey bees use pollen as a protein food for their young.

Proboscis – The tongue of a honey bee.

Propolis – A kind of glue or resin collected by the bees for use in closing up cracks, anchoring hive parts, etc. It is also called bee glue.

Pupa – The third stage of a developing bee, during which it is inactive and sealed in its cell. The adult form is recognizable during this stage.

Queen excluder – A device, usually constructed of wood and wire or sheet zinc, having openings large enough for the passage of worker bees, but too small for the passage of larger drone and queen bees.

Robber bee – A field bee from one colony that takes honey from another colony.

Sacbrood – A slightly contagious disease of brood that is caused by a virus.

Sealed brood – Brood, mostly in the pupa stage, that has been capped or sealed in cells by the bees with a somewhat porous capping of wax.

Section comb honey – Honey in the sealed comb that was produced in thin wooden frames called sections.

Smoker – A device that burns slow-burning fuels to generate smoke for the purpose of keeping the bees calm while working in their hive.

Solar wax extractor – A glass-covered box for melting down beeswax by the heat of the sun.

Super – A receptacle in which bees store surplus honey placed “over” (above) the brood chamber. As a verb, to add supers in expectation of a honey flow.

Swarm – A large group of worker bees, drones, and a queen that leaves the mother colony to establish a new colony.

Travel stain – The darkened appearance on the surface of comb honey when left in the hive for some time; caused by bees tracking propolis over the surface as they walk over the comb.

Uniting – The combining of two or more colonies to form one large colony.

Virgin queen – An unmated queen.

Wax moth – A moth whose larvae feed on and destroy honeycomb.