



Advanced Beekeeping



The 4-H Beekeeping project guides you as you learn about raising honey bees. Beekeeping offers many exciting educational experiences, from learning about bees and honey plants, to raising bees and producing honey and other bee products.

This is the third of three 4-H beekeeping manuals. The first, *Learning About Beekeeping*, covers basic information on beekeeping: types of bees, the honey and wax they produce, plants that attract bees and the beekeeper's equipment. The second manual, *Working with Honey Bees*, offers guidance as you acquire a beehive, care for it throughout the year and keep good records of your beekeeping work.

This manual includes more detail on some things you have already learned and introduces more advanced beekeeping topics: increasing the number of your honey bee colonies, increasing honey production, producing special kinds of honey, managing disease and more about bee societies.

The directed experiences in this manual are suggestions to help you to learn more about apiculture. Learning all you can and taking responsibility for your bees' health as you expand your apiary is important. Use this manual as a resource for problems you may have or areas that you want to learn more about, rather than a how-to guide. You'll learn most by doing and keeping notes so you remember what worked and what didn't with your bees. Stay current with local practices and concerns by talking to others who raise bees. Local beekeeping organizations can be a great place to learn. The internet has a wealth of resources and has made it much easier to connect with other beekeepers in your state, the country and around the world.

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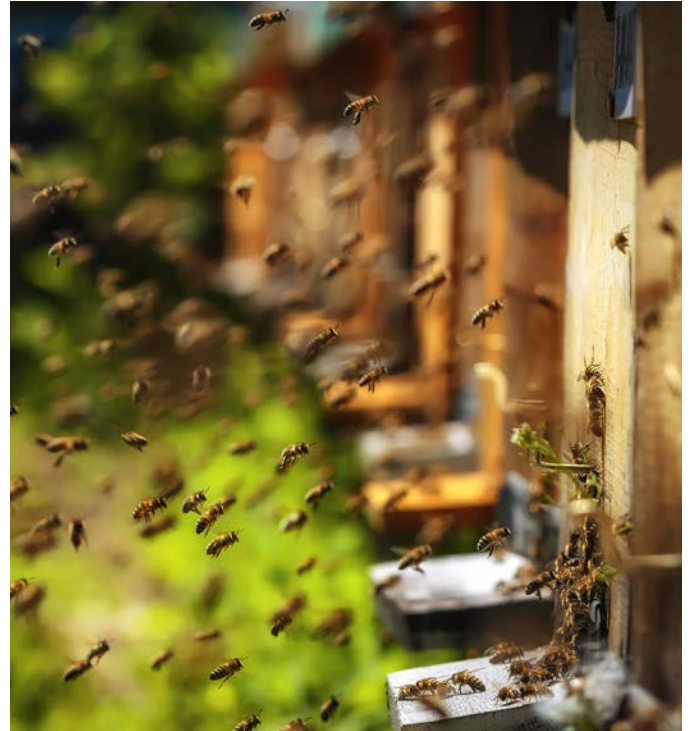
Expanding Your Apiary

Once you feel confident in your ability to maintain a beehive throughout the year and have successfully produced surplus honey, you're ready to take on more complex and difficult projects with your bees. You will continue to develop your skills as a beekeeper with the help of this manual. Good beekeepers not only care for their colonies but also manage them to increase honey production. Your goals should now be to:

- Keep strong, populous colonies with young queens.
- Continue to improve your understanding of the ways of bees.
- Increase honey production.
- Experiment to learn better ways to improve your apiculture skill.

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 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 don't overextend themselves. Your decision is based on many factors, including your available time, expense, space considerations, physical condition, interests and local climate. The maximum number of hives a beekeeper can care for differs from beekeeper to beekeeper. Your maximum may be two hives as a hobbyist, while a farmer might have 200 hives.

Your beehive is a dynamic, changeable system with great potential for growth. Be alert to apiary operations that can be improved, and consider experiments to help you understand more about your bees and how to care for them. We recommend you use the scientific method for experiments (Appendix B). The more you learn, the better you'll be able to help your bees produce more honey.



Beekeeping is a lifelong learning process. Talking with other beekeepers helps you learn. Advice from more experienced people is as valuable now as it was the first time you watched a beehive being opened. Continue to read all you can about bees and beekeeping. Take your questions to your beekeeping advisor, local bee inspector, and local and state associations. Subscribing to a beekeeping journal can introduce you to topics of interest you haven't even thought of!

You are now in charge of your learning. No one is telling you what to do and when to do it, and no one is asking you questions that show your understanding of a concept or procedure. You are mostly on your own with the help and advice of other beekeepers. You choose your activity, do it and when you believe you have mastered it, move on to another. Most of all, enjoy the journey!

Records

Keeping accurate records is especially important as you expand your apiary. Records help you remember what you did, evaluate the success of your work and reduce the chance of making the same mistake twice. They also help you track how much time and money you're spending on your

beekeeping project. You can continue with the record-keeping format you used when you started (templates are included in Appendix C), or you can use the templates 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. Wild clover is a major source of nectar for bees in much of the Midwest. Any place that has a mixture of trees and unplowed fields is good. You can ask people in your neighborhood, school or church if you don't have a place to keep a hive. Most will agree to help you, especially if you offer them honey.

Water should be available within a quarter-mile of the hives. Bees can collect water from dew and puddles, but even dew may be scarce during a hot, dry summer. A bird bath works well for providing water. Bees must have water to air-condition the hive and dilute royal jelly for feeding brood, so you must provide it if it's not naturally available.

The apiary should be accessible at all times of the year. Place the hives on hard, dry ground so you can drive up to your apiary without having to carry your equipment long distances. 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 improves your bees' survival chances over the winter.

Increasing Your Colonies

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



Removing the queen cage

Purchasing nucleus hives (nucs) is a 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 builds up more quickly than a package of bees installed on foundation because it already has 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 online for beekeepers that sell nucs or local queens. You usually need to supply the brood box and enough frames with foundation or comb to fill out the box. One concern with a nuc is that beekeepers often get rid of the oldest frame and any disease there can spread, so be sure to get your nuc from a reputable company.

Installing packages

Sometimes you cannot find a provider of nucs, or they aren't 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 collaborate with someone who is planning to bring a truckload of packages to your area. Follow these steps when ordering a package.



Shaking the bees onto the hive

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, before they sell out. Packages can usually be installed when plants are starting to bloom so the bees have enough resources. This may be any time between April 1 to mid-May in the Midwest and northern states.
2. Prepare your equipment before your bees arrive. You need the following things for each colony.
 - Hive stand to keep the hive bottom off the ground
 - Two deep brood boxes with 10 frames of foundation each (or 9 to 10 frames with comb)
 - Bottom board
 - Entrance reducer
 - Inner cover
 - Two supers for the honey flow

- Cover
- A way to feed the bees (a friction pail or gallon jar with small holes in the lid both work well)
- 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.) Top feeders work well because they are enclosed in the hive and easy to refill in bad weather. Division feeders also work well for warm weather.

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

- Install your 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 to another hive. If you only have one hive, this isn't an issue.
- If you are installing during the day, block the entrance with some grass for an hour or two to keep the bees in the hive. Otherwise, the bees tend to drift into the most visible hive (usually the one on the end).
- Remove the grass after a few hours (or the next morning if you installed late evening).

4. Installation

- Using smoke when installing a package usually isn't necessary, but it's a good idea to have a smoker lit in case you need it. It may encourage the bees to go down into the hive. Knock the bees down to the bottom before removing the can so they are less likely to fly when you remove the queen.
- Pry out the syrup can with your hive tool and set it aside.



Introducing the queen in the cage

- Remove the queen cage and place her between the frames in the hive between two frames.
- Spraying the bees with 1:1 sugar syrup right before shaking them into the box can help keep them from flying.
- 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.
- Place the queen in the hive. 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. Put the candy end of the cage at the bottom, in case it gets wet. This prevents it from flowing onto the queen.
- Check the hive after three days to make sure the queen was released. The bees may take longer to release the queen with a candy plug. You may have to remove the plug at this point. Check back again in a day or two to make sure the new queen is laying eggs. Remove the queen cage once it is empty.

Note: Make sure the bees are not biting the cage if the queen is still in it. You can easily push them aside with your finger unless they have latched onto the cage with their mandibles. If you can push the bees aside, pry off the screen and allow the queen to walk

between the frames. If the bees are latched onto the cage, do not release the queen, or they will kill her. In this case, you may have another queen in the colony, or the introduction may require more time. If the bees already released the queen, 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 queen. It's 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!

5. Feeding the bees after installing the package is important. Your colony will decline in population until the new brood hatches, and the queen needs comb to lay eggs in. Feeding allows them to draw out the comb from the foundation. Feed



Bottle feeder



Division board feeder

the bees with a gallon jar of 1:1 sugar syrup (at least 50 to 60 percent sugar by volume) inverted over the hole in the inner cover. Have about six small holes in the lid so the bees can feed on it. In cold weather, consider adding the medication fumagillin (sold as a powder called Fumadil-B) to the first two gallons of syrup to 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's empty. You may need about 5 to 7 gallons of 1:1 sugar syrup per package if installing the package onto foundation. Installing the package onto comb requires much less syrup. It's also possible to feed the hive with a division board feeder or Boardman feeder. 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 the bees are in the middle.

Caring for the hive after installation

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 cannot find her, you need to buy a replacement queen.

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 rearranging the frames. Replace the frames in roughly the same configuration.

When all the comb is drawn from the foundation in the first box, or the bees have at least started it, 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 toward the center of the upper box to encourage the bees to move up and draw out the foundation and expand the nest.

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 encourages the bees to draw it out.

Supers with foundation should have 10 frames; those with comb can have eight or nine frames if properly spaced.

Splitting Colonies

Two of the many ways to divide colonies are explained below. Complete these preparations before using either method.

- Choose strong colonies to divide. The best time is four to six weeks before swarming usually occurs. This is early to mid-April for most Midwestern states.
- Be sure to use enough smoke.
- The colony should ideally have brood on eight to 10 frames or more.
- Arrange for a new queen to be delivered either the day before or the same day you want to 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



Strong hive ready to split

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 for 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, but don't let them get wet.

- Have your equipment ready for the new colony. You 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. This is optional but recommended if no nectar is coming in from the flowers or you are adding foundation instead of drawn comb. (Use a division board feeder or gallon jar with a few nail holes in the lid and 1:1 sugar syrup.) You also need an empty, deep hive body to enclose the feeder.

Note: For the double-screen method below, you also need a double screen and a queen excluder if you're not taking the time to find the queen.

Simple divide method

Four days before the queen you ordered is to be delivered, open the hive using your smoker and divide the brood equally between two boxes of the existing hive. If you find the queen, put her in the bottom box or 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 you don't see the queen, you can put a queen excluder between the boxes. The presence of eggs four days later will tell you where the queen is.

Once you divide the brood, remove the queenless box to a new location and introduce a queen the next day. Make as even a split as possible and move the divide at least a mile away to keep foragers from returning to the original location; however, this may be impractical. If placing the divide in the same apiary, put all the oldest brood (capped brood about to emerge as adults) and one frame of very young (larvae in uncapped cells) into the upper box that you're going to remove. You can tell if brood is nearing emergence by uncapping some cells



Splitting a colony with three brood chambers.

and looking for older pupae. Make sure both boxes contain pollen and honey. You can also put extra brood into the new hive from other colonies later. The new adult bees help make up for the loss of foragers that return to the original hive.

Introduce the new queen with the candy cage 12 to 24 hours after you make the divide. If you are requeening the other hive, wait 12 to 24 hours after de-queening before introducing the new queen.

Double-screen method

This method isn't commonly used. It's similar to the simple divide and can be used for making splits or for making up nucs. Double screens are frames that have a screen on each side and that fit over the brood box.

You can make or buy double screens. Use one 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.

The double screen fits over the brood chamber of the old hive and has a slot that provides an upper entrance for the bees. It allows heat and the hive's odor to be transmitted to the upper part. The heat from the lower box helps warm the brood 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