PURDUE UNIVERSITY

PURDUE EXTENSION

4-H-593-W

4-H Beekeeping

Division III

Advanced Beekeeping Methods

Year in Project: _____

Date Started in Beekeeping III: _____

Name: _____

Club: _____

County: _____

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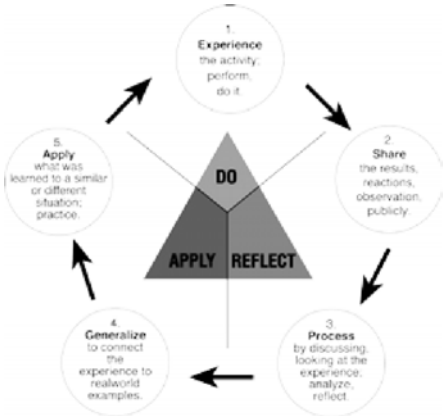
4–H Beekeeping, Division III: Advanced Beekeeping Methods

The 4-H beekeeping project is intended to help you learn about bees and how to be a beekeeper. Beekeeping offers many hands-on educational experiences, from learning about bees and honey plants, to learning to raise bees and produce honey, to learning how to market your honey.

If you have completed the 4-H beekeeping manuals, *Division I, Understanding the Honey Bee,* and *Division II, Working with Honey Bees,* you are now experienced and knowledgeable enough to study more advanced topics. These may include increasing the number of your honeybee colonies, increasing honey production, producing special kinds of honey, and learning more about the bee societies. If you have not studied the Division I and II beekeeping manuals, you should review them and start slowly in *Advanced Beekeeping*.

Note to Parents and Volunteer Leaders:

The 4-H beekeeping project helps youth learn about raising honey bees. Beekeeping offers many exciting educational experiences, from learning about bees and honey plants to learning to raise bees to make and sell honey. The *4-H Beekeeping Leader's Guide* (4-H-576-W) has information about youth development stages, experiential learning, and other resources that might be useful. The learning experiences in this manual have been planned to initiate "experience centered" activities. Youth are encouraged to take responsibility for their beekeeping projects. They can enhance their learning by consulting resources on the Internet, at school, and at the library, or by talking to someone who raises bees.



Experiential learning distinguishes 4-H youth development education from many formal educational methods. Activities are designed so youth experience a learning activity, reflect on what they did (explore the meaning of the activity), generalize what they learned (to test the 4-H members' comprehension and appreciation of the activity), and then think about how they can apply what they learned to other situations (generalize). You can help guide youth as they explore each activity by discussing each section.

Purpose

Division III Beekeeping is intended to help youth learn many things, including
- how to increase the number of their honeybee colonies;
- how to increase honey production, producing special kinds of honey;
- more about the bee societies;
- how to compile beekeeping records;
- how to present the results of their work to others; and
- how to develop inquiring minds — the habit of asking questions and searching for answers.

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Advanced Beekeeping Methods

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Introduction

When you feel confident in your ability to maintain a beehive throughout the year and have been successful in producing surplus honey, you are ready to undertake more complex and difficult projects with your bees. In *Advanced Beekeeping*, you will continue to develop your skills as a beekeeper. Good beekeepers not only care for their colonies, but also manage them to increase honey production.

Your goals for advanced beekeeping should be
- keeping strong, populous colonies with young queens,
- continuing to improve your understanding of the ways of bees, and
- experimentation.

As your beekeeping experience increases, your ability to work more quickly and competently also increases. You will be able to add new hives to your small original apiary until it contains the maximum number of hives that you can care for. Good beekeepers know what their maximum apiary size should be and do not try to overextend themselves. To determine the number of hives you can tend, you will need to consider a variety of factors: time, expense, space considerations, your own physical condition, local climate, etc. The maximum number of hives differs from beekeeper to beekeeper. For a hobby, the maximum may be two hives; for a young farmer, it could be 200.

To achieve the greatest amount of honey production, you must realize that your beehive is a dynamic, changeable system with much potential for growth. Be alert to the apiary operations that can be improved and consider experiments that will help you understand more about your bees. As you learn more, you will be able to help your bees produce more honey.

Although you have had some practical experience in beekeeping, you should not neglect the help that other beekeepers can still give you. As you continue this project, the advice of more experienced people will be as valuable as it was the first time you watched a beehive being opened. Continue to read all you can and to take your questions to your beekeeping advisor, local bee inspector, and local and state associations.

In the *Advanced Beekeeping* project, you are in charge. No longer will you be told what to do and when to do it. No

longer will you be asked specific questions to show your understanding of a concept or procedure. Now you are basically on your own. You choose your activity, do it, and when you believe you have mastered it, move on to another.

Projects

The project suggestions given later in this manual are just that: suggestions. They are intended to develop your beekeeping skills. You can pursue any beekeeping project of your own design. Choose one that fits your own interests and the needs of your bees. See the list under Project Suggestions for ideas. Select a project that you are interested in and read about it. If you are still interested, begin work on the project. Undertake as many activities as you think you will be able to complete, but do at least two projects each year. Keep a notebook with an up-to-date description of your work. With the aid of a beekeeping diary, you can write a detailed report explaining your project from start to finish. Consider taking photographs, making drawings, or using other ways of adding to the explanation of your activities.

Use the Resources section to find sources of information. Many projects may be done using the **Scientific Method** (page 33). Following the steps listed for the scientific method helps to organize your thoughts and experiment. This makes for a nice comparative project. Make your own data sheet following the five steps listed.

An **Action Demonstration** (page 34) is a good way to show others what you have learned and to interest them in beekeeping. Read the action demonstration guidelines in this manual for ideas about how to present and score your demonstration. Ask your county Extension educator about doing an action demonstration at the Indiana State Fair, if you are interested in doing that.

Resources

There are two books that are recommended for the serious beekeeper, *Honey Bee Biology and Beekeeping* and *The Hive and the Honey Bee*. These books contain a lot of information about bee biology and products of the hive, including most of the information a beekeeper would ever need. Therefore, it is a good idea to purchase a copy of one of these books or to make certain that your local library has one. *Honey Bee Biology and Beekeeping* is the better one, but is more expensive. See the Resources section of this booklet for ordering information and for information on subscribing to a beekeeper trade journal.

Record Sheets

Keeping accurate records is important. Records help you remember what you did and evaluate the success of your work. They also help you keep track of how much time and money you are spending on your beekeeping project. The record sheets given in the manual may be copied, or you can use them as guides to create your own record sheets.

Managing Honey Bee Colonies

Choosing a Good Apiary Site

The site you choose for your apiary should have plenty of floral sources within two miles of your hives. In much of the Midwest, wild clover will be a major source of nectar for your bees. Any place that has a mixture of trees and unplowed fields is good. There should be water available within a quarter mile of the hives. The apiary should be accessible at all times of the year. The hives should be placed on hard, dry ground that you can drive up to in a truck. It is best to place the bees near some trees that block the wind from the west and on a slight hill to avoid frost pockets. A protected site with good air drainage will improve the chances that your bees will survive over the winter.

Increasing the Number of Colonies

You can make an increase in your colonies by either buying nucs, installing package bees, or dividing your existing colonies.

Buying nucs

Purchasing nucleus hives or "nucs" is a very good way to increase your colonies. The nuc is a small hive of three to five frames containing comb with bees, brood, honey, and pollen. A nuc will build up more quickly than a package of bees that is installed on foundation, because there already are some capped brood and empty cells where the queen can lay eggs. Nucs purchased locally are more likely to have queens that produce bees adapted to your local conditions. Ask at beekeeper meetings or look on the Internet for beekeepers that sell nucs. Usually, you will need to supply the brood box and enough frames with foundation or comb to fill out the box.

Installing Packages

Sometimes you cannot find a provider of nucs or they are not available early in the year when you want to get your bees. In this case, buying package bees is a good option. Package bees are produced in southern states early in the year for shipment up north. They can be purchased from a supplier and shipped to you directly, or you can make arrangements with someone who is plans to bring a truckload of packages to your area.

1. Order a 2- to 3-pound package of bees with a marked queen to arrive at a specified date. Order early (preferably by January), because some years they sell out. Packages can usually be installed in the Midwest about April 1.
2. Prepare all of your equipment before your bees arrive. For each colony, you will need the following:
    a. Hive stand to keep the bottom off the ground
    b. Two deep brood boxes with ten frames of foundation each (or 9 to10 frames with comb)
    c. Bottom board
    d. Entrance reducer
    e. Inner cover
    f. Two supers for the honey flow
    g. Cover
    h. A way to feed the bees (A "friction pail" or gallon jar with small holes in the lid both work well.)
    i. Division board feeders (These can be used with floats to keep the bees from drowning. Entrance, or "Boardman," feeders are convenient, but don't work well in temperatures below 40°F.)

3. When the package arrives at the post office, check to make sure the bottom is not covered with dead bees. If there are 2 to 3 inches of dead bees, notify the shipper and ask for compensation. Keep the package in a dark place at about 50° to 70°F. Spray with 1:1 sugar syrup, but do not soak the bees too much. If you need to wait a day or two before installation, spray with sugar syrup twice a day.

   Install the package as soon as possible. Just before dusk is ideal. Packages can be installed at other times of the day if it is raining or cool (45°F or less). Installing in the evening keeps the bees from leaving the hive and drifting into others. If you only have one hive, this is not important. If installing during the day, block the entrance with some grass for an hour to keep the bees in the hive, otherwise the bees will tend to drift into the most visible hive (usually the bees fly into the one on the end). Remove the grass after a few hours or the next morning. Spraying the bees with 1:1 sugar syrup right before shaking them into the box can also help keep them from flying. Installation steps:

   a. It usually is not necessary to use smoke when installing a package, but it is a good idea to have a smoker lit. It may encourage them to go down into the box.
   b. Pry out the syrup can with your hive tool and set it aside.
   c. Remove the queen cage and put her in your pocket.
   d. Jar the package sharply to knock the bees down to the bottom. Turn it over and shake it vigorously from side to side to get the bees into the box. You may need smoke to encourage the bees to go down between the frames.
   e. Let the bees release the queen by eating the candy. Remove the cork from the candy and put a small hole in it with a frame nail (being careful not to stab the queen). Then, position the cage at an angle between the middle frames with the screen facing down so the bees can feed the queen. It is a good idea to put the candy end of the cage at the bottom, just in case it gets wet. This prevents it from flowing onto the queen.

4. Feeding packages is very important. Your colony will decline in population until the new brood hatches and the queen needs comb to lay eggs in. Feeding will allow them to draw out the comb from the foundation. Feed the bees with a gallon jar of 1:1 sugar syrup (at least 50 to 60 percent sugar by volume) that is inverted over the

Figure 1. Bees and hive

hole in the inner cover and has a dozen or so small holes in the lid so the bees can feed on it. In cold weather, it might help if the first two gallons of syrup contain the medication fumagillin, which is sold as a powder called Fumadil-B. This will prevent dysentery (Nosema). Place the feeder jar over the inner cover hole, leaving a space for bees to come out. Cover the jar with an empty hive body. Check the feeder jar regularly and refill it whenever it is empty. You may need about 5 to 7 gallons of 1:1 sugar syrup per package if installing the package onto foundation. If you are installing the package onto comb, much less syrup will be needed. It is also possible to feed the hive with a division board feeder or Boardman feeder.

5. Check the feeder the next day to make sure your bees have consumed some syrup. If the bees are not clustered in the middle, rearrange the empty frames so that the bees are in the middle.
6. Check the queen in three days. If she is still in the cage, make sure the bees are not biting the cage. It will be easy to push them aside with a finger unless they have latched onto the cage with their mandibles. Then, pry off the screen and allow the queen to walk between the frames. If the bees are latched onto the cage, do not release her, because they will kill her. In this case, you may have another queen in the colony, or it may just require more time for the introduction. If the queen was released by the bees already, check for eggs in the bottom of the comb by tilting the cells up to the light. If there are no eggs and no queen, you may need to order a new one. But it is also possible that she just hasn't laid any eggs yet because she is too young or because there are no cells to lay them in, and you just can't find her!
7. Check the bees one week after installing the package. Always carefully remove an outer frame first to avoid crushing the queen. Look for drawn comb containing eggs. If there are no eggs, search for the queen. If you can not find her you will need to buy a replacement queen. If you are planning preventative treatments for American foulbrood disease, Terramycin (mixed with powdered sugar) can be given to the bees now. However, this usually is unnecessary.
8. Inspect the bees every 7 to 10 days to make sure there are eggs and a queen. Observe the expansion of the brood nest, but do not disrupt the nest by putting empty comb in the middle of it. Replace the frames in roughly the same configuration.
9. When all of the comb is drawn from the foundation in the first box, or at least started by the bees, add a second deep

box. You can take one or two outer frames of drawn comb that have little or no brood from the first box and place them towards the center of the upper box to encourage the bees to move up and draw out the foundation and expand the nest.

10. Watch. Give the bees new boxes as soon as they fill up the old ones. When adding supers that contain foundation, place them directly above the brood nest even if you have one super of drawn comb and honey in place already. This will encourage them to draw it out. Supers with a foundation should have ten frames; those with comb can have 8 to 9 frames if properly spaced.

Splitting Colonies

There are many ways to divide colonies. Two examples are given below. You need to complete the following preparations before using either method.

- Choose strong colonies to divide. The best time is 4 to 6 weeks before the time swarming usually occurs. This is early to mid-April for most Midwestern states.
- Ideally, the colony should have brood on 8 to 10 frames or more.
- Arrange for a new queen to be delivered either the day before you want to divide the colony or the same day that you will divide the colony. She will be shipped in a cage with candy and worker "attendants." If the queen of the strong colony is more than a year old, you may want to order two queens and replace the older queen with a new one. If necessary, a queen can be kept in the cage with the attendants or several days to a week in a location that is 65-70°F. Give them a tiny droplet of water with your finger once or twice a day on the screen.
- Have your equipment ready for another colony. You will need the following items.
    - Another hive stand
    - A bottom board
    - Top and inner covers
    - Two deep hive bodies with combs or frames with foundation
    - A feeder is a good idea if there is no nectar coming in from the flowers or you are adding foundation instead of drawn comb (feeder pail or gallon jar with a few nail holes in the lid and 1:1 sugar syrup).
    - An empty, deep hive body to enclose the feeder

For Method 2 (below), you will also need a double screen and a queen excluder (if you are not taking the time to find the queen).

1. Simple Divide Method

Four days before the queen you ordered is expected to be delivered, divide the brood up equally between two boxes of the existing hive. If you find the queen, put her in the bottom box or put her in a queen cage while you prepare to remove the top box and move frames around. This is the safest way to avoid hurting her. If the queen was not seen, put a queen excluder between the boxes. The presence of eggs four days later will tell you where the queen is.

When the divide is made, remove the queenless box to a new location and introduce a queen the next day. To make an even split, it is best to move the divide at least a mile away to prevent all the foragers from returning to the new location, but this may be impractical. If placing the divide in the same apiary, put all of the oldest brood (about to emerge as adults) and one frame of very young (larvae in uncapped cells) into the upper box that you are going to remove. You can tell if brood is nearing the time of emergence by uncapping some cells and looking for older pupae. It is also a good idea to make sure both boxes contain pollen and honey. You can also put extra brood into the new hive from other colonies later (after shaking the bees off the brood frame). The new adult bees will help make up for the loss of foragers that will return to the original hive. You can introduce the new queen with the candy-cage 24 hours after you make the divide. If you are requeening the other hive, be sure to wait 24 hours after de-queening before introducing the new queen.

2. Double-Screen Method

This method is similar to the first and can be used for making splits or for making up nucs. The double-screen fits over the brood chamber of the old hive and allows heat and the hive's odor to be transmitted to the upper part. The heat from the lower box helps to keep the brood warm in the upper box. The double-screen does not permit queen pheromone to pass to the queenless box, because the bees cannot touch each other, so the bees in the queenless box are soon ready to accept a queen. If the upper hive does not accept the queen, the screen can be removed and the hive can be merged again with no fighting, because the bees still share a common colony odor. With this method you can make up many nucs or splits, because you do not have to find the queen.

Double screens are frames that have a screen on each side and that fit over the brood box. They can be purchased or made from parts of hive frames. Use a double screen that has movable pieces of wood to create an upper entrance. You also can make your own double-screen by stapling window screen over both sides of the hole in an inner cover and making a notch in the side of the inner cover to provide an entrance for the bees in the top box.

Choose a strong hive and decide which brood frames you want to move to the top box to make the nuc or split. Use one or two frames of young, uncapped brood and most of the frames of sealed brood that are about to emerge as adults.

Inspect the frames for brood and honey, and decide which ones you want to go in the upper box. It is convenient to bring an empty box to set frames in, or you can just lean them on end against the hive. Replace the frames that you removed from the bottom box with frames from the top box. You can also temporarily add a third brood box and replace frames you move with new frames of comb or foundation. If using frames with foundation, place them between frames containing comb that do not contain much brood. Try to keep the brood in the center of the nest.

Then, place a double-screen over the bottom brood chamber and put the box containing older brood, honey, and pollen above it. Or, if you happened to find the queen, just put these frames of brood in the upper box, put the queen in the lower box and place the double screen in between the top box and the original brood chamber. Make sure that the upper box has an entrance, and face it opposite the direction of the lower entrance.

Introduce a queen to the queenless box 1-4 days after the brood chambers are separated by the double-screen. It takes three days for an egg to hatch, so if you do not know where the queen is in the beginning you will know which box is queenless in 3-4 days (the one without eggs).

Check the box with the new queen within a week after introducing her. If the queen was accepted, it can be moved it to a new location with a new bottom board and covers. If it needs more bees, you can shake some into it from the bottom box, but be careful you do not shake the old queen into it!

Taking Care of Your Queens

The key to having productive colonies is to always have vigorous queens in disease- and mite-free colonies. Young queens are productive egg layers and are much less likely to swarm. It is a good idea to check all of your hives at least briefly every 10 days, but you should at least check them during critical times, like early spring, just after harvest when treating for mites, and before winter. Check to make sure there are eggs and a good laying pattern — lots of brood in the combs, not a scattered brood pattern. Requeening once a year will insure that you always have young queens. Many beekeepers leave the queen in for two seasons if she is still laying a good brood pattern the second season, but they run the risk that she will begin to fail during the colder months. It is good to have marked queens so that you will have an idea of how old she is and where she came from.

If you have supercedure queens, you can mark these yourself with just a little practice. *(Supercedure - replacement of a reigning queen by her workers)* Catch the queen as she walks on the comb by grabbing her wings. Pin her against your clothes and hold her gently but firmly on either side of the thorax between your thumb and forefinger. Have an open bottle of enamel paint (e.g., Testor's), and an open queen cage ready. Use the stem of a grass blade to put a small spot of paint on her thorax, rubbing it into the hairs. Be careful not to use too much or to get paint on other parts of her body, like the eyes and antennae. An easier way is to use enamel paint marking pens, which can be found at hobby stores or in certain bee supply catalogs. Let the queen dry off for about five minutes in the queen cage before releasing her back into the colony so the workers do not remove the paint. Clipping off half of one of one of her front wings also is an option that some beekeepers use to prevent her from flying away with a swarm. That way, if the colony swarms, the queen may be lost in the grass, but the bees will return to the hive where they will have a new queen. However, they may still swarm again with a virgin queen if you do not relieve the crowding of the brood nest. **Warning:** Make sure she is a mated queen before you clip her wing! If you clip a virgin queen's wing, she cannot fly out and mate.

Young queens are more readily accepted by bees than older queens. Also, queens are more likely to be accepted in small colonies and it is easier to find the old queen to remove her in a small hive than it is in a hive with lots of bees. Therefore, it is easier to requeen in the spring because that is when the colony population is lowest. But there are several advantages to requeening during the summer in northern states. Northern-bred queens may be better adapted to your conditions, and these queens are only available in the summer. For example, someone raising their own queens in the Midwest may be able to have new queens by about the first of June. At this time, it is more likely that there will be good weather for mating queens than earlier. There should be plenty of drones for the queens to mate with as the strong colonies prepare for swarming. Finally, introducing queens during the summer can also insure that you have young queens that are likely to start laying eggs earlier in the year the following spring. Also, young queens are less likely to swarm or be superceded than old queens. If you are trying to maximize honey production, you may want to wait until just after the honey harvest to requeen, or you may want to do it gradually over the summer.

Requeening Methods

A number of requeening methods are covered below. The first step in replacing the queen is to find and kill the old queen. If you are only requeening some of your colonies, replace queens that are no longer laying large patches of brood or ones that you know are old or never produced big colonies. The usual method of killing a queen is to pinch her head. **Do not try to introduce a new queen until the old queen has been out of the colony for at least 24 hours.** In some cases, you can wait longer. Do not wait more than three days, however, if at all possible. The simplest way to introduce a queen into a queenless hive can also be a little risky. If a queen is young and laying eggs, it is often possible to just place her onto a frame of bees and watch as the bees accept her. If they start surrounding her, it is a sign that they are going to kill her. This is referred to as “balling” behavior.

1. Candy Cage

This is the most common method used to introduce a new queen. The introduction is done as was described for installing package. Queens are usually shipped in candy cages. You can make up your own queen cages and candy if you are raising queens. Make the candy by mixing high-fructose clear corn syrup or honey with powdered sugar. It takes a surprising amount of powdered sugar. The candy

must be soft but firm. If it is too soft, it will melt in the heat of the hive and may kill the queen by covering her. Put a piece of wax paper between the candy and the screen of the cage to keep it from drying out, and then staple the screen on. The hole in the non-candy end of the cage is sealed with a cork or piece of wood.

2. Nucs

Since queens are more easily accepted into small colonies, one method of requeening is to make up small nucs to introduce the new queens into. A nuc can also be used for introducing virgin queens and queen cells that you find in your other colonies. It then serves as a mating nuc as the queen flies out and mates. Once the queen is accepted and laying, combine the nuc with a larger colony that you made queenless one to two days before merging them.

3. The Newspaper Method

Perhaps the safest way to merge colonies is to put a sheet of newspaper between them. Put a few small slits in the newspaper with your hive tool so the bees can chew threw it more quickly. This allows time for the two boxes of bees to acquire the same colony odor, which prevents fighting. To do this with a nuc, first place the frames from the nuc into a deep hive body. Put one sheet of newspaper over the open hive you are going to merge it with and place it on top. Make some slits in the newspaper with your hive tool so that the bees will chew their way through.

4. Push-In Cage

Make a rectangular 3-by-5-inch cage to push into the comb with the queen underneath. It should be made out of 8-mesh hardware cloth (eight openings per inch, see Figure 2). This method is often used when introducing artificially inseminated queens. When done properly, it is the safest method.

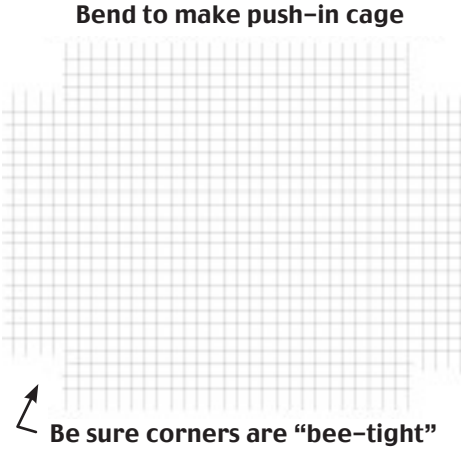

Figure 2. Push-in cage

You can also buy plastic push-in cages that work a little better, because the bees are less likely to chew around the edges. The advantage of a push-in cage is that it allows the queen to begin laying eggs before she is released. Shake the bees off of comb that is fairly dark (they are stronger). Place the cage in an area with a little open nectar or honey (preferably) over a small patch of emerging brood so the bees that emerge will tend her. It is not necessary that the cage is over brood, but there should be a few cells of honey. You MUST make sure that the push-in cage is pressed in firmly. Check the cage in 3 to 5 days to make

sure the bees have not chewed underneath. If they are beginning to do this, you must move the cage. Once the queen is laying eggs or you are satisfied the bees are not biting the cage, you may release the queen directly. **Hint:** If the bees have their mandibles clamped onto the cage, it will be difficult to dislodge them with your finger. Never release a queen if they are biting the cage.

5. Virgin Queens

Virgin queens can be introduced the same way as other queens, but they are sometimes more difficult because they are less attractive to the bees. A new queen will take 5 to 10 days to take her first mating flight, and another week after that before she is laying lots of eggs. If she doesn't mate in 14 days, she is too old to properly mate. You have to expect a two-week break in brood rearing with a virgin queen. For this reason, you may want to consider introducing her to a mating nuc before killing the old queen and introducing her to the main hive. Another good alternative is to introduce her ABOVE the old hive. Take a notched inner cover and place it with the notch up and facing the back of the hive to provide a second entrance. Take two frames of brood and bees and one frame of honey (but not the queen) and put them in a deep box above the inner cover. Seal the hole in the inner cover with a double-screen. After 24 hours, introduce the virgin in the top box. In two weeks, check for eggs and brood. You can then use the newspaper method to merge the two colonies, or you can just remove the double screen and allow them to merge. The new queen should be the one that survives, but it is safest if you remove the old queen first.

6. Queen Cells

Queenless hives accept queen cells very well. Just find a dark comb in the middle of the nest and mash down some cells with your fingers. Carefully, push the thickened bottom portion of the queen cell into the comb and use the mashed area to give space for the cell to hang downward. The bees will attach the cell to the comb and the queen should hatch out and be accepted. Handle queen cells very carefully to avoid damaging the queen inside. She is very sensitive to mistreatment while at certain stages of development. Do not bend the cell at all when attaching it. Try to keep the cell warm during transport: 75° to 90°F is best, but don't let it dry out, either. If the weather is cool (below 60° F), the best place to attach the cell is in the middle of the brood nest near the top of the comb.

Seasonal Management

With the problems now faced with mites, beekeepers are finding that they need to be a little more flexible on the timing of certain operations, such as medications, queen introductions and the honey harvest. Each spring, there is a swarming season and a nectar flow that will depend on the weather and its influence on flowers. It is good to be aware of the weather and to know what important flowers are blooming. This makes you a better beekeeper, because you will be prepared to help your bees at the right time, and it keeps you in touch with nature. Some suggestions for a seasonal management schedule are given below (dates are typical for the Midwestern region, but your schedule will have to adapt to the local weather).

December to February
Downtime. Work on equipment and read beekeeping magazines and books.

February
This is usually a time when you can check your bees, if the temperature is above 40° F and there is no wind. Check your hives briefly. If a hive is dead, it can be marked as such or stored. The comb should be protected from wax moths by putting moth crystals on it or storing it in a cold place. If there is any brood, immediately close the hive to keep from chilling the brood. Brief inspections of brood can be done on days that are above 50° F with no wind, or above 55° F with light wind. This can be a time to put in mite strips for thorough mite control, but this is usually done after the honey harvest. If there is no sealed brood, all of the mites will be exposed to the pesticide because they will not be able to hide beneath the cell cappings. The need for mite control will depend on mite populations, but one or two treatments per year are usually required: an optional treatment in the spring if mite populations are low, and a treatment as soon as honey is removed every year. If you are using mite treatments that rely on evaporation of something (like thymol), these must be done when it is warm enough. Read the directions for the particular product you are using to determine if the weather is warm enough.

Hives should be inspected for food stores about the time that they are beginning to rear brood (usually January or

February, weather permitting, or this may be put off until March). If colonies did not have adequate stores going into winter, they may be starving in February even without brood rearing. Colonies can be fed in cold weather by putting granulated sugar (white) on the inner cover. Another efficient feeding method for the winter is to make a cake of candy following the recipe given on the next page:

Winter Bee Candy
15 pounds granulated sugar
3 pounds clear high-fructose corn syrup
4 cups water
1/3 tablespoon of cream of tartar

Mix the ingredients and heat it to 242°F (use a candy thermometer to determine the temperature). Pour the heated mixture into molds to make flat cakes that will fit on top of an inner cover. Place the hardened cakes over the inner cover (keeping the opening free for the bees to feed).

Late February or early March is usually the best time to put on pollen substitute in the Midwest, if supplemental feeding is planned to stimulate earlier egg laying by the queen. Pollen feeding should be done about six weeks before reliable sources of nectar can be obtained from early flowers (like maple trees and dandelions). However, too much early brood rearing can also encourage swarming, since colonies become crowded and may be confined during rainy spring weather in April. It also causes bees to consume honey at a much greater rate, because they increase the temperature of the brood nest to incubate the larvae, and this requires energy. Pollen substitute can be purchased from a bee supply company and should be mixed according to the directions. Some people trap bee pollen and store it in their freezers to add to their pollen substitute and make it tastier for the bees. **Hint:** Make pollen substitute the day before you intend to use it to make sure it doesn't get too hard or soft when it sets up. If it gets hard, the bees won't eat it. If you put the pollen substitute between wax paper, it will not leave a mess on the frames and will be easier to apply.

March
Make sure that hives have adequate food. More colonies starve to death in March than any month because as bees begin rearing brood, they eat up honey and pollen at an alarming rate.

Combine very weak colonies with stronger ones. Equalize colonies somewhat by stealing a frame of brood from each of the strongest hives and giving them to the weakest hives. Colonies that need honey can be given a frame from the stronger hives, or fed syrup.

Some beekeepers do a preventative treatment for American foulbrood disease at this time. This is probably unnecessary unless your colonies have had this problem in the recent past, or if you do not know what the symptoms are and want to be sure your bees are safe. Mix one 6.4 oz pack of terramycin with 2.5 lbs of powdered sugar. This should be fed to the bees in three doses, five days apart. Each feeding should consist of about three tablespoons of sugar/terramycin mix. Alternatively, you could try rolling it up in newspaper and making a "terra taco" that is about six inches long and taped at the ends to keep the sugar from spilling. These should be consumed within three weeks or removed from the hives. Prolonged exposure to antibiotics may select for antibiotic-resistant foulbrood.

You may choose not to use preventative treatments of antibiotics. If you inspect your hives regularly, you will see when a foulbrood problem occurs and can cure it before it gets out of control. If you do have combs with a lot of foulbrood, they should be burned or put in a well-sealed garbage bag and thrown away.

April

Continue to make sure there is adequate food if the weather is cold or rainy. A strong colony that is occupying two boxes should have at least three full frames of honey. However, if the weather is good and the honey isn't available, the bees should be able to forage on dandelions and spring flowers and get by. Feeding in bad weather will stimulate more rapid brood rearing, and may be necessary to prevent starvation in some cases.

Begin swarm control in April. Split the strong colonies, if you have the extra equipment to start new colonies (perhaps using equipment from winter losses). Another practice is to reverse the brood boxes. The brood nest is usually at the top of the hive at the end of winter. Placing this box on the bottom board and putting the nearly empty bottom box above it should reduce crowding of the brood nest and may prevent swarming. Another practice that might help curtail swarming is to use a slatted rack on the bottom board with the deep side of the rack facing up. This gives the returning

foragers a place to cluster so they stay out of the brood nest. It also tends to keep the brood nest lower in the hive. Note, however, that the slatted rack is not very compatible with monitoring Varroa mites with sticky boards, or with the use of screened bottom boards. You can also put a super with empty combs underneath the brood nest. Most of the foragers will stay in this box. You may want to use a queen excluder to keep the brood out of that box. Most beekeepers do not use slatted racks for swarm control.

If the swarming instinct is not curtailed, only the most tedious methods can prevent swarming. For a hobby beekeeper with a few colonies, these methods are feasible (but not always successful). Once the bees start constructing swarm cells at the bottoms of the frames, go through the colony every 7 to 10 days and cut all the cells. But **BE CAREFUL.** Before you cut cells, make sure that you see eggs in the colony. The queen may have stopped laying eggs and be about to swarm, or she may have already swarmed, and you didn't notice that there are fewer bees. You do not want to make the mistake of cutting all of the cells and leaving your colony hopelessly queenless!

May
Make sure the bees have plenty of room. Give them new brood chambers or supers before they need them to reduce crowding. The extra empty comb will stimulate increased foraging and honey production. Flowers are starting to give nectar – dandelions, autumn olive, European honey suckle, tulip poplar, and others. Sometimes black locust trees produce a short nectar flow at the end of May and basswood trees can produce honey in late May or June.

If you are raising your own queens, May is a reasonable time to start. There should be drones for them to mate with when they are ready.

June
This is the month the honey flow really starts. The clovers are producing nectar and should be in full gear by the end of the month or early in July. Make sure all the supers are on. If you raised your own queens in May, you could introduce them to small nuc hives and let them mate in June.

July
If you are raising queens, you could remove the queens from some of your hives as you have time towards the end of the nectar flow. The honey flow from clover usually stops about

the end of July or beginning half of August in the Midwest. Finding queens in big colonies is difficult. It is best to keep marked queens! The day after the old queen is removed, fuse the nuc with the large queenless colony to introduce the new mated queen, or introduce her with some other method.

August

Often, the real honey flow is done by the end of the first week of August. It is important to get the honey off as early as possible and to treat for Varroa mites. This is perhaps the most critical thing to help your bees survive the winter. If you are monitoring your hive for Varroa mite populations with sticky boards, you will have a good idea of whether you need to treat them and which hives need it the most. As soon as the supers are off, Apistan strips or Checkmite strips can be put in the hives, using one strip for every five frames covered with bees and leaving them in 6 weeks. In many areas mites are becoming resistant to Apistan strips. It is also possible to treat with Apilife VAR, which is a less toxic product containing thymol. Read more about this in *Parasitic Mites of Honey Bees* (http://www.entm.purdue.edu/Entomology/ext/targets/e-series/EseriesPDF/E-201.htm). Controlling the mites now will insure that healthy bees are raised during September. They will be your "winter bees." They will need to live all winter long and still be able to forage and feed the brood in the spring. In contrast, working bees in the summer only live about six weeks.

Once the honey supers have been harvested, the honey needs to be extracted and bottled. The wet supers can be returned to the hives (after the mite treatments are out) to let the bees clean them up. Sometimes beekeepers just set the supers out in a shady place and let the bees rob them out. Some people store their supers wet, which is OK, but they will smell a little sour from fermentation. The bees will clean them up in the spring. Stored comb will require moth crystals. It is important that you reduce the entrances of any weak colonies that may get robbed out by stronger colonies when the nectar flow stops in August. When you work your bees, do not leave honey exposed too long or your bees will get used to robbing from each other.

September

Hopefully in late August and early September the bees found lots of nectar in goldenrod and aster flowers. The small, white asters are often important for the fall flow in the upper Midwest. Weak colonies should be combined with stronger ones before the winter. Colonies that are merged should be

reduced to two or three deep boxes. You could use three boxes for very strong ones that you will split next year. Extra boxes and comb should be stored in an unheated building with covers on the top and bottom. When storing equipment in hot weather, note that wax moths can destroy the comb in two weeks. If it is going to be warm, you should keep several tablespoons of moth crystals (PDB, para-dichlorobenzene) on them. Stack the boxes and put crystals on newspaper on tops of frames for every four to six boxes. Either nail wooden entrance reducers in place leaving the smallest opening (three-eighths inch high), or staple three-eighths inch hardware cloth all across the entrance. Half inch also works and is easier to find, but some mice are small enough to get through it.

October to November
If your colonies do not have at least nine frames of honey for the winter, it is best to feed them 2:1 syrup (twice as much granulated sugar as water, by volume). You can dissolve it in hot water. Fumidil-B powder can be added to help control for Nosema disease (dysentery). It is only necessary to feed your bees in the early spring or late fall, or when you are trying to get them to draw comb on foundation. Often in the Midwest the bees make enough fall honey for themselves, and we do not have to feed them.

Colony Troubleshooting

Your primary concern is the presence and well-being of the queen. It often is unnecessary to find the queen. If you do not see her, look for eggs. If eggs are present, there was a queen at least three days ago, because it takes three days for an egg to hatch. Also, look for queen cells. Swarm cells are queen cells made in preparation for swarming in the spring and are usually toward the bottom of the comb. Emergency and supercedure queen cells are found towards the middle of the comb. When a queen is failing and they are making a supercedure queen cell, sometimes it is best to let the bees replace her. However, this may cause a break in brood rearing of 2 to 3 weeks.

1. Problem: I can't find any eggs or brood!
Possible Causes and Solutions:

a. The queen has quit brood rearing because of the season

(winter time or about to swarm) – no action needed.

b. No queen – buy and introduce a new queen ASAP. Optional test: add a frame of eggs and young larvae from another hive. Check for the start of queen cells on third day. This indicates they were probably queenless and will now raise a new queen.

c. New queen present, but is not yet laying (you may find some sealed brood left from the last queen) – be patient. Queens normally begin laying eggs roughly two weeks after emerging from the cell.

d. Extended shortage of pollen

2. Problem: There are eggs present, but no other brood.
Possible Cause: Brood rearing has just resumed after being halted. Perhaps they raised a new queen that just mated.
Solution: This is good! No action needed.

3. Problem: I see wet-looking pollen.
Possible Cause: When pollen is not needed, pollen in the center of the brood nest may look wet or shiny on top. This pollen can be used by the bees, but they will first move it and make it look fresh again, indicating a need for pollen (because brood rearing is under way).
Solution: No action needed.

4. Problem: There are clean, shiny-looking cells in the middle of brood nest.
Possible Cause: The workers have prepared the cells for egg laying. They should look clean and shiny on the bottom.
Solution: No action needed.

5. Problem: I see eggs, but more than one egg per cell.
Possible Causes and Solutions:
a. The queen is freshly mated, or not mated — be patient. She will soon learn to put only one egg per cell. However, you should check again in 5-10 days, and replace the queen if this is still happening.
b. Probably the colony has been queenless for two weeks or more and you have a laying worker colony. Some of the workers ovaries have developed and they are laying drone eggs – do not introduce a new queen to this colony. Laying workers usually kill queens that are introduced because the laying workers produce some queen substance as if the colony had a real queen. Usually the laying worker colony

is a weak one and can be combined with another colony without too much danger to the queen. Use one of the following methods in this case:

- Merge the colony with another colony. Use the newspaper technique and place the laying worker colony above the one it is to be merged with.

- Try to introduce a queen. Take the hive 20 feet away from its stand and shake all the bees off the frames and out of the box onto the ground. The theory is that the laying workers usually do not find their way back to the hive, or the disruption helps them accept a queen. Set up the hive in its original position. Introduce a queen under a push-in cage that is pushed into dark comb that contains some open honey, and possibly a little capped brood. Be careful to push the cage well into dark comb. Release the queen in three days if the workers are not biting the cage. (They cling to the cage with their mandibles when biting it and are not easily brushed aside.)

6. Problem: The brood is scattered in an uneven pattern.
Possible Causes and Solutions:
a. Queen is running out of sperm – if this is the cause, requeening is advisable. If nothing is done, the bees will raise a new queen and the current queen will be superceded by her daughter.

b. Something is killing the brood. Cold nights in the spring can kill some brood. Rarely, pesticides and poisons may cause the brood to have an uneven pattern. Or, the problem could be mites or disease.

- check for possible sources of pesticides or other poisons, if you have not had cold nights recently.
- check for disease symptoms of foulbrood, chalkbrood, and parasitic mite syndrome.

Clue: Is one colony showing the symptoms or are several? If one, situation (a) is more likely. If several, (b) is more likely.

7. Problem: I found the queen, but I also see a new queen cell that has a neat, round opening at the bottom.
Possible Cause: A virgin queen has recently emerged from this cell.
Solution: If the old queen is present and doing well, and you want to keep her, you should try to find the virgin queen and kill her. Otherwise, the virgin will probably kill

the old queen and there will be a break in brood rearing. Another possibility is that the old queen is not performing well. You should evaluate the brood to make sure she is still laying lots of eggs and filling frames with brood. If the brood is spotty, it may be best to let the new queen take over. Queens usually take about two weeks to mate and begin laying eggs.

8. **Problem:** I opened my hive and suddenly found virgin queens emerging from several cells!
   Possible Cause: Your colony was preparing to swarm. When bees are going to swarm and they have multiple queen cells, the worker bees prevent the queens from emerging too soon by sitting on the cells and thumping them. Sometimes the queens are not completely inhibited and begin to chew their way out, but the workers re-seal the opening before the queen can emerge.
   Solution: It is too late to prevent the bees from swarming, if they haven't done so already. If you want queens to requeen other hives, this is a good opportunity. You can capture some of these queens and put them in cages with attendant bees. Add some bee candy (made of powdered sugar and white corn syrup) or give them a drop of honey and put them right into new queenless hives (wait 24 hours after dequeening). Remember to give them a small droplet of water twice a day if you are keeping them for a while. You can keep them in the cage with candy for about a week. These queens can also be mated in small nucs and kept for colonies that need new queens later.

Short Guide to Using Honey Bees in Pollination

General Considerations

Why use honey bees?

Many crops are dependent on pollination by bees for adequate fruit set. North America has over 3,000 species of wild bees. Some of these species are much more efficient than honey bees on a per-bee basis for pollinating specific plants. But, almost all of the wild bees are solitary. A single female makes a nest, forages, and cares for the brood, so solitary bees do not have colonies. Honey bees are social – they have a colony containing one queen that lays all the eggs, and tens of thousands of worker bees to do the foraging. Many wild bees only visit specific kinds of plants or are only active for part of the season.

- The *orchard mason bee* is useful because it is active during the spring and is an efficient pollinator of apples. Mason bees can be encouraged to nest in plastic straws or holes drilled in wood. Their progeny will return to the same orchard each year.

- *Bumble bees* are important because they are large, active foragers and are also social - living in small colonies that are active throughout the season.

- *Honey bee* colonies also are active throughout the growing season. Worker honey bees will visit any flowers that provide good amounts of nectar or pollen, the two resources bees need for energy and protein. The main advantage of using honey bees is that you can manage colonies with tens of thousands of bees to serve as mobile pollination units.

What's a good pollinating hive?
A hive that was just started from shaking a package of bees onto a foundation is not a good pollination unit, because the population is low and will continue to decline for at least a month while the bees draw comb for the queen to lay eggs in and the first new workers hatch out. A good pollination unit is a strong hive (meaning it contains lots of bees). If it is a strong hive, it should have many bees coming and going from the entrance on a warm day. If you take the lid off, there should be bees filling at least one or two large brood chambers, with a carpet of bees covering the tops of the frames. A good pollinating unit will have at least one deep brood chamber full of bees, brood, and eggs (indicating that they have a queen).

When do you move your hives?
Bee hives are usually moved after sunset to avoid losing foraging bees. Beekeepers that move only a few hives usually just screen off the entrances and load the hives individually on a truck. Straps can be used to make sure boxes to not come apart if the hive is knocked over. Beekeepers with larger operations often move hives on pallets with four hives per pallet. The grower should expect the hives to come at night and should jointly decide with the beekeeper where the hives will be placed – in the orchard or the edges of the field.

How do you time the move?
The importance of timing depends on what flowers are competing for the attention of the bees. One thing to consider is the attractiveness of your crop as a nectar source. Bees are

very good at locating the sweetest nectar in the area. Often this comes from weeds in the surrounding fields. Bees like to forage within 300 feet of the hive, but will travel two miles or more for a good nectar source. Ideally, it is best to have the bees moved into the crop just as flowering has started in earnest, so that the bees do not get used to foraging on the nearby weeds. If they are moved in too soon, there may not be enough of the crop blooming to effectively compete with the weeds.

Consider drawing up a pollination contract.
When contracting for pollination, it is important that the beekeeper and grower discuss details, including all of the following:

- Which pesticides will be used, if any, while the bees are present? Bees are extremely sensitive to sprays on flowers It is possible for a beekeeper to lose all 300 of their colonies in one week to pesticide-poisoning during pollination.

- The beekeeper should have access to the colonies at all times to inspect them and make sure they still have queens and are healthy.

- The beekeeper and grower should know which **pesticid**es are most toxic to bees. All of these points should be decided ahead of time. It is best to sign a formal contract with the beekeeper and owner of the crop to be pollinated. This protects both the grower and the beekeeper.

How many hives are needed?
The number of hives needed depends on the crop. (See Table 1.) Crops with more than one seed per fruit benefit from multiple bee visits to the flowers to get large fruit. Examples of such crops are apples, cucumbers, melons, and blueberries. Blueberries need perhaps the most hives per unit of area, because they are not that attractive to the bees. Examples of some estimates of the optimal number of hives per acre are given in the box on the right.

Crop	Hives per acre
Apples	1.2
Blueberries	4.0
Cantaloupe	2.4
Cucumber	2.1
Squash	1.0

Table 1. Number of hives needed for different crops.

LD50s (µg/bee)	Toxicity
less than 100	virtually non-toxic
11-100	slightly toxic
2.0-10.99	moderately toxic
greater than 2.0	highly toxic

Table 2. Classification of toxicity based on LD50s (µg/bee)

Pesticides and Bees

Pesticide Toxicity
The acutely toxic effects of pesticides to bees are measured by experiments in which the test compound is administered to bees as a contact pesticide in a controlled way. Table 2 indicates how pesticides are rated based on their LD50s (the concentration in microgram/bee needed to kill 50 percent of the test bees).

Residue Exposure
Some pesticides are very toxic to bees but can still be applied to the blossoms in the evening, because they rapidly decay to less toxic compounds. The residual activity of pesticides is often expressed as an RT25 value. This is the time that needs to pass for the pesticide to degrade enough that bee mortality is reduced to 25 percent of the initial mortality of the freshly applied product. This test is done by spraying the pesticide on alfalfa leaves and keeping the leaves in a cage with bees at 75°F. But cooler temperatures can dramatically increase the time needed for residues to become nontoxic to bees. Be especially careful when the weather is cool. More information can be obtained from reading *Protecting Bees from Pesticides* (http://www.entm.purdue.edu/Entomology/ext/targets/e-series/EseriesPDF/E-53.htm).

Inventory

List all of your beekeeping equipment.

Date Obtained	Item	Number	Cost
		Total:	

Receipts

Date	Item	Value – Used at Home	Value – Sold
		Total:	

Financial Summary

Assets:

Total value of bees, equipment, etc., on hand January 1.	
Total value of supplies, equipment, etc., purchased during year.	
Miscellaneous expenses during the year. Explain:	
Total:	

Inventory:

Total value of bees, equipment, etc., on hand December 31.	
Total value of bee products available for sale December 31.	
Total:	

Total pounds of honey produced:

extracted (_____ pound) + chunk (_____ pounds) + comb (_____ pounds)

= _____ pounds

Value of bee products sold: _____

Yearly Profit (or Loss) =

Assets – Inventory + Value of bee products sold.

_____ - _____ + _____ = _____

Yearly Profit/Loss: _____

Work Record

Record all time spent working on your beekeeping project.

Date	Location	Kind of Work	Time Spent
		Total:	

Apiary Record

(Maintain a record book for your hives with a chart for each individual colony.)

Colony No.								
Date	**Queen**	**Brood Amount**	**Amount Pollen**	**Amount Honey**	**Bee Pop-ulation**	**Honey Removed**	**Equip-ment**	**Notes**

Colony No.								
Date	**Queen**	**Brood Amount**	**Amount Pollen**	**Amount Honey**	**Bee Pop-ulation**	**Honey Removed**	**Equip-ment**	**Notes**

Colony No.								
Date	**Queen**	**Brood Amount**	**Amount Pollen**	**Amount Honey**	**Bee Pop-ulation**	**Honey Removed**	**Equip-ment**	**Notes**

The Scientific Method

Scientific Method – an organized way to address a problem you are having with your bees.

1. Stating the problem
Think about what you want to learn.

2. Forming the hypothesis
After you choose a problem to study, describe what you think is happening.

3. Observing and experimenting
Observe or set up an experiment to test your hypothesis. Tally your data. You can make your own charts by hand or on the computer.

4. Interpreting data
Once you have collected your data, you need to understand what it tells you. The data can be interpreted by comparing numbers visually or in graphic form.

5. Drawing conclusions
Consider how your observations and/or experiments affect your hypothesis. Is the hypothesis supported or rejected by your observations and experiments? How do the results give you ideas for future studies and a new hypothesis? Should you run your experiment again? Should you change one of your variables?

Worksheet components:
1. State the problem.
2. Write a hypothesis.
3. Observe and experiment (create a data sheet).
4. Tally, study, and interpret your data.
5. Draw conclusions.
    a. Was your hypothesis supported, or not? (circle one)
       Yes No
    b. What else did you learn?

Demonstrations and Talks

Any one of the suggested projects could be an excellent topic for a demonstration or discussion at your school, county, or state fair. You might also be able to find other clubs and groups that would be interested in such a presentation. Talks are generally more interesting if you do an "action" demonstration. General guidelines and a checklist for an Action Demo are given in this manual.

Action Demonstration Guidelines

What is an action demonstration (action demo)?
An action demo is a fun way to share with others what you have learned in your 4-H project. It's a kind of "show and tell" but with more action. An action demo is not like a regular demonstration, where the audience sits and listens to a prepared talk. An action demo lets the audience get involved.

Action demonstrations can be given anywhere there are a lot of people, such as a county or state fair, shopping mall, street fair, or any 4-H event. Your job as a demonstrator is to interest the audience in your topic so that they stop and learn something new or try their hand at what you are doing.

How do I choose a topic for my action demo?
An action demo can be done on almost any subject. The topic should be something that you enjoy and are knowledgeable about. Consider the following questions when choosing a topic.

- Can you complete the action demonstration in 3 to 5 minutes?
- Can it easily be repeated over and over again to fill the assigned time?
- Is your action demo showing something that would interest the general public?
- Is there a good way to involve your audience in your action demo (hands-on or answering questions)?
- Can the supplies for the "hands-on" section be used over and over again, or will they need to be replaced? (Remember, if the materials must be replaced, it will cost more to do the demonstration.)

How can I get the audience involved?

The first thing you need to do is be enthusiastic and attract people's attention as they walk by your table. You might have a colorful tablecloth or poster to spark their interest. You might ask them a question, like: "Would you like to play this game?" or "Have you ever made pretzels? Would you like to try?" The best way to attract their attention is to have people around your table doing something. People love to do hands-on activities, so once you get a few people at your table, they will attract others. For more information on action demonstrations, see V-4-H-28.

Involve your audience by having them:
- Do what you are doing
- Do a "hands-on" section
- Judge the quality of various items
- Play a game
- Answer questions

Remember, the key to a good action demo is getting your audience involved.

Action Demo Checklist

Topic	Yes	No
Was the topic interesting to the general public, causing them to stop, watch, or participate?		
Did the topic stimulate questions from the audience?		
Was the topic of suitable length?		
Did the topic include something "hands-on" for the audience to do?		

Organizing the Content	Yes	No
Was the topic organized into short "show-and-tell" segments that were done repeatedly?		
Were segments presented in logical order?		
Were segments explained so that the audience understood "why?"		
Was it evident that the 4-H member was knowledgeable about the subject and could answer questions?		
Did visuals, pictures, posters, or actual objects clarify the important ideas?		
Presenting the Demonstration	**Yes**	**No**
Did the 4-H member seem enthusiastic?		
Did the 4-H member encourage the audience to become involved in the demonstration?		
Did the 4-H member speak directly to the audience?		
Did the 4-H member show evidence of practice and experience?		
Did the 4-H member show that she/he enjoys talking to the audience?		
Did the 4-H member show enthusiasm, friendliness, and a businesslike manner?		
Did the 4-H member tell about what they learned through this 4-H project?		
Comments:		

Exhibits

You should get information about the 4-H Beekeeping exhibit from your county Extension educator. Indiana State Fair guidelines are available at the 4-H Web site (www.four-h.purdue.edu).

The displays that you could design are as numerous and varied as the many types of projects you have to choose from.

Project Suggestions

- Hive increases
- Uniting hives
- Fall and spring management
- Dividing hives and introducing a queen to a hive
- Dividing colonies for increase
- Queen production
- Queen rearing
- Double queen method
- Two-queen system of honey production
- Hive swarms
- Summer management
- The bee language
- Bee hunting
- Construction of an observation hive
- Research on honey bees and pesticides
- Home-built beekeeping equipment
- Protecting honey bees from pesticides
- Bee behavior
- Section comb honey production
- Selective honey gathering
- U.S. standards for grading honey
- Collecting pollen for supplemental feeding
- The value of the honey bee as a crop pollinator
- Use of honey bees for crop pollination
- Construction of a simplified pollen trap for use on colonies of honey bees
- Processing and uses of beeswax
- Pollination of agricultural crops
- The history of hive bodies
- Designing and building a hive stand

Resources

Recommended Magazines:

American Bee Journal
http://www.dadant.com/journal/
Bee Culture
http://www.beeculture.com/

Recommended Books:

Honey Bee Biology and Beekeeping,
by Dewey M. Caron. Wicwas Press.
Cheshire, Connecticut. 1999. ISBN 1-878075-09-8.

The Hive and the Honey Bee
Dadant and Sons Publisher. 1992. ISBN: 0-915698-09-9

Recommended Video:

A Year in the Life of an Apiary, by Keith Delaplane,
University of Georgia. 1-800-359-4040
http://www.gactr.uga.edu/tv/videocatalog/bees.html

Purdue University Beehive Website

There are many beekeeping resources listed at the Purdue University Beehive site:
http://www.entm.purdue.edu/Entomology/research/bee

Indiana Department of Natural Resources (IDNR) http://www.in.gov/dnr/

The state apiary inspector is employed by the Indiana Department of Natural Resources (IDNR, http://www.in.gov/dnr/), Division of Entomology and Plant Pathology, and is located in Indianapolis. The Apiary News & Information Web Site http://www.in.gov/dnr/entomolo/apiary/apiarynews.htm has a variety of information for the beekeeper.

- Beekeeping meetings
- Indiana apiary regulations
- Applications for shipping bees and elements of beekeeping into Indiana
- Assistance for beekeeping in Indiana (state apiary inspector, Purdue bee specialist, beekeeping associations, etc.)
- Plants attractive to native bees
- Links to Purdue bee publications
- Links to state and federal programs and services

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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) that permits free passage of a bee but too small to encourage comb building.

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.

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 pupal stages of development.

Burr comb – Small pieces of wax built upon a comb or upon a wooden part of a hive but not connected to another comb or part.

Castes – The different kinds of adult bees in a colony: workers, drones, 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.

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 honey bees 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 16 days old, that leave the hive to collect nectar, pollen, water, and propolis.

Foundation - Used to form base on which bees can construct complete comb, made of either wax or plastic.

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 available for purchase. 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.

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 stages 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 cause 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, or tries to take, 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.

Supersedure – rearing a new queen to replace the mother queen in the same hive.

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.

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