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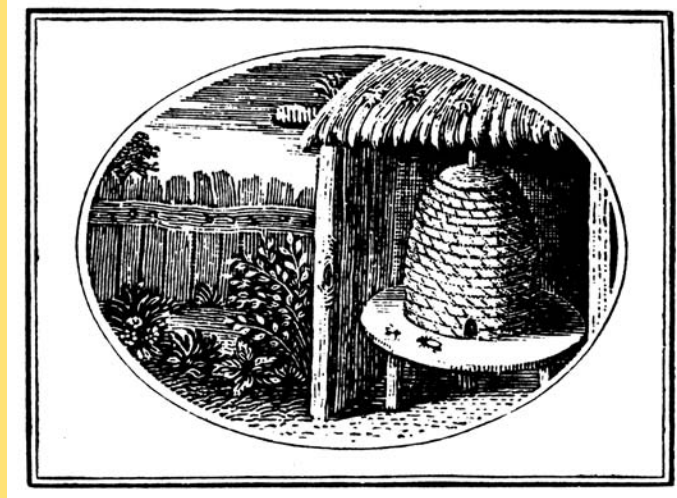
Beekeeping



*Alabama Cooperative Extension System
Alabama A&M University and Auburn University*



ANR-135



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James E. Tew



*Alabama Cooperative Extension System
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Beehives kept under a shed
to protect colonies from
heat and rain.



IS BEEKEEPING FOR YOU?

- *Do you enjoy the outdoors and do you enjoy supporting nature?*
- *Do you enjoy gardening and nurturing plants?*
- *Do you enjoy woodworking?*
- *Do you enjoy a biological challenge?*
- *Do you enjoy talking to people with similar interests?*
- *Do you enjoy managing a sideline business?*
- *Do you enjoy participating in a historical craft?*

If you can answer yes to most of these questions, beekeeping is for you.





A honey bee foraging on apple blossoms.

THE SOUTHEASTERN UNITED STATES is an excellent location for beekeeping. The climate is generally warm with mild winters. Though not the best states for honey production, the Southeast has an abundance of nectar and pollen-producing plants, and dependable honey crops of 40 to 60 pounds per colony are routine. With readily available food sources and an agreeable climate, honey bee colonies thrive in all parts of the area.

With a reputation for producing high-quality queens at affordable prices, Alabama, Mississippi, and Georgia have historically been known as prominent queen and package producing areas. Though queen production is still an important component of beekeeping in the Southeast, hobby beekeeping, providing pollination, and gardening beekeeping are also important in this area.

Nearly anyone can keep a hive or two of honey bees. The majority of beekeepers are hobbyists, who keep bees just for pleasure. Men, women, teens, or young children, to some extent, can all be beekeepers. Gardeners, retirees, professionals, teachers, physicians, construction workers, airline pilots, and lawyers are among the types of diversified occupations enjoying beekeeping. A sideline beekeeping hobby can earn extra income if colonies are managed efficiently.

Even if you do not have a place to put a few colonies, most people can find a friendly farmer or landowner on whose land to place colonies. If you enjoy biology, outdoor activities, woodworking, gardening, animal care, or if you are just looking for a sideline income, beekeeping will probably interest you.

Stings

Everyone knows that bees sting. Rarely, however, does a colony become so agitated that large numbers of bees attack, though it may seem like large numbers to the person being stung. The stinger and poison gland will remain attached to your skin if you are stung. Scrape or wipe off the stinger. It is thought that pulling the stinger with your fingers will force all the venom into the wound. Generally, the honey bee is the only stinging



A bee's stinger that has been torn from the bee's body.



A productive bee yard in South Alabama.

insect to leave its stinger behind after a stinging incident.

You should have some idea about how stings affect you before investing money in bees and equipment. Some swelling, redness, and itching at the site of the sting are considered normal. If you experience rare, extreme insect sting and bite reactions, such as difficulty in breathing or rashes away from the sting site, consult your physician before undertaking beekeeping.

*Use good, protective equipment,
and put it on before entering
the bee yard.*

The Cost of Beekeeping

Whether you are interested in keeping bees as a hobby or as an occupation, you probably are interested in the cost in time and dollars. Beekeeping is not a particularly expensive hobby. It can be a profitable business as well as a source of pleasure and relaxation if you can withstand the occasional sting and if you are willing to take care of your bees.

Bees require more time at certain periods than they require at others. The amount of your time needed will depend on the number of colonies you keep and on your commitment. If you have only a few colonies, you will probably spend more time per colony than if you have a larger number.

Cash investment will depend on the equipment chosen. Cost of bees and equipment varies from year to year. Generally, a new hive with new bees will cost about \$100 to \$150. Request a catalog from bee supply dealers and compare prices. See the list at the end of this publication.

COMMON BEE RACES USED IN THE SOUTHEASTERN UNITED STATES

Italian bees—Italian bees are the most common race used in the Southeast. These bees are generally yellow and are gentle and calm. Brood rearing starts in late winter and continues until late fall. Excessive summer brood rearing by these bees is considered by some to be a disadvantage. Food consumption is high in overwintered colonies. Swarming is not excessive. Italian bees produce brilliantly white cappings on their honey.

Carniolan bees—The Carniolan bee has been described as a grayish-black Italian bee. These bees are exceptionally docile, and they are, in general, good honey producers. They winter with smaller clusters. However, Carniolans have a strong disposition toward swarming. Brood production is linked to pollen availability so they have large summer but small winter populations.

Caucasian bees—Caucasian bees are grayish-colored and are gentle and calm in the hive. Though they are excellent brood producers, they do not reach full strength until midsummer.

*Having a young, healthy queen
of any race is better than
having an old queen
of a selected race.*

Mature queen cells produced by a commercial queen breeder.





An Italian queen bee surrounded by attendant bees.

They are weak swarmers but great producers of propolis (bee hive glue). In the fall, they may actually nearly close their hive entrances with propolis, leaving only small holes. This race seems to be more susceptible to Nosema, an occasional protozoan disease. They also tend to be more aggressive robbers.

Hybrid bees—Honey bees can be selected for many attributes such as disease resistance or honey production. A variety of these hybrid bees are available to beekeepers who desire specific attributes. Particularly common are hybrid bees that are Varroa mite resistant. Hybrids are normally combinations of Italian, Caucasian, or Carniolan bees. Frequently called mite-resistant queens, hybrid queens have interested beekeepers as a way to help control mite pests. For a beekeeper wishing to use integrated pest management (IPM) concepts, using mite-resistant queens would be a good idea. These queens, however, cannot be counted on as the sole method of mite control.

Races of Honey Bees

Only a few species of bees throughout the world produce honey. The most productive and manageable of these honey-producing bees is the honey bee, *Apis mellifera* L. It is the only true honey bee found in the United States. Different strains or races of the honey bee are well known in this country. The three major races of honey bees are the following: the Italian bee, *Apis mellifera ligustica* Spinn; the Carniolan bee (gray or Carnica bee), *Apis mellifera*

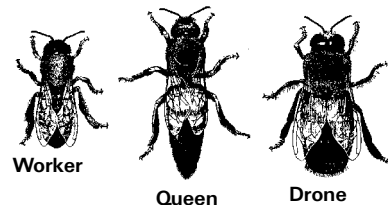
carnica Pollman; and the Caucasian bee, *Apis mellifera caucasica* Gorb. These races are the result of natural development in their homelands. A race of bees is generally named for the geographic area where it developed. In most of the Southeast, only the Italian and Caucasian races are commonly used.

The Honey Bee Colony

Regardless of the race you choose, the honey bee colony will have three forms of bee life: the queen, the worker, and the drone. These forms do not look alike, and, as a beekeeper, you will grow to recognize all three.

The queen is the mother of the bee colony. Her main functions are to lay eggs and to secrete chemical substances, or pheromones, that hold the colony together and greatly influence the activities of the worker bees. A superior queen may lay up to 3,000 eggs in a day, but the average is 1,200 to 1,800 during the spring and early summer.

Normally, there is only one queen in a colony. Under certain conditions, a queen and her queen-daughter may occupy the same colony for a short period. The perpetuation of the colony is dependent on the egg laying of the queen. She is the only female in the colony that has fully developed reproductive organs and can lay either fertilized or unfertilized eggs. Fertilized eggs develop into workers



Members of the honey bee colony (worker, queen, drone).



A capped queen cell, two capped drone cells and a queen cup.



Carniolan worker bees on comb.

while eggs she does not fertilize develop into drones. The queen can be distinguished from the workers that surround her by her size and shape. She is larger than a worker and longer than a worker or drone, though not as broad as a drone. Her wings are much shorter in proportion to her body length than are the wings of either workers or drones. The queen appears more wasplike than the other bees appear because of her tapering abdomen. She is usually surrounded by a court of young workers who feed and care for her.

The queen hatches from a fertilized egg and develops in a special cell called a queen cell. The queen cell is easily distinguished by its larger size, peanutlike appearance, and vertical position on the comb. When a new queen chews her way through the bottom of her cell, she first feeds on nectar and pollen. Then she begins to search for other queen cells. She chews a small hole in the wall of each queen cell that she finds, stings, and kills the developing rival queen. If two queens emerge from their cells at the same time, they fight until one is killed.

The young queen will mate when 6 to 8 days old. She mates while flying. She may fly and

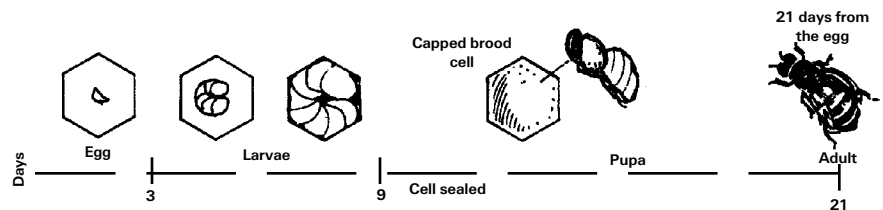
mate for 2 or 3 days with an average of 8 drones total. But once the mating process is complete, she returns to the colony and after 2 to 4 days, begins her life of laying eggs without ever mating again. She can lay either fertilized or unfertilized eggs, according to the needs of the colony.

When a colony prepares to swarm, the worker bees build several queen cells, and the queen lays a fertile egg in each one. The bees that are left behind will have a new queen to replace the one that leaves with the swarm. If the queen is suddenly lost by accident or disease, the workers change a worker cell that already has female larva less than 3 days old into a larger, longer queen cell. This larva is fed nothing but royal jelly, and, as a result, a queen develops instead of a worker.

The queen bee may live 3 to 5 years, but the average length of a queen's life is about 2 years. Under warm conditions most queens wear themselves out laying eggs in 1 or 2 years and should be replaced.

Worker bees are infertile females that develop from fertilized eggs in worker-size cells. They are the smallest members of the colony and form the greatest part of the colony's population. A colony may contain 50,000 to 90,000 workers at the height of the season.

The worker bee is remarkably well equipped for doing all of the work of the colony. She has a long tongue for collecting nectar, a honey sac (or crop)



Development cycle of the worker honey bee.



Nurse bees caring for larvae.

for transporting nectar, pollen baskets on her hind legs for transporting pollen, four pairs of wax glands on the underside of her abdomen for secreting wax to make a comb, and glands for secreting royal jelly. Royal jelly is

a food that is fed to all bees for the first 2½ days of their lives and to a queen larva during the entire larval period. The worker has a barbed stinger for defending herself and the colony. When she uses her stinger, it usually remains attached to the victim and is torn from her body. She dies soon afterward. She has many other physical and behavioral adaptations for performing her duties in the colony.

The workers build the combs; clean the hive; clean and polish the cells; collect pollen, nectar, water, and propolis; convert nectar to honey; feed the immature bees; feed and care for the queen; and guard the hive.

Workers reared during the spring, summer, and early fall usually live only 4 to 6 weeks, while those reared in late fall usually live through the winter, possibly for about 4 months.



Worker larvae of varying ages feeding on royal jelly.

The worker usually does not lay eggs. When a colony becomes queenless for a long period, one or more workers are fed royal jelly by other workers, and their ovaries and reproductive systems develop so they are able to lay. Since they are unable to mate, the eggs will all be unfertilized and will produce only drones. The presence of several eggs in one cell, usually on cell walls, is an indication that laying workers are in the colony. Ask for advanced help with such a colony.



Autumn drones on the entrance board.

Drones are the males of the bee colony and develop from unfertilized eggs laid by the queen in large, drone-size cells. A drone is much larger and stouter than a worker or a queen although not as long as a queen. A young drone feeds himself from honey cells within the hive. Drones soon learn to solicit food from workers and are fed, by workers, for the remainder of their lives.

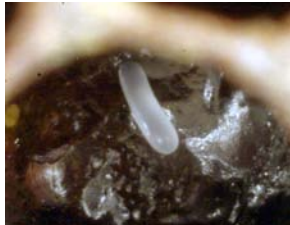
The drone has no pollen basket, no honey sac, no wax glands, no stinger, and can perform no hive duties. His only known function is to mate with a young virgin queen. He mates with the queen while flying. After mating, the drone falls to the ground and dies.

Normal colonies begin to rear drones in the spring when nectar and pollen become plentiful. Special cells are made by workers for rearing drones. These cells are larger and less numerous than worker cells. Drone cells are normally built in areas at the bottom or top of the combs or in areas where worker cells have become misshapen. The number of drones in a colony varies from a few hundred to several thousand.

The workers stop feeding the drones when the nectar flow stops in the fall, and the drones become weak from starvation. The worker bees then carry them from the hive to die. Drones can live about 8 months if not killed during the mating process.

Development Stages

There are four stages of development in the life of the honey bee. These are the egg, the larva, the pupa, and the adult. Developing bees, from the egg stage to the time they emerge as adults, are commonly referred to as brood. The brood from which workers emerge is called the worker brood; drones



The small honey bee egg attached on the cell bottom.

emerge from the drone brood. The number of days required for the development of the queen, worker, and drone differs. The worker requires 21 days to develop while the queen requires only 16. The drone bee requires 24 days to complete development.

The Bee Hive Design

The hive is the home of the bees. Bees' natural hives may be a hollow tree, the wall of a building, or a small cave in rocky areas. However, in many states it is illegal to intentionally keep bees in hives without removable frames.

Moveable-frame hives have several advantages. You can get three to ten times more honey from these hives, and the honey is much easier to harvest. In addition, it is much easier to check the progress and health of your bees at any time and to control swarming. Each part of the hive has a specific function.



A newly assembled and painted hive.

The **hive stand** is the base on which the hive sits. You can buy or easily make a stand, or you can use bricks, concrete blocks, or short posts set in the ground. The important thing is to get the hive a few inches off the ground.

The **alighting board** (landing board) makes it easier for bees returning from the field to enter the hive. This part is often combined with the hive stand.

The **bottom board** forms the hive floor. Bottom boards are reversible having a deep side and a shallow side. Some modern bottom boards may have a screen opening to help control Varroa mites.

The **entrance reducer** or **entrance cleat** is used to reduce the size of the hive entrance, especially in winter. Its primary purpose is to keep mice from entering the hive. This should be removed in the summer and during periods of heavy nectar flow to allow faster entrance and exit of the field force and to aid in ventilation.



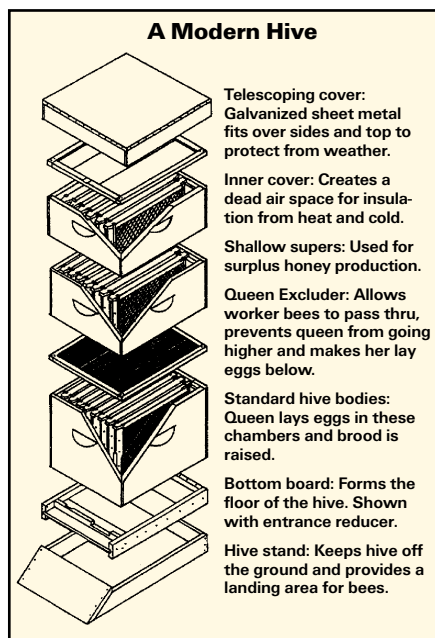
A colony with an entrance reducer in place in preparation for winter.

The **brood chamber** is where the young bees that eventually maintain colony strength are raised. This equipment part is frequently called the hive body.

The **frames** surround and support the combs, which are built by worker bees from the comb foundation. The combs are used for brood rearing and for storage of honey and pollen. You will also need beeswax foundation (commercially prepared wax sheets on which bees will build combs) and materials for installing them. A wide selection of foundations is available. Plastic frames and plastic foundations are readily available commercially and are faster and easier to use.



A woodbound queen excluder.



(Schematic from Rossman Apiaries Equipment Catalog, Moultrie, Georgia)

The **queen excluder** is a device placed between the brood chamber and the supers where surplus honey is stored. This keeps the queen from laying eggs through-out the hive. The openings in the queen excluder are large enough to allow only workers to pass through to fill the combs in the supers with nectar.

The **super** is where the surplus honey is stored. You will get honey for your use from here. There are four different kinds of supers: deep, medium-depth, shallow, and section. Select supers according to your personal preference. The deep super is the same size as the standard brood chamber. In fact, they are the same equipment with different uses. Deep supers, when filled with honey, are heavy and difficult to handle. Many beekeepers prefer the shallow super, especially if they are producing cut-comb honey. A common practice is to use two deep supers as brood chambers and several shallow supers for honey storage.

Some beekeepers prefer to use medium-depth supers for both brood chamber and honey storage. In this arrangement, three medium-depth supers are

used for the brood chamber and several for honey storage. The equipment is also lighter. This allows the interchange of equipment throughout.

Section supers are designed for the production of comb honey sections, and they require special frames. Though not difficult, producing comb honey requires beekeeping experience.

COMMON EQUIPMENT NEEDED TO START ONE BEEHIVE

First Year

- A complete basic hive
 - Hive stand and bottom board
 - Two hive bodies, each with 10 frames and foundation
 - An inner cover and an outer cover
 - Paint
- Bees—probably a 3-pound package
- A veil, smoker, and hive tool
- A division board feeder or a boardman feeder

Second Year

- Three supers, each with 10 frames and foundation
- Small extracting setup (or borrow a friend's)
 - 2-4 frame extractor
 - Uncapping knife and cappings scratcher
 - Settling tank (or use 5-gallon plastic buckets)



The **inner cover** fits evenly around the edge of and over the super and serves to keep out drafts of air, ants, and other enemies of bees. More importantly, it allows the outer telescoping cover to be removed without damage to the hive. A bee escape placed in the hole in the inner cover converts it to an escape board, which may be used to remove bees from the combs of honey at harvest time.

The **outer cover** is the top of the hive. It should be covered with galvanized metal or aluminum to protect the wood. The telescoping outer cover fits down over the inner cover, giving added protection. If a nontelelescoping outer cover is used, an inner cover is not needed.

Plastic beekeeping equipment has been available for years. It is becoming more common in traditional beekeeping. Plastic frames, bottom boards, inner covers, outer covers, and hive bodies are all available in various kinds of plastic. Beekeeper opinions vary when comparing wooden hive components to plastic hive components.

Paint the outer portions of your hives with two coats of white paint several weeks before you get your bees. Do not paint the inside of the hives, but paint both sides of the bottom board. Latex is the type of exterior finish for hives.

Building your own or buying used equipment are ways to lessen the cost of equipment. If you buy second-hand hives and parts, have them inspected by the state apiarist to be sure they are disease free. If you build your own equipment, follow beehive construction plans. The measurements are critical.

*Make bee friends.
Attend local bee meetings.
It's a good way to get your
questions answered.*

Selecting Protective Equipment and Honey Extracting Equipment

The amount and type of equipment you choose are your personal decisions. Your basic equipment should include a bee veil, a pair of gloves, a hive tool for opening hives and removing frames, a smoker, and a bee brush for getting bees off the comb when harvesting honey.

You will need an uncapping knife and extractor if you plan to extract and bottle honey. A small, hand-operated, two-frame extractor will be good for a start. Proper care of your equipment will save you time, money, and work.

Choose a dry place to store equipment when it is not in use. Cover it to keep out dust. Combs in storage should be fumigated to kill all stages of the wax moth and protected to prevent reinfestation from wax moths.



A beekeeper dressed for sting protection.



A small honey extracting operation.

How to Start Beekeeping

Though planning should occur in the fall, spring is the ideal time to actually begin to keep bees. The best months are late March and early April when fruit trees and early flowering plants are in bloom. The longer days, warmer weather, and nectar and pollen from spring blossoms will help bees get off to a good start. If you start with packaged bees or a nucleus colony, your bees will build combs and increase their populations on the early nectar flow.

Do not expect to harvest much, if any, surplus honey the first year. Your bees may need all the honey they can store the first season to overwinter in good condition and to produce well the second year.

It is best to start with two colonies. Having two gives you the advantage of being able to exchange brood, bees, and combs in case one of the colonies needs some help. However, do not make exchanges between the colonies if there is danger of disease. In addition, do not try to keep more than two hives until you feel you can manage more. Too many colonies may keep you busy just supplying them with supers, and you will not be able to enjoy learning the details of beekeeping.

Getting Bees

There are four ways to get honey bees to start beekeeping:

- (1) Buy a mated queen and a 3-pound package of bees.
- (2) Buy a full-strength colony or nucleus colony (a small colony with three to five frames of brood, bees, and queen).
- (3) Capture a swarm.
- (4) Relocate a colony from a tree or building to a hive. This is considered to be an advanced procedure and is not recommended for a new beekeeper.

Packaged Bees

The best way to start beekeeping is to buy a mated queen and a 3-pound package of bees for each colony you plan to start. Place the order early and indicate when you want the bees shipped. You should have your hives, feeders, hive location, and all other equipment ready and waiting when your bees arrive.



Packaged bees, produced in the South, awaiting shipment.

Packaged bees are shipped in a screened cage. This cage will contain the worker bees, a feeder can of sugar syrup, and the queen bee in a smaller queen cage. The queen cage is suspended beside the syrup can at the top of the package or just below the can. The queen usually has a few attendant worker bees and a special candy in the cage with her.

When they arrive, place the package of bees in a cool, dark, well-ventilated room until you can install the bees in the hive. The bees can be kept in the package for a day or two if there is plenty of sugar syrup in the feeder can. If the feeder can is empty, brush or sprinkle sugar syrup on the screen twice a day. Use only as much syrup as the bees will clean up readily. A 3-pound package of bees will consume about a pint of syrup in an hour. The bees will be much more gentle and easy to handle when placed in the hive if they are well fed.



Late afternoon is the best time to install bees in the hive so they will settle down quickly without flying too much. You must continually feed packaged bees with sugar syrup until plenty of nectar is available and the colony is strong enough to forage for itself. The bees will no longer take the syrup when the colony is strong enough and nectar is available.

Place the cage on its side and sprinkle or brush the sugar syrup on the screened cage sides about 1 hour before time to put the bees in the hive.

When you have everything ready to install the bees, put on your veil and get your hive tool and smoker. Remove five frames from the hive body and push the other five frames to one side of the chamber. You probably won't need it, but light the smoker and have it ready. It is best to reduce the hive

MAKING SYRUP

Make syrup from equal parts of water and granulated white sugar. Corn syrup, purchased from bee supply companies, can be fed to colonies without mixing. Use hot water to make the syrup, but do not boil the mixture. Hot tap water may be sufficient. Add the sugar and stir it until it is thoroughly dissolved. Make about 5 pints of syrup for each package of bees you have to install. Make it a few hours before you plan to put the bees in the hive so the syrup can cool.

You can make a feeder from a gallon-sized, friction-top can or a large-mouth glass or plastic jar with tiny holes in the lid. Holes should be made with the point of a small nail. A frame nail works nicely. Several styles of feeders can be purchased commercially.



entrance with an entrance cleat or stuff the entrance lightly with green grass. Sprinkle the bees through the screen with enough lukewarm water to thoroughly wet them and loosen the cover of the package, but do not remove the cover. Give the package a sharp bounce on the ground to knock the bees to the bottom. Remove the syrup can and queen cage and temporarily replace the cover over the hole.

Check the queen cage to make sure the queen is alive. Then remove the cork or whatever covering from the end of the queen cage where candy is located so worker bees can eat the candy and release the queen. The cage may be either plastic or wood. Punch a small hole through the candy with a small nail, and wedge the queen cage, candy-end up, between two frames in the center of the hive so that the screened face of the cage is exposed to the bees.

Shake enough bees over the queen cage to form a small cluster. Shake the remaining bees from the package into the hive. It may be difficult to shake the last few bees from the package. The bees flying and crawling outside the hive will find the hive if the weather is not too cold. Gently replace the other frames in the hive and put the feeder on top of the frames with the holes downward. Then place a super without frames over the feeder and put on the hive cover.

The next day check to see if the bees are going in and out of the hive; otherwise, do not disturb the hive for about 3 to 4 days. Then check the feeder; if it is empty, refill it. Be very careful to disturb the bees as little as possible. After the bees have been in the hive for about 5 days, check the colony to see if the queen has been released and is laying. Wax comb will be started on the foundation, and there will be a few eggs and some syrup stored in the cells if the colony is developing normally. Use



Package bees being shaken into a new hive.

as little smoke as possible and handle the bees and equipment gently. Remove the empty queen cage, remove any burr comb that the bees may have built around the queen cage, refill the feeder with syrup, and close the hive quietly.



A new queen caged with attendant bees.

The purpose of the first inspection of a packaged colony is to see if the queen is alive and laying. If you see eggs in cells,

don't look for the queen. You know she is present and laying. If the queen is not present or laying after 7 to 8 days, you must do one of the following:

- (1) Immediately introduce another queen.
- (2) Give the colony a comb with eggs and larvae.
- (3) Unite the bees with another colony.

There are no other alternatives. Providing the new colony with a new queen is the best option.

Since queens in colonies started from packaged bees may die or be superseded during the first 6 weeks, you should check your colonies about once a week to make certain all is well. A clue that things are not going well will be the presence of developing queen cells. It usually takes about 12 weeks for a colony started from packaged bees to reach a large population.

Remember to continue feeding your bees until all the frames have wax combs or until the bees no longer take the syrup. Bees should be fed any time there is a shortage of nectar during the first year.

By checking your bees regularly, you will know when to add another hive body or super. Regular checks will also help you gain experience in working your bees, so your experience and your colony grow at the same rate. This experience may save you bees, honey, money, time, and disappointment later.

Established Colonies

Use care when buying established colonies from another beekeeper. Hives offered for sale may be homemade with poor combs. Sometimes, the bees may be diseased or have high mite populations. However, in general, purchasing an established colony is a good way to start beekeeping. There is nothing wrong with good homemade equipment built to proper dimensions, but hive bodies and frames made without regard for the proper “bee space” are worthless. The bees themselves can be improved at slight expense by requeening the colony. The state bee inspector may be able to help when purchasing established colonies.



Using a nucleus hive to make a split from nearby colonies.

Nucleus Colonies

A nucleus colony is a small colony made up of three to five frames of bees with a queen. It is frequently called a “nuc” (pronounced “nuke”).

The advantage of starting beekeeping with nucleus colonies is that you have developing bees (brood) that will quickly increase the size of the colony. Be sure the bees are from colonies free of disease. The nucleus colony will need incoming nectar, or you must feed it sugar syrup until all its combs are completed.

Hiving a Swarm

Though not as common as it once was, it is still possible to start your colonies by using swarms. Getting a swarm is unpredictable and swarms are not usually available as early in the spring as packaged bees. Swarms contain old queens that should be replaced before supersedure begins.

When you find a swarm of bees clustered on the limb of a tree or bush, cut the limb as gently as possible. If you can't cut the limb, shake the bees into a container you can cover. Carry the bees to an open hive you have prepared with foundation, and dump them into it. Though not necessary to find her, try to locate the queen, and be sure she goes into the hive. Put a frame of unsealed brood in the hive if you have other bees. This will help keep the swarm in your hive.



A springtime bee swarm on an apple tree limb.

Don't look for perfect bee yards—look for good yards. All bee yards have a few problems.

Selecting an Apiary Site

The location and arrangement of an apiary is important to the bees and to the people and animals close by. Location may make the difference between success and failure of your bee project.

Choose a well-drained area that is shaded at least part of the day. Pine trees make good shade for hives; the edge of a wooded area is also good. Avoid deep shade, tall weeds, and shrubs where air cannot circulate.

CHARACTERISTICS OF A GOOD BEE YARD

- Accessible year-round by vehicle
 - Close to sources of nectar, pollen, and water
 - Well-drained
 - Away from frost pockets
 - Exposed to morning sun and afternoon shade
 - Protected by fences or plant barriers
 - Minimally exposed to pesticides
 - Has storage facility and scenic vistas
(These are nice but not necessary.)
-



A good supply of clean water near the apiary is helpful to your bees for cooling the hive and for processing honey. Bees cause problems by collecting water at such places as faucets, swimming pools, and birdbaths. They will continue to use a water source all during the flying season when they become accustomed to it. Provide a dependable water source for your bees if you are in a hot climate where water is routinely scarce or if there is a drought. A hose or faucet dripping on a board usually meets the need.



A nice, shaded apiary location.

If possible, hives should be located where you can haul equipment in and out and have room to manipulate the hives. They should be at least 4 feet apart to make it easier for worker bees to find their own hive. Worker bees will enter the wrong hive if they are closer together. This is called drifting. If possible, place each hive so the entrance faces east or south so the morning sun can warm the entrance in the early spring and late fall.

Another very important consideration in locating your apiary is a source of nectar and pollen throughout the spring, summer, and fall. The plants from which the bees gather nectar determine honey color and flavor. Though honey bees can gather food and water 1 to 2 miles from the colony if necessary, they get most of their nectar and pollen from within about a half-mile radius of the hive. Location, from this standpoint, should not be a problem for two or three hives, even in cities.

Do not locate hives near a field that is routinely treated with insecticides. Unfortunately, many insecticides are highly toxic to honey bees, but not all insecticides are equally hazardous.

The hives in many apiaries are arranged in neat, straight rows. Though this looks nice, it is much better to place the hives in some irregular pattern so that field bees will more likely return to their own colony. Field bees drift to the end hives increasing their population at the expense of the colonies in the center of rows. A semicircular, U-shaped, S-shaped, or other irregular arrangement reduces drifting.

The ideal winter location for bees is one that receives full sunlight part of the day and where water and colder air will drain away from the hives. Hives may be located on the southern slope of a hill or in an area protected from cold winds by trees, shrubs, buildings, or some other windbreak. A windbreak is beneficial to the colony in late winter and early

spring when there is a large amount of brood in the hive that must be kept warm.

Examining the Colony

Until you gain some experience in working your bees, the best time to examine a colony is between 10:00 a.m. and 3:00 p.m. on a warm, calm, sunny day when the bees are working. Bees are much more defensive during cool, chilly weather, early in the morning, late in the afternoon, during cloudy or rainy weather, or when the nectar flow has been suddenly interrupted.

A beginner should close the hive and wait until another day if the bees seem restless. Bees may be extremely defensive one day and unusually calm the next. Don't try to work unruly bees until you have gained some experience.

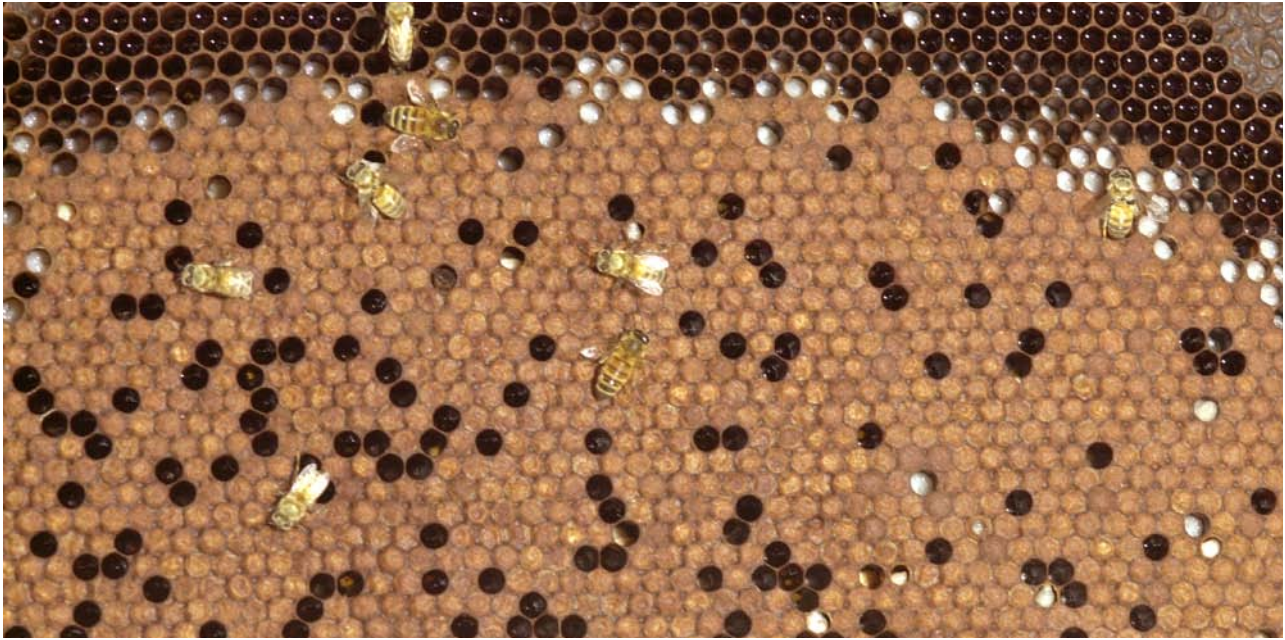
The first step is to light your bee smoker. Select a smoker fuel that will hold fire, burn slowly, and make plenty of white smoke. Cotton or burlap rags, well-dried rotten wood, or pine straw make good smoker fuels. Many Southern beekeepers use pine straw, which works well. Give several puffs with the bellows to be sure that the smoker is well lighted and giving off cool, white smoke.

Put on your bee veil and be sure your pant legs are tied above the ankle or tucked into your socks or boots. Use gloves if necessary. Stings are unavoidable but can be kept to a minimum using protective clothing.

All movements in working bees should be slow and gentle to minimize disturbing and exciting them. Your examination should do little or no damage to the bees and combs.

Approach the hive from the rear or side. Avoid standing in front of the entrance or getting in the





A good brood pattern.

bees' line of flight. It is best to stand to one side of the hive and blow two or three puffs of smoke into the entrance to subdue the guards.

The next step is to remove the outer cover of the hive as gently as possible to avoid arousing the bees. Then gently pry the inner cover loose with your hive tool. It probably will be necessary to pry from more than one corner to loosen the cover without jarring the hive. Blow two or three light puffs of smoke through the gap between the inner cover and the hive body. Let the inner cover down again for a moment. Gently lift it up again and blow in two or three more light puffs of smoke. This should be enough smoke to drive down any bees at the top of the hive. Be careful not to oversmoke the hive. Over-smoking will cause the bees to stampede and make handling much more difficult.

Place the covers upside down near the hive entrance but out of your way as you remove them.

You are now ready to lift out the frames. They may be stuck together with propolis (bee glue). With your hive tool, gently loosen the frames, one at a time, at the ends. It is always best to take out the first or second frame from the edge of the colony. The queen is less likely to be found at the side of the hive, so there is less danger of injuring her. Handle the frame containing the queen very carefully.

The outside frames may need loosening along the sides of the hive. If the outside frame is difficult to remove because of a bulging comb or because the comb is attached to the side of the hive, loosen the next frame. Gently lift the frame out holding it by the upper corners so you won't damage the comb, which may contain honey, pollen, or brood. Ideally, have an empty deep hive body available for holding

the removed frame. For convenience, set the empty deep hive body on the upturned outer cover. A less desirable method is to lean the frame against the hive while you work. This may be the only frame you will need to set out of the hive. The others may be lifted out, examined, and moved to the sides. Burr comb and propolis may need to be scraped off before frames can be replaced in the colony.

When you are ready to close the hive, replace the frames in the order in which they were removed. Push all of the frames to one side to give you room to put back each frame after you take it out. After all the frames are back in place, space them so there is about $\frac{1}{4}$ inch between the side of the hive and the outside frames. Gently replace the inner and outer covers. Take extra care not to pinch or crush too many bees because this might disturb the entire colony and result in more stings.

Remember, clear, warm days, proper use of your smoker, and gentle, slow movements will help you reduce trouble when you examine your bees.

Fall and Winter Management

The beekeeper's year begins in the fall. How you manage your bees in the fall determines, to a large extent, how productive your bees will be the following spring. Fall is the time to prepare your bees for the coming winter.

To be in first class condition for wintering, each colony should have a young, vigorous, laying queen; a minimum of 40 to 50 pounds of honey (this is about two shallow supers of honey or a well-provisioned hive body and one super of honey); the equivalent of 3 to 5 well-filled standard-sized combs of pollen; a population of disease-free bees that will cover 10 or more frames; and hive location where there is sunlight, water, good air drainage, and protection with some kind of windbreak.

The best time to requeen in the Southeast is during the late summer and fall nectar flows. Colonies should be requeened any time it is necessary during the active season, but if you can choose your time, choose August or September. Queens are cheaper and easier to get at this time of year, and you will start the spring with a young, vigorous queen that should ensure a good spring buildup, a large colony for the spring nectar flow, and less likelihood of swarming.

Queens should be ordered from a reputable queen producer and the order placed in plenty of time to ensure delivery when you need them.

Good fall nectar flows occur in many parts of the Southeast. Fall honey is usually strong flavored and, though perfectly edible, is not desirable for human consumption.

A good way to check the stores in the fall is to visit the apiary on a warm day when the bees are flying. Lift one end or one side of the hive to determine by weight the amount of stored honey. All is probably well if the hive feels as if it is nailed to the ground. However, if the hive is light and feels as though you should put a rock on top to keep it from blowing away, the bees need feeding.

Colonies that do not have 40 to 50 pounds of honey by early autumn should be fed enough sugar syrup to equal this amount. Use 2 parts sugar to 1 part water to make the syrup. Each gallon of this sugar syrup will increase food reserves by about 7 pounds. Colonies should be fed early enough in the fall that the bees will have time to elaborate the syrup into "stores" before cold weather, but not so early that they will use up the syrup in brood rearing. There are several types of feeders and methods of feeding bees sugar syrup. Be careful. Bees should be fed in the late afternoon to reduce the chance of bees from one hive robbing another hive of its sugar syrup or honey stores.

Bees cannot begin or maintain brood rearing without pollen. Pollen should be stored in the hive to be available during late winter, because normal colonies begin brood rearing several weeks before a good supply of pollen is available in the field. If you have a colony that is short of pollen, it should be fed pollen supplement in late winter to start and maintain early brood rearing during late winter and early spring.

For various reasons, you may have weak colonies in your apiary from time to time. In most cases, it is poor management to overwinter a small or weak colony because in most locations the weak colony will not have time to increase to its peak population for the spring nectar flow. In early fall, a weak colony can usually be strengthened by transferring extra honey, pollen, and sealed brood from a strong colony if there is no danger of spreading brood diseases. If this is not practical, a weak or queenless colony may be united with a stronger queen-right colony.

In early fall, carefully check each colony for symptoms of bee diseases, especially American foul-brood. After the fall nectar flow is over, remove all empty hive bodies and supers. These extra combs, hive bodies, and supers should be fumigated to kill all stages of the greater wax moth and properly stored to prevent reinfestation and protect from dust and dirt. The queen excluder should be removed before winter. This will enable the queen to move with the cluster during the winter.

Another means of saving stores and helping bees get through the winter is to install an entrance reducer. Provide an entrance 4 inches wide and $\frac{3}{8}$ inch deep. This helps keep out cold air and mice that may cause trouble during the winter months. Hive entrances should not face the direction of the prevailing winter winds. It may be beneficial in some locations to ventilate the top of the hive to permit escape of moisture-laden air. This can be

accomplished by raising the front edges of the inner cover $\frac{1}{4}$ inch with twigs or stones. Precision is not required. Do not disturb your bees during the winter months unless you are feeding them.

Even though you will not be working with your bees in the winter, there are still some jobs to be done. Clean, repair, and paint any hive parts you have taken off. This is also a good time to cull bad combs. Closely check stored combs, and don't let the greater wax moth larvae damage them.

If you are planning to increase your colonies in the spring, winter is a good time to assemble and prepare any new equipment you will need.

Winter is also a good time for study and reading to improve your knowledge and skills in working with bees. You may wish to attend meetings and visit other beekeepers to exchange ideas and learn from them.

Visit your apiary from time to time to check for signs of trouble during the winter. You may need to protect your apiary from livestock, skunks, and other animals that might upset the hives or disturb the bees.

In January, select a warm, calm, sunny day to remove the entrance reducer and clean out any dead bees that have accumulated on the bottom board. Replace the entrance reducer. Check the colony's food supply by lifting the hive from the side or the rear to see that it is heavy with plenty of honey. The bees need to be fed if the hive feels light. When you find a colony that does not have some sealed honey in the hive, it is on the brink of starvation and should be fed immediately. If emergency feeding is necessary, use sugar syrup made of 2 parts sugar to 1 part water drizzled directly into the empty cells of combs. Place two or more combs on each side of the cluster. This is a desperate measure and failure is common.



Several styles of hive feeders.

In February, clear the entrance of dead bees, check the food supply, and see if the queen has started laying. If you find a colony queenless, it should be requeened, united with a stronger queen-right colony, or provided with a comb with eggs and/or larvae not more than 3 days old so that the bees themselves can raise a queen. At this time of year, requeening is difficult because of the scarcity of replacement queens and drones for mating.

Any time a dead colony is found, the hive should be closed, made bee-tight, and removed from the apiary. As soon as possible, the remains of the colony and the hive should be examined to determine the cause of death. If death of the colony was caused by disease, it should be handled according to recommendations for disposing of diseased bees and equipment. The hive should be cleaned and stored for future use if there is no evidence of disease.

Spring Management of Overwintered Colonies

Your bees must be ready for the nectar flow if they are to store a good amount of surplus honey. The ideal situation is to have all of your colonies at or near maximum strength as close to the beginning of the nectar flow as possible—not too early and not too late.

Brood rearing will begin about Christmas or soon after. Your bees will be using the stored honey and pollen to feed the developing bees. Pollen is the bees' source of protein, and honey is their source of energy.

It may be necessary to feed the bees if you did not leave them enough honey or if they did not store enough honey and pollen during the fall. A sugar syrup and/or pollen supplement or substitute may be fed in the late winter or early spring to have the colony strong when the nectar flow begins.

Late winter/early spring is a critical period for a colony of honey bees. Keep a close check on the

amount of honey and pollen stored in the hive. A colony of honey bees should have 15 to 20 pounds of honey stored in the hive at all times. A strong colony with a good queen may use up all its stores just before the spring nectar flow. Such a colony, with a large amount of brood to feed and keep warm, will greatly increase its consumption of stored honey and pollen. It may use all the food in the hive and die of starvation within a few days of the time nectar is available in the field. Don't let them die of starvation when one or two combs of honey or one or two gallons of sugar syrup will carry them to the nectar flow. Though sugar syrup is good, honey is the best food for bees. You can use combs of honey that have been saved for this purpose or from colonies with a surplus if there is no danger of spreading diseases. If combs of honey are not available, feed your bees sugar syrup made of 1 part sugar to 1 part water.

Pollen is essential to brood rearing. If your bees don't have pollen stored in their hives during the late winter and early spring, they cannot start brood rearing. If a colony starts brood rearing and runs out of pollen, brood rearing will stop. If your bees don't have pollen, feed a substitute available from bee supply houses.

It is not usually necessary to feed pollen substitutes in many parts of the South.

Colonies that are overwintered in two- or three-story hives slowly move into the top story of the hive as the



An overheated, populous hive in need of supering.

season progresses. In most cases, you will find the brood nest in the top super during early spring inspections. The queen normally expands the brood nest out and upward, and she is not likely to move down when laying. When the top super becomes crowded, the queen will slow down or stop laying, and signs of swarming are often seen. To correct this situation, reverse the brood chambers. Reverse the brood chambers about 6 weeks before the spring nectar flow. On a warm, calm, sunny day, pry the brood chambers apart, clean the bottom board, and place the top brood chamber on the bottom board and the bottom brood chamber on top. This places the brood nest and the queen on the bottom with empty comb space above for the queen to move into and continue laying. Reversing the brood chambers will provide adequate room for the natural, upward expansion of the brood nest. This will stimulate brood rearing. Be sure some honey is in the hive body directly above the brood nest. To reverse the brood chambers in a three-story hive, place the top super on the bottom board and the bottom brood chamber on top. This leaves the center chamber in its original position. Three weeks later, reverse the chambers again, check the brood pattern to see that the queen is laying well, and add a honey super.

During early spring inspections, weak or queenless colonies should be united with strong queenright colonies. One big, strong colony will store more surplus honey than two small colonies will store under the same conditions.

*In spite of your best efforts,
sometimes a colony will swarm.
Don't worry about it.*

Swarming

Swarming is the natural means of propagation of honey bee colonies. Swarming may occur at any time of the spring, summer, or fall, but it is most likely to occur in the spring just before or during the nectar flow. All bees may swarm under certain conditions, but some races and strains are more inclined to swarm than are others.

When bees are preparing to swarm, they will always build queen cells. These are easily recognized by their large size, peanutlike appearance, and vertical position on the comb. Numerous queen cells on the lower parts of the combs or frames are called swarm cells. The bees may start one or two each day over a period of a week or more.



Swarm cells surround worker brood.

Several conditions contribute to swarming. A crowded brood nest is one of the main causes. Another is the age and productiveness of the queen. Poor ventilation of the hive and weather conditions affecting the nectar flow may contribute to swarming.

tribute to swarming.

Since neither the swarm nor the parent colony has time to increase its population to maximum strength in time for the spring nectar flow and will not store as much honey as the original colony, swarming should be controlled or prevented by good management.

Bees will be overcrowded in the brood nest before queen cells are started. The bees may cluster on the outside of the hive because there is literally no room for them inside. If you look into the hive entrance, the bees will appear to hang below the combs because of crowding. However, in extremely hot weather, bees may cluster on the outside of the hive. This should not be mistaken for swarming.

The first step to prevent swarming is to requeen each colony in the fall since the queen has a tremendous influence on whether the colony swarms. Most young, vigorous queens produce enough queen chemicals (pheromones) to prevent swarming except under conditions of extreme crowding.

The next step is to provide adequate room for brood rearing. This may be done in several ways. Probably the simplest is to reverse the brood chambers, which makes space available for more egg laying above the full chamber. The queen can then expand her brood nest upward. Be sure to destroy all queen cells while reversing the brood chambers. Check for and destroy queen cells at 7- to 10-day intervals. It may be necessary to reverse the brood chambers again before the nectar flow starts. Once it starts, you rarely need to worry about swarming if hives are properly supered.

You need three to five or more medium or shallow supers for each strong colony. Keeping hives properly supered will allow plenty of storage room for surplus honey, thus eliminating the need for using the brood nest for honey storage.

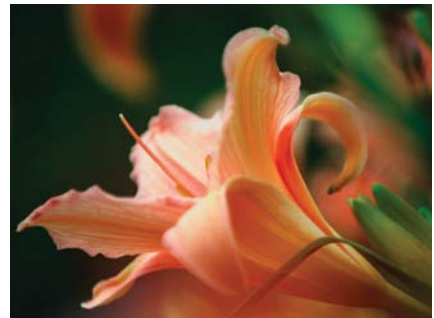
The adult bees also need room to congregate when bad weather keeps them in the hive. Sometimes it may be necessary to add a super before the nectar flow to provide enough space for all of the adult bees to get inside.

You can also relieve congestion in the brood chamber by moving frames that are filled with honey to another hive. Alternatively, frames of capped brood may be moved to a hive that needs more bees. Uncapped brood may be moved, but do not give a weak colony more than the bees can care for. Be sure you remove filled comb and replace it with empty brood comb or frames with foundation. Alternate the empty frames with those already in the brood nest. Do not remove enough brood to reduce the

population to the point that the colony cannot harvest a maximum crop of honey.

Some beekeepers clip the wings of the queen to prevent her from flying away with a swarm. This does not stop the colony from developing the swarming impulse. When the colony swarms, the clipped queen cannot fly, and she remains at the hive. Without her, the swarm soon returns. Many times a colony will attempt to swarm several times under these conditions. If this happens, the swarm will leave with the first virgin queen to emerge.

Queen cells built on the face of the comb and near the top are called supersedure cells. These cells are not as numerous as swarm cells. They are all the same age and are an indication that the reigning queen is failing. Supersedure cells are not an indication of impending swarming. As the queen becomes older, her capacity to produce eggs slows down. Worker bees will then rear a new queen to replace the old one. Supersedure may or may not result in swarming. In some cases, you may want to allow the supersedure process to get a new queen, but requeening is a more effective way to prevent swarming. Never allow supersedure during the honey flow because it may result in swarming when the queen leaves the hive to mate. The clipping procedure is not supported by all beekeepers.



DEMAREE METHOD OF SWARM PREVENTION

Another method of swarm prevention is the Demaree method. One version of this method is to open the brood chamber and locate the queen. Place one comb containing unsealed brood, eggs, and the queen in the center of an empty brood chamber and fill the remaining space with empty combs. Examine all brood combs and destroy all queen cells. Remove this hive from its bottom board and put the brood chamber containing the queen in its place. Then place a queen excluder on top of the brood chamber and put one or two supers above the excluder. Place the remainder of the brood and the bees in a hive body at the very top of the hive. In 7 to 10 days, examine the brood combs in this hive body and destroy all queen cells that have been started. When the queen fills the brood chamber under the queen excluder, add another brood chamber under the excluder or simply raise the excluder to give her access to the second story. It is seldom necessary to use the Demaree method more than once during a season.



The Nectar Flow

The major nectar flow is a thrilling and busy time for any beekeeper. It is when plants are yielding nectar and bees are collecting it.

It is also when the bees are making and storing surplus honey. The time of the nectar flow will depend on where you live. April and May are usually the months of greatest nectar flow, and the best surplus honey is stored then.

Check your bees regularly to see that the queen is laying abundantly to assure a large force of workers. If the brood nest becomes crowded with bees and honey, add another brood chamber.

How often you need to check your bees will depend on several things: the size of the colony, the availability of nectar, and the time that each major nectar flow starts. The length of time between checks is more or less a matter of judgment. Close observation is necessary.

Queen Excluder

A queen excluder confines the queen to the brood nest to prevent her from laying eggs in honey supers. Some queens will lay a narrow band of eggs up the center of the entire hive unless they are prevented from doing so. Using excluders can save time and work until you gain enough experience to manage bees for honey production without an excluder. Put the excluder and first super on the hive before the nectar flow to let the bees become accustomed to passing through it. The benefits of using an excluder outweigh the disadvantages. (See discussion of queen excluder on pages 10 and 11.)



A good goal is to keep the top super empty. It becomes emergency space when you have an extra good nectar flow year.

Supering

Most surplus honey is stored in a relatively short period of time in boxes called supers. A strong colony may store 15 or more pounds of honey a day during a good nectar flow and ideal weather. Keep a close check on your bees to see that they have ample storage space to store the nectar, to convert the nectar flow into honey, and to store the honey made from it. Keep plenty of supers equipped with empty combs or foundation.

Place the first super on the hive when the honey cells in the top brood chamber or food chamber are whitened with new wax. Add the second super when the one the bees are working in is two-thirds to three-fourths full. It is a good practice to place the new super under the one in which the bees are working to encourage the storing instinct and to prevent the bees from causing discoloration, called travel stain, of the capped combs by repeatedly passing over them. Add the third super when the second super is two-thirds to three-fourths full. Place it under the second super. By this time, all combs in the first super may be capped; if so, you may remove it to avoid having to lift it when more supers are needed. Follow this procedure until



near the end of the nectar flow. Then place the empty super on top so the bees will completely fill all combs and cap the honey in the lower supers.

When it is necessary to use a super of foundation, you can entice the bees to begin drawing the foundation into the comb by exchanging one or more center frames of foundation of comb from another hive. Don't add extra supers until your bees are ready for them.

Nectar Plants

Generally, the plant or plants from which bees gather nectar determine honey color, flavor, and quality. Honey plants may be grouped in several ways, but most important to a beekeeper is the time of bloom. Spring is the season when most high-quality surplus honey is stored.

Primary honey plants in the Southeast are tulip poplar, sourwood, tupelo, gallberry, and the clovers. Clover honey is often used as the standard for comparison. Clovers and other legumes yield a light-colored, almost clear, mild-flavored honey. Tulip poplar nectar produces a high-quality, deep amber, full-flavored honey. Soybeans and cotton yield an amber honey that has good flavor. Both may produce surplus honey, but the use of insecticides makes beekeeping near these fields quite hazardous.

The fall nectar flow usually yields a dark, strong honey that, due to taste, is not a good quality for human consumption. This honey is excellent, however, for wintering bees. The only fall-blooming plants that may yield good quality honey are alfalfa and *Lespedeza sericea*. There are many other plants in isolated instances that are excellent for honey and are good sources of pollen. These may be an important factor in beekeeping success in many areas.

A beekeeper adding a super to a hive.-

Observe your bees closely to learn what they work and, if possible, keep simple records of dates when nectar plants bloom. After a few years, you will know when to expect your greatest surplus honey storage and what quality of honey to expect from various nectar sources.

Harvesting Honey

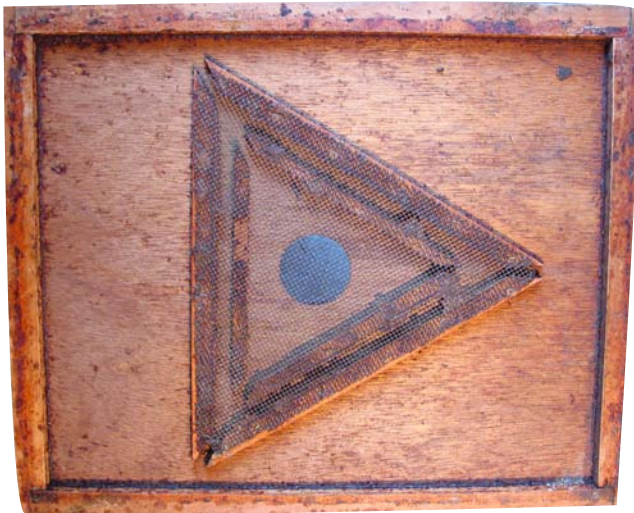
Timing the honey harvest is important. Never take honey from the colonies until it is nearly completely capped, but do not leave surplus honey in the hives too long. To do so results in overcrowding the colony, and the comb honey may become travel stained from bees walking over it. Surplus honey, however, should be removed before the end of the

main nectar flow or during a subsequent nectar flow to help prevent robbing.

There are several ways to remove bees from the supers of honey to be harvested: by smoking, shaking, and brushing the bees from each comb; by using a bee escape board or chemical repellents; or by using a power-driven blower to blow the bees from the super.

If you have only a few supers of honey to harvest, the simplest way to remove the bees is to smoke, shake, and brush them off each comb. As the comb is freed of bees, place it in an empty super or other suitable container and cover it to keep the bees away.

*A few bees will always
be left in the supers after
removing them from the bees.
It's just too hard to get
all the bees out.*



One of several styles of escape boards.

The escape board is an inner cover fitted with a one-way bee escape. Bees can leave but not re-enter the super. Put the escape board immediately below the super to be harvested the day before it is to be removed. Close all other openings into the super so that the bees cannot return. Do not leave an escape board too long during hot weather because the combs of honey may soften or break down or become infested with wax moth larvae. If your operation is large enough to justify the added expense, a power-driven blower built especially for removing bees is the best method.

Remember, honey, like any other food, should be handled carefully and kept clean at all times. It should be tightly covered to keep out insects, small animals, dirt, and moisture.

Processing Honey

The honey crop may be processed as cut comb, chunk honey, or extracted honey. Select combs that are completely capped if you wish to package cut comb honey. Remove the comb by cutting around the inner face of the frame with a hot knife; lift off the frame and cut the comb into proper size pieces. It is best to let the cut edges drain. Carefully place each piece in a separate container so you won't break the caps on the cells of honey. Plastic containers are available from bee supply houses.

Chunk honey is a combination of cut comb honey and liquid extracted honey. If you prefer chunk honey, select combs that are filled and capped. Remove the comb the same way you do for cut comb honey, then cut it into pieces just large enough to pass through the mouth of the jars you plan to use. Usually, two pieces of comb honey are put in each jar. Honey that drips from the comb during the cutting process or honey that you extract or squeeze from the comb may be strained and poured over the comb honey to finish filling the jar. This makes a very attractive package. Many people prefer it because they like to chew the comb.

If you wish to package extracted honey, you must use a honey extractor that removes the honey by centrifugal force. Select combs that are at least two-thirds capped. Honey that has not been capped should have been in the comb at least 2 weeks before extracting.

Combs must be uncapped to extract honey. Several kinds of uncapping knives can be used. You can also use large kitchen knives heated in water. Uncap the combs on both sides.

Put combs of similar weight opposite each other in the extractor. The extracting procedure depends on the extractor you have. Follow the directions with your machine.

Drain the honey out of the extractor and strain it through cheesecloth or a similar fine mesh material to remove bits of comb and other particles. Put the honey in large containers. Cover them properly and allow them to stand for several days. During this time, air bubbles, bits of wax, occasional bee parts, and propolis will rise to the surface and can be skimmed off.

Heating honey to a temperature between 140 degrees F and 150 degrees F for about 30 minutes will prevent granulation and fermentation if honey does not come in contact with air and if equipment is free from crystals of previously granulated honey. This step is not commonly done by most beekeepers.



A commercial honey processing facility.

Never heat honey over direct heat, but steam it in the top of a double boiler. Use a dairy or candy thermometer to check the temperature. After heating, honey must be cooled quickly to retain color and flavor. Proper heating also makes honey strain readily. Straining also helps to clarify honey.

If honey does become granulated, it may be liquefied by placing it in the top of a double boiler and heating the water slowly to 140 degrees F to 150 degrees F. Do not let the water boil. Loosen the jar lid.

If you extract honey, save the frames of combs. These may be reused and your bees will not need to make new combs for surplus honey storage. Return the combs to the hive to be cleaned up by the bees if there is no danger of spreading diseases. If a nectar flow is in progress, the bees may refill these combs with surplus honey. If the nectar flow is over, they should clean the combs in about a week. When the bees have removed the honey and the combs are no longer needed for honey storage, remove the supers of empty combs from the hive, fumigate, and properly store them.

The main advantage to extracting honey is that the reusable combs save labor, money, and time. It also results in greater total yield of surplus honey. Bees consume about 8 pounds of honey to produce 1 pound of wax.



Harvesting Beeswax

Beeswax is a valuable item that can add to your income. Wax cappings removed from the comb for extracting are prime wax. Allow honey to drain from the cappings and place them in hot water in a 5-gallon container. Heat the container until all of the wax has melted. Remove it from the heat and allow it to cool. The wax will float to the top and form a cake when cool.



Molten beeswax coming from an electric wax melter.

*Caution:
Beeswax is highly flammable.
Use extreme caution if
melting it over an open
flame. It is much safer
not to use an
open flame.*

Cappings and combs should not be processed together because combs are poorer quality wax than are cappings. Put old combs, bad or damaged combs, and combs that have excess areas of drone cells in bags. Weight them under water and boil to separate the wax from the remaining residue called slum-gum. Or, pack and ship old combs to a bee supply manufacturer for rendering.

Summer Management of Honey Bee Colonies

Examine your colonies every 2 or 3 weeks to determine their condition during June, July, and August. In areas where there are summer nectar flows, you must provide supers for storing surplus honey or you will miss part of your crop. Don't forget to keep a close enough check on your colonies to prevent swarming. Add an additional brood chamber and supers as needed.

In some areas, bees may get little or no nectar during part of the summer. Some bees may use from 10 to 20 pounds of their stored honey for brood rearing, so you must leave enough in the hive to ensure that the colony will not starve during this period.

Take whatever action necessary to protect your bees from hazardous pesticides and keep a close check for wax moth infestation (see page 37) in weak colonies. The combs in colonies that have become weak from the loss of their queen or a poor queen, damage from pesticides, diseases, starvation, or whatever cause can be completely ruined by the larvae of the wax moth.

Check all colonies for brood diseases and the performance of the queen.

Be careful while working your colonies and don't let robbing get started.

Requeening your colonies during a nectar flow is the easiest time to replace your queen.

Commercial Pollination

Most bees are kept simply for the production of honey, but the honey bee makes its greatest contribution to our human society by pollinating plants. Crops such as apples, apricots, blackberries, blueberries, cucumbers, grapes, huckleberries, dewberries, plums, strawberries, muskmelons, peaches, pears, persimmons, tung, and watermelons are either completely or partially dependent on pollinating insects. Melons and cucurbits require from five to seven bee visits to each blossom to set large amounts of good quality fruit.

Seed crops produced in the southeastern area that depend on pollinators include several varieties of clovers, vetches, beans, and peas. Clover seed production is increased four to twelve times when pollinated by bees. Cottonseed production also benefits from insect pollinators.

Farmers also need supplemental bee population to pollinate watermelons, cantaloupes, and cucumbers. The beekeeper receives a rental fee for each hive of bees that is brought in.

The honey bee is the most important commercial pollinating insect, and its importance is increasing because of the reduction in the number of wild honey bees and wild pollinators. However, the contribution of wild pollinators, such as bumblebees and orchard bees, is significant. All pollinating bees should be protected.



Bee colonies, on trailers, being used to pollinate cucumbers.

Diseases of Bees

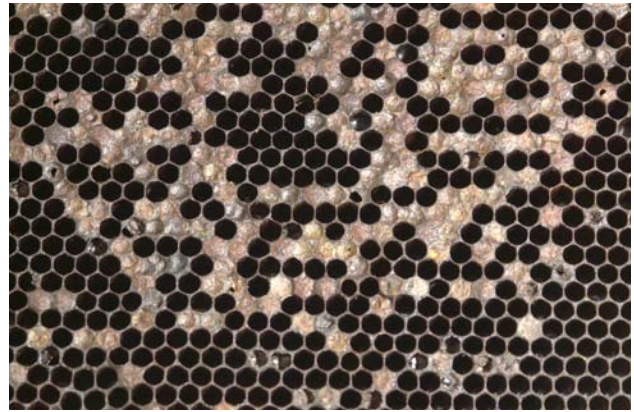
Several diseases may affect your bees. The most serious are those that attack the brood, but be on guard for diseases and pests that affect adult bees. It is most important that diseases be detected in their early stages. Contagious diseases can spread rapidly within a colony and from one colony to another. Learn how to identify and control bee diseases, and make routine inspections for disease.

Diseases of the Brood

Brood diseases cause young larvae or pupae to die in the cells. Carefully examine dead brood to detect and identify the disease. Be sure to check cells that have sunken, discolored, or punctured cappings. Carefully note the dead brood's appearance, position in the cells, age, color, and consistency. This will help identify the disease. The remains of diseased brood can be seen better if you hold the comb in a position so that sunlight will shine directly into the cells.

Of all the diseases and pests discussed here, American foulbrood is probably the most damaging. You won't see it often, but learn to identify it.

American foulbrood (AFB) is the most dreaded brood disease. It is caused by the spore-forming bacterium *Paenibacillus larvae*. This disease does not affect adult bees or humans. Once the disease starts, it is very difficult to combat. In the early stages of

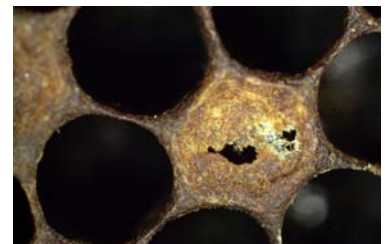


An American foulbrood spotty pattern. Most empty cells have a decaying bee within.

the infection, you may find only a few dead larvae or pupae in the colony. Sometimes AFB will spread rapidly within the colony and seriously weaken or kill it during the first year. Many times, it will be the second year before the colony is destroyed. If you let this disease go unchecked, it may quickly spread to your other colonies and to nearby apiaries.

Immature honey bees infected with American foulbrood usually die after the cells are sealed. A severely infected comb of brood will have a scattered and irregular pattern of capped and uncapped cells. Many of the cell caps will be discolored, sunken, and punctured. This causes the comb to have a “pepper-box” appearance.

Most immature bees that are killed by AFB during the larval stage die stretched lengthwise in the cell. This is a positive indication of the disease. After infected larvae or



Punctured cappings indicating American foulbrood disease.

pupae die, their color changes gradually from pearly white to a coffee color and then to almost black. It takes the dead brood a month or more to decay and dry. When they dry, the remains stick very tightly to the cell wall and are very difficult to remove.

The body wall of the larvae or pupae can be easily ruptured about 3 weeks after death. Stir the decaying mass in the cell with a toothpick or twig. If American foulbrood was the cause of death, about an inch of brown, gluelike material will string out before breaking when you withdraw the toothpick. This is known as the ropey stage. When dead brood reaches this stage of decay, a foul odor that is typical of this disease can be detected.



The ropey stage of American foulbrood disease.

American foulbrood can be spread in several ways. Nurse bees can give food contaminated with the spores of the disease organism to young larvae. Honey stored in cells that once contained diseased brood becomes contaminated and may be fed to young larvae. Robber bees can take contaminated honey from a colony that has been weakened or killed by AFB back to their own colony. Alternatively, you can spread the disease by using equipment from a diseased colony and then using the same equipment with a healthy colony. Unfortunately, beekeeper spread is the primary method of scattering American foulbrood.



The tongue characteristic of American foulbrood disease.

Though Terramycin applications may mask the presence of AFB, the only totally effective remedy is to kill infected colonies and burn hive bodies, frames, combs, and bees. Contact the state apiary inspector if you think your bees are infected.

European foulbrood (EFB) is caused by the bacterium *Streptococcus pluton*. This disease organism does not form a spore like the one that causes American foulbrood. For this reason, it is not usually as difficult to combat as AFB. In some areas, European foulbrood may occur more often than American foulbrood. Adult bees are not affected, only the immature bees or brood. Some strains of bees are more resistant to this disease than are others. If you have trouble with EFB, you should requeen your colonies with queens that are resistant to the disease.

European foulbrood may be difficult to detect in its early stages. It spreads rather slowly within the colony, killing only a few cells of young brood in the beginning. However, in some cases, it spreads rapidly and the colony is seriously weakened. This disease occurs more often in the late spring when brood rearing is at its peak.

In most cases, EFB kills larvae before their cells are capped; they usually remain curled in the bottom. When killed by this disease, the larvae change in color from the normal glistening, pearly white to a faint or grayish yellow. When larvae have been dead long enough to begin turning brown, the tracheal (breathing) system becomes visible as white lines. The decaying larvae do not usually form the ropey stage. However, some people can detect a typical sour odor. Dead larvae dry and the remains form a scale in the cell. This scale does not stick tightly to the cell wall. It does not become brittle but remains flexible and can be easily removed.

Although the organism that causes EFB does not form spores, it does overwinter on combs. Nurse bees can spread the disease as they feed contaminated honey to young larvae. Also, bees robbing diseased colonies can spread EFB. Many times a beekeeper spreads the disease by using equipment contaminated with the disease. In addition, bees from infected colonies may drift to healthy colonies nearby. In most cases, EFB will decline during the summer to a very low level, showing up again in the fall. A good nectar flow will help most colonies recover temporarily.

Requeening diseased colonies with good productive queens from strains that are resistant to EFB will enable them to overcome the disease. This breaks the brood cycle and allows the bees to clean out all diseased larvae. It also gives the colony a more productive queen.

Sacbrood is caused by a virus. Adult bees are not affected. Sacbrood is considered less serious than the foulbrood diseases. In some cases, it may weaken the colony and cause it to be unproductive. Sacbrood usually attacks a colony during the spring or early summer. In most cases, it attacks only the oldest larvae, most of which die during the 2-day period before changing to pupae. This happens soon after the cells are sealed. The color of the dead larvae changes to brown and the skin becomes tough. During the decaying process, the larva becomes a sac of watery material that can be easily removed from the cell. There is no recommended medication for the control of sacbrood. If you have a colony that becomes weak from this disease, requeen it with a good queen to reproduce a strong force of young bees that will clean up the disease.

Chalkbrood is caused by the fungus *Ascosphaera apis* and is spread in contaminated brood food. Larvae are most susceptible to this disease at about 4 days old. Diseased brood are usually covered

with fluffy, cottonlike material, in both sealed and unsealed cells, and usually are located on the outer fringes of the brood nest. Brood killed by this disease dry and form white mummies that are easily removed from the cells. This disease is not considered to be serious, and strong colonies will usually overcome this disease without any help from the beekeeper.



A Varroa mite on a dead larva.

Diseases and Pests of Adult Honey Bees

*Don't worry about
keeping your bees mite free.
Concentrate on keeping
the mite population
at low levels.*

Varroa mites (*Varroa destructor*) were first recorded in the United States in 1987. The Varroa mite is a reddish-brown, external honey bee parasite about the size of the head of a pin. Varroa mites attach

to adults and developing brood, where they feed on their blood. If left untreated, Varroa mites can deform bees and eventually kill the colony. Varroa mites cannot be left untreated.

Varroa mite symptoms include the following:

- (1) Disfigured adult bees (deformed legs or wings)
- (2) Mite-infested capped drone brood
- (3) Bees discarding larvae and pupae
- (4) Spotty brood pattern
- (5) Reddish-brown spots (adult mites) on white pupae
- (6) Cells being uncapped and destroyed

Some beekeepers describe Varroa infestations as being similar to foulbrood but without the smell. A Varroa kill can also be compared to an insecticide kill. Colonies can die so fast from high Varroa infestations that thousands of dead bees will pile in front of the hive—a symptom usually reserved for pesticide kills. Most problems with Varroa mites occur in the fall. The mites need either immature or adult bees to survive and, without bees, will die within a few days. Therefore, combs, frames, and equipment are safe to reuse after approximately 7 days.

Inspecting a Hive for Varroa Mites

To routinely inspect for Varroa mites, check pupae for reddish-brown spots (adult Varroa). It is best to open capped drone brood for this inspection though capped worker brood can also be used. For more definitive examinations, a single Apistan strip can be put into a colony overnight and the mite fall checked the next day. If only a few mites drop, don't treat right away; however, if hundreds of mites drop, treat immediately. Do not leave the single strip in the colony.

Another way to check Varroa populations is the sugar roll. Use a 1-quart canning jar with the 2-piece ringed lid. Discard the center portion of the lid and cut a piece of 8-mesh hardware cloth to fit inside the ring. Scrape about 200 to 300 bees into

the jar and confine them with the hardware cloth lid. Then, through the hardware cloth, sprinkle about 1 teaspoon to 1 tablespoon of powdered sugar onto the bees and roll the jar to thoroughly coat them in powdered sugar. Pour sugarcoated bees and mites onto common window screening and count the mites. Beekeepers like this test because the bees survive the procedure.

Treating for Varroa Infestations

Several chemical treatments and management schemes are available for beekeepers to use when combating Varroa mites. Contact your county Extension office, your state apiarist, or a commercial beekeeping supply company for current recommendations on Varroa control. During treatment with any drug or pesticide, all honey supers for human consumption MUST be removed. Always follow label instructions for handling and applying any chemical in the beehive. Dispose of waste chemicals as directed on the label instructions. Again, it is important never to have any type of disease or pest treatment program underway while surplus honey supers are on the hives.

Tracheal mites (*Acarapis woodi*) were first reported in the United States from Texas in 1984. Tracheal mites are microscopic parasites that live in the breathing tubes of adult honey bees where they feed on bee blood. Suffering colonies have dwindling populations, do not cluster well, and often die in the winter, frequently leaving behind large amounts of honey. Infested adults may act irritated or disoriented. Weak adults can be found crawling aimlessly near the entrance of the hive. Unfortunately, tracheal mites cannot be positively identified without dissecting the bees under a microscope. Vegetable shortening patties are useful in suppressing tracheal mite populations. Eradicating mite populations is not practical.

DIRECTIONS FOR MAKING VEGETABLE SHORTENING PATTIES

Rate: 1 pound of vegetable shortening (e.g., Crisco) to 2 pounds of white granulated sugar (1:2 ratio). Patty size should be about ½ to 1 pound.

Exposure time: Continuous (except during nectar flow). Replace as often as needed. Most effective during spring and autumn.

Location within the colony:
On brood nest top bars.



Since any material only suppresses mite populations temporarily, beekeepers should be prepared to contend with tracheal mite infestations indefinitely. Normally, tracheal mites are not as harmful to the colony as are Varroa mites.

Small Hive Beetles (SHB) (*Aethina tumida* Murray) are the newest beehive pest to invade some honey bee colonies in various southeastern, midwestern, and northeastern states.

Small hive beetles appear to be primarily pests of stored equipment, especially full honey supers awaiting extraction. In states where the beetles have become established, it has proved to be a problem in some areas while being of little consequence in other areas within the same state. These beetles appear primarily to be pests of full honey supers awaiting extracting and are, therefore, honey house pests. Though comprehensive descriptive information on small hive beetles is presented here, these beetles have not yet shown themselves to be general pests in all areas. They are presently new pests, and beekeepers are learning to cope with them. They may or may not be a problem for you.

The Small Hive Beetles' Life Cycle

The adult small hive beetle (SHB) is dark brown to black and about one-third the size of a worker bee. Larvae are elongated, whitish grubs that have three pairs of legs and can be mistaken for wax moth larvae. However, small hive beetle larvae do not spin cocoons and must complete their development outside the beehive in the soil. In severe infestations, larvae may be seen crawling out of the hive entrance or from stored honey supers.



The small hive beetle adult and larva.

Beetles, like moths and bees, undergo complete metamorphosis. The beetles' life cycle starts with eggs that are laid in the hive and within 2 to 3 days hatch into larvae. Ten to 16 days later, the larvae crawl from the hive and drop to the ground outside, where they burrow into the soil and pupate. In about 3 to 4 weeks, they emerge as adult beetles and re-enter the hive a week later. This process may repeat itself several times a year, especially during the warmer months.

Colony damage does not occur when only a few adult beetles are present in the colony. Small hive beetles must build up their population significantly before they can take over and destroy a hive. The beetles, in their various development stages, feed on honey and pollen in the hive, foul the honey, and destroy the comb and bee brood. The beetles' armor resists attempts by bees to sting them. The destruction eventually causes the bees to leave the hive.

Honey Destruction

Because they defecate in the honey and the resulting fermentation and odor make it unattractive to the bees, larvae of small hive beetles are most objectionable to adult bees. The small hive beetle larvae also damage wax honeycombs, especially newly drawn, delicate combs. When wax combs stand for a few days to a few weeks in the honey house, ready to be extracted, beetle larvae infestation can be most troublesome. This damage to honeycombs happens when beetles are actively reproducing in the colony and are taken into the honey house.

Difficulty in Finding Small Hive Beetles

Looking for small hive beetles in a colony may be difficult—the adult beetle is darkcolored, moves fast, and avoids light. Beetles are likely to be found in crevices in the hive or on the bottom board, although when temperatures are cooler, the beetles remain with the bee cluster and do not move onto the bottom board. Many times when separating a hive consisting of two deep hive bodies, the beetles can be found along the frame rest grooves.

A simple technique used to look for beetles in bee colonies is to remove the outer cover, place the cover upside down on the ground, remove the deep super or brood chamber, and place on the up-turned outer cover. If beetles are present, they will move out of the super away from the light and into the outer cover, and they may be seen crawling in the cover.

How to Rid Hives of Small Hive Beetles

PROPER DIAGNOSIS

Since many types of beetles commonly appear in beehives, don't assume all beetles are small hive beetles. Preventative use of unapproved insecticides in and around beehives is potentially risky and is not recommended. Beekeepers should become familiar with the small hive beetle to properly diagnose and manage the beetle should it occur. Populations of small hive beetles are known to be established in Alabama, Georgia, Florida, and South Carolina as well as other surrounding states. Sound pest management begins with positive diagnosis of the pest.

GOOD HIVE MANAGEMENT

Several colony management tools are effective against infestations when integrated with the use of available insecticides. They are the following:

- Maintain a strong bee population in each hive.
- Inspect every hive at least once a month.
- Move the hive to disrupt the life cycle of the beetles.
- Maintain close mowing or bare ground around the hive to facilitate chemical controls and provide less shelter for beetle larvae leaving the hive to pupate.

*Contact your county
Extension agent
for current small hive beetle
control recommendations.*

CHEMICAL CONTROLS

A pesticide selected for application within or around a beehive must have usage directions specifically for the control of hive beetles. To protect themselves, their bee colonies, and the honey, beekeepers must read and follow all use precautions on the pesticide label.

SHB PESTICIDE TREATMENT INSIDE THE HIVE

An emergency exemption has been approved by the United States Environmental Protection Agency for beekeepers to use pest control strips containing the chemical coumaphos. The strips can be used under the trade name CheckMite+ Bee Hive Pest Control Strip. The insecticide is impregnated into a plastic strip that is placed in the bottom of the hive body. There, the beetles absorb a lethal dose of insecticide when they contact the strip.

BASIC PRECAUTIONS FOR USING CHECKMITE+

CheckMite+ can also be used for control of Varroa mites. The use directions are very different for control of hive beetles, such as when the chemical should be applied and how long the treatment should last. For example, CheckMite+ strips should be placed in the hive for no more than 7 days at a time when treating for beetles. A hive should be treated with this pesticide no more than four times per year. A hive, having honey destined for human consumption, should not be treated with any chemical including CheckMite+. Specifically, honey supers must not be on the hive during treatment (whether for SHB or Varroa mites) to avoid this pesticide's coming in contact with honey intended for human food. Coumaphos works best when the air temperature is over 70 degrees F. Complete use directions are listed on the product label.

Prepare a piece of corrugated cardboard box, approximately 4 inches by 4 inches, by removing one side, thereby leaving a series of paper ridges. Remove a CheckMite+ strip from the original packaging and cut the strip in half across the center. Staple the CheckMite+ strip halves to the ridged side of the 4-inch by 4-inch corrugated cardboard. Place this cardboard as close to the center of the bottom board as possible, with the strips facing down. Leave the cardboard and strips on the bottom board for at least 3 days but not more than the time specified on the label. For convenience of installation, a paint paddle can be stapled to the cardboard. Again, always follow directions as listed on the product label. Beetles will crawl beneath the cardboard into the paper ridges to hide and will be exposed to the chemical coumaphos.

PESTICIDE TREATMENT OUTSIDE THE HIVE

Beekeepers will also want to exploit a vulnerable point of the beetles' life cycle, when mature larvae enter the soil near the hive to pupate. GardStar 40% EC is a concentrated formulation containing the insecticide permethrin and is commonly used to control fire ants. This product is directed at control of the hive beetle larvae: it kills the larvae when they come into contact with insecticide-treated solid near the hive.

For bee yard use, you will need to dilute GardStar 40% EC in water and apply to soil in front of the hive using a sprinkling can or low-pressure sprayer. Even small amounts of pesticide spilled or sprayed onto the hive can be dangerous to bees. **Caution:** GardStar 40% EC in concentrated form can cause irreversible eye damage if splashed in the eyes. Wear a face shield or safety glasses.

BASIC PRECAUTIONS FOR USING GARDSTAR 40% EC

GardStar 40% EC poses a higher risk to bees and humans than does CheckMite+. Because permethrin is highly toxic to bees, beekeepers must use extra caution when applying it around a beehive. If a hive is SHB-infested, here are two ways to approach the problem:

- Move a hive to a site where GardStar 40% EC has been previously applied to reduce potential insecticide exposure to bees.
- Mix concentrate from the original container.



A wintering colony showing signs of a *Nosema* infection.

***Nosema* disease** is caused by a protozoan called *Nosema apis*. The bees' ingested food or water can become contaminated with the spores of the disease organism that germinate and multiply in the gut. As a result, the bees die sooner than normal. In many cases, the level of infection does not become serious and the colony is able to overcome the disease.

There are no specific visible symptoms. The only way to positively diagnose the presence of nosema disease is to use a microscope to examine the alimentary tract for the presence of spores. In most cases, the level of infection reaches its peak in the spring and declines to a very low level during the summer. A small increase in the level of infection usually occurs in the fall.

This disease can be spread in several ways. When an infected colony is overwintered, the bees may defecate on the combs. Contaminated food will help spread the disease. Contaminated cages used to transport queens and packaged bees may spread this disease.

Paralysis is an adult bee disease caused by a virus. Commonly, only an occasional colony is affected. Adult bees with this disease tremble and become weak, sluggish, often dark-colored, and shiny. They crawl about and are unable to fly. Many of the bees will be found on the top bars in the hive. There is no treatment for paralysis. If a colony becomes seriously affected, it should be requeened.

Greater wax moths*, *Galleria mellonella, are serious pests of honey bees. They damage bees, destroying their combs. The larvae of the moth destroy the combs by tunneling into and through them as they feed on the pollen and waste material in the wax and cells. While larvae are in almost every hive, they do not damage the combs if colonies are strong. When colonies get too weak to protect their combs, wax moth larvae are able to do much damage. If disease, starvation, poor queens, loss of queens, or pesticide damage weakens colonies, the wax moth larvae will destroy the combs. The



Wax moth larvae, a destructive pest of combs and hives.



Wax moth damage within the hive.

most effective control is to maintain strong colonies. You can help your bees by keeping the hive clean and free of excess propolis, burr combs, and refuse since these protect the wax moth larvae even in strong colonies.

The wax moth larvae may seriously damage comb honey. Normally, the eggs are laid on the combs or frames before the honey is harvested. The eggs hatch after the honey is in storage and the young larvae bore through the cell caps. The honey will leak through these holes, making the comb unsuitable for marketing as comb honey.

Low temperatures will kill all stages of the wax moth. Using low temperatures avoids the problem of chemical residues, and equipment can be reused without endangering the bees. The minimum temperatures and exposure times required to kill all stages of the wax moth are 20 degrees F for 4½ hours, 10 degrees F for 3 hours, or 5 degrees F for 2 hours.

After treatment, properly store the comb honey or empty combs to protect them from re-infestation.

Ants sometimes become a major problem in apiaries, honey houses, and individual colonies. Unfortunately, all insecticides recommended for control of ants are toxic to honey bees. However, in some cases the ant problem can be solved without using insecticides outside the hive.

An old technique that still may be applicable involves devising ant barriers. If you have only a few colonies, place the hives on a bench-type support with the legs in cans of kerosene or used motor oil. You must shield the oilcans to prevent rain from floating the oil out. This must be done in a way so the ants cannot bridge the space between the sides of the oil cans and the rain shields. Check the cans regularly to make sure the ants have not made bridges of dirt, trash, or leaves. Make sure there are no weeds, grass, or shrubs touching the hives or the support that would allow ants to bypass the cans of oil. If ants are a major problem, check with the county Extension office for current chemical control recommendations.

Mice may enter hives during the winter and damage brood combs by building nests in them. Either entrance reducers or ¼-inch mesh hardware cloth that has been cut to fit the hive entrance will prevent mice from entering the hive.

Birds, skunks, and other animals may also damage colonies by feeding on the bees. Whenever any of these animals damage your colonies, trapping or poisoning may be used. Be sure to check with your local conservation officer about laws governing their use.

Africanized honey bees (AHB) were introduced into Texas in the early 1990s. Initially, it was feared that they would spread throughout much of the warm climate areas of the United States. After nearly 10 years of colonization, they invaded much of the southwestern United States into southern California, but Africanized honey bees have not moved much beyond Houston, Texas, to the east.

Africanized honey bees are nothing more than an unimproved variety of honey bee. They appear identical to common honey bees but are actually a bit smaller. These bees sting much more than the common honey bee stings, are skittish on the combs, and swarm too much. They are not particularly good honey producers in areas where there is a good flow. Rather than produce surplus honey, they produce bees and swarm excessively. Many times the public is concerned when confronted with a large insect and suspects it to be a killer bee. Reassure people that the Africanized honey bees are small insects. If you suspect a colony of being too hostile, contact your Department of Agriculture. Keep in mind that occasionally European bees can be nasty also.



A beekeeper surrounded by agitated Africanized honey bees.

Shipping Samples for Disease Diagnosis

It is often difficult to make positive diagnoses of bee diseases in the apiary, especially by inexperienced beekeepers. In some cases, positive identification cannot be made except in the laboratory. The U.S. Department of Agriculture provides laboratory diagnoses. If you suspect your bees are infected and need help in diagnosing the problem, be sure to follow these instructions for collecting and shipping a sample to the laboratory.

If you suspect a brood disease, cut a 4-inch square section of the brood comb. Make sure this piece of comb contains as much of the dead or infected brood as possible. If you suspect an adult bee disease, collect at least 200 sick bees or bees that have just died. Place your sample of brood comb or adult bees in a wooden or strong cardboard box lined with paper towels or newsprint. Do not pack samples in tin or glass containers and do not wrap either the comb or bees in waxed paper, aluminum foil, or plastic wrap. These materials promote mold growth that increases the difficulty of making a satisfactory diagnosis.

Send samples to

Bioenvironmental Bee Laboratory
Agricultural Research Center
Beltsville, MD 20705

Be sure to print or type your name, address, and zip code on the return label.

Pesticides and Bees

The honey bee is very susceptible to a wide range of pesticides. The population of bee colonies is quite often severely reduced or completely wiped out by field and orchard applications of pesticides. A sure sign of pesticide bee poisoning is thousands of dead bees at the hive entrance and in the hive. Most insecticides are toxic to honey bees, but they are not

equally hazardous. The farmer, beekeeper, and custom pesticide applicator can and should cooperate closely to keep losses of honey bees to a minimum.

There are a number of things to consider when using hazardous pesticides around honey bees. With few exceptions, dusts are more hazardous than are sprays. Dusts tend to drift more and the bee will pick up more of the particles on its body. Application by plane is more hazardous than application by ground equipment because aerial application covers a much larger area in a shorter period of time, and the drift problem is increased. Treatment of large areas and repeated applications will cause greater bee losses. Application over colonies, especially in hot weather when bees are clustering on the outside of the hives, may cause severe losses.

Time of application, bloom period, and attractiveness of the crop to the bees are very important. Insecticides applied when the crop is in bloom and bees are foraging in the fields are usually the most hazardous. Treating a nonblooming crop with a hazardous material when a cover crop or wildflowers are in bloom in the field or close by may also cause heavy bee losses. For the bees, the safest time to apply pesticides is in late afternoon or at night when bees are not foraging.

Location of colonies is very important. Colonies in the fields at the time of insecticide application usually sustain much heavier losses than colonies at the edge of or outside the field. The farther away from the area being treated, the safer the colonies. Colonies moved into fields or orchards after treatment may escape damage.

The formulation, amount, and kind of pesticide used are important. Use the pesticide that is the least toxic to bees but that will control the pest. Read and follow directions for use on the label of the pesticide container. Heed all precautions.

Beekeepers should let farmers and custom pesticide applicators know where their bee yards are located to reduce accidental spraying or dusting. Farmers and custom pesticide applicators should let beekeepers know when a material hazardous to bees must be used. Whatever action is necessary to protect the bees can then be taken.

In cases when only a few colonies are involved, it may be worthwhile to cover the colonies with wet burlap before a hazardous pesticide is applied in the area. Cover the colonies at night when all the bees are in the hives. During the day, keep the burlap wet with water. Covering the hives is not practical where repeated applications of hazardous pesticides are made.

Applicators and beekeepers can contact the county Extension office for information concerning the relative toxicity to honey bees of commonly used pesticides.

Miscellaneous Management Techniques

Dividing Colonies

One way to increase your number of honey bee colonies is to divide one large hive into two or more smaller hives. A good time to divide a colony is in late spring or early summer. Select the colony that is to be divided and have all equipment that you will need on hand. Open the hive and find the queen. Place the queen, about half of the adult bees, and about half of the combs of brood (mostly unsealed) in a hive body on the original bottom board. Be sure to leave enough adult bees to adequately care for the brood. Fill the remaining space in the hive body with empty brood combs or comb foundation. Place another hive body with empty brood combs and combs of honey on top and close the hive.

Put the other half of the combs of brood in a hive body on a new bottom board and fill the remaining space with empty brood combs or foundation. Most of the brood in this hive body should be sealed. Shake about half of the worker bees into this hive body. Close the hive and screen the entrance. Move this hive to a location at least 2 miles away. Introduce a new queen to this colony no sooner than 2 hours and no later than 24 hours after moving the hive.

*Dividing colonies is not exact.
You will always have to
estimate both adult bee
and brood populations.
If you err, make adjustments.*

Do not plan to harvest any surplus honey from these colonies the first season. Most new colonies will need all the honey and pollen they can store to build up, get through the first winter, and be ready to harvest a surplus honey crop the second spring. There may be some locations where new colonies have time to increase their populations and store a surplus crop of honey the first season.

Another way to increase colonies, if you have several strong ones, is to remove one or two combs of brood and bees from each strong colony when the population is at its peak. Replace these combs of brood with empty brood combs or frames of foundation. Place the removed combs of brood and bees in a hive body on a bottom board. Close the new hive and screen the entrance. Move it at least 2 miles away. Introduce a new queen to this colony in not less than 2 hours or more than 24 hours. Do not take

enough brood or bees from any one colony to reduce its population to the point that it will be unable to store a good crop of surplus honey. This method of increasing hive numbers is a good way to control swarming if done during the swarming season.

*Have a good flashlight
and know where
you are going.*

Moving a Colony

Eventually, you will find it necessary to move a hive of honey bees. This is not a complicated job, but you should keep a few rules in mind. Field bees are oriented to the location of the hive. These bees will return to the previous hive location unless you move the colony at least 3 miles. A good time to move honey bees is during the summer after the major nectar flow is over. It takes a colony 7 days to become oriented to the new hive location and forage area. The best time to move bees is at night when they are all in the hive. Harvest surplus honey before moving the hive. This will reduce the weight of the hive and the chance of breaking and ruining combs of honey during the move.



A colony ready for moving to a new location.

The first step in moving is to prepare the new location. Prepare hive stands. Position them so that when the hive is placed on the stand, the bottom board will slope very slightly from back to front but will be level from side to side. This allows moisture to drain out of the hive and off the bottom board. Remember that, if possible, the entrance to the hive should face east, southeast, or south and the

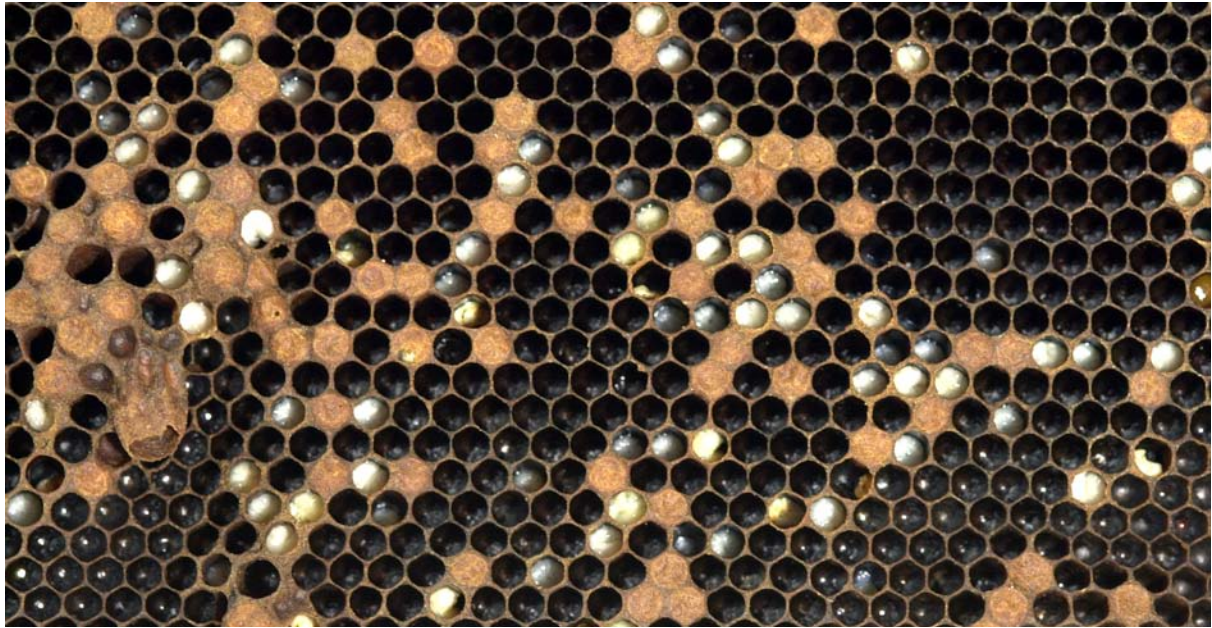
HOW TO GET HELP

- *Contact your county Extension office.*
 - *Contact your state Extension specialist or state apiculturist.*
 - *Attend both local and state beekeeper meetings.*
 - *Refer to books listed at the end of this publication.*
 - *Go online for beekeeping-related Web sites such as www.oardc.ohio-state.edu/agnic/bee.*
-



final arrangement of hives should be in an irregular pattern such as an S-shape, semicircle, or diamond-shape. Remember too, that beekeeping is more pleasant when supplies and equipment can be easily hauled into and out of the apiary.

If you want to move your bees only a few hundred feet, first take them at least 3 miles away and leave them for a week or more. They will soon forget the old location and become oriented to the new one. Then you can move the hives to the desired permanent location you have prepared for them. Or, you can move the hives about 3 feet each day until you get them to the desired location.



A spotty brood pattern. The queen cell indicates a queen problem.

If only one hive of a group is moved a short distance, its field bees will return to the original location and join nearby hives. If all of the hives in a group are to be moved a short distance, it is better to move them at the same time a few feet at a time.

The proper use of smoke is probably the most important part of the job of moving bees; use it liberally. Keep the smoker well filled and tamped down, so the smoke stays cool.

The second step is to prepare the colonies a day or more ahead of the move by fastening the hive parts together. You can use hive staples, wooden strips with the proper size nails, or plastic or steel straps. Close all holes in the hive except the entrance.

The colony must have ventilation while it is being moved. Do not suffocate your bees. Cover the entrance with window screen. If the weather is

warm, remove the hive cover and cover the top with window screen.

Remember that you should wait until night to move your bees, using no more light than is necessary.

Now you are ready to load the hives. Place them in a vehicle with the entrance facing forward. Place them close together and tie them down so they cannot bounce or shift around during the move. Leave the vehicle engine running while loading and unloading the hives. Vibrating the hives seems to cause the bees to be calm on the combs.

When you reach your destination, light the smoker and smoke the hives. Place them on their stands and smoke the hives again. Remove the screens from the entrance and the top. Move away quickly; the bees will be upset. When conditions are suitable for flying, the bees will leave the hives and orient themselves to the new location.

Requeening a Colony

Requeening is good insurance against swarming. It helps you keep strong, productive colonies and is a way to improve stock or change from one race or strain of bees to another. There are several methods of introducing a new queen to a colony. The ones used by successful beekeepers work well under specific conditions but fail when conditions are not ideal. The “mailing cage” method is used by many beekeepers. Here is one version of this method:

When you order a queen bee by mail, she arrives in a small cage with several workers. The cage is plugged at both ends with a cork or a plastic plug. In one end is a white candy material used for food during shipment. As soon as the queen arrives, give the workers two or three drops of water on the screen side of the cage. Put the caged queen in a dark, cool place until you can get everything ready to introduce her to your colony. Never put a caged queen in direct sunlight. She should be introduced as soon as possible.

When you have everything ready, open the hive, remove the old queen, and kill her to ensure that she will not return to the hive. Remove the cork from the end of the cage that has the candy plug. Place the cage, with the new queen still inside, directly over the brood nest with the screen side down and facing the opening between two frames. Or, place the cage lengthwise between two frames in the center of the brood nest. Be sure that the bees have access to the screen side of the cage and the candy end. The bees should release the queen in about 48 hours.

Check the queen cage after 2 to 3 days to be sure that she has been released. If she has not, punch a small hole through the candy plug with a toothpick or similar object. Be sure you do not release the queen. Let the bees release her. If the queen has been released, do not look for her at this time. Wait about a week after placing her in the hive. By this time, she should be laying and there is less danger of the bees killing her.

When checking to see if the queen has been released, use as little smoke and disturb the colony as little as possible.

Preventing Robbing

Bees sometimes steal honey or sugar syrup from another colony. This is called robbing. Robbing can be a serious matter in beekeeping. It may occur at any time but is more likely during periods when little or no nectar is available.

Do everything you can to prevent robbing; it is much easier to prevent than to stop. Harvest surplus honey before the nectar flow is over or during a later flow. When harvesting surplus honey, take care to cover the supers as they are removed from the hive.

In many instances, it is necessary to cut or break some comb when working bees. Be careful not to leave pieces of comb lying around the bee yard. Anytime you leave bits of comb with honey or drip honey outside of the hive or in the bee yard, you increase the danger of getting robbers started.

Robber bees can be recognized by their actions. They usually attempt to enter the hive through cracks between supers. They do not usually alight on the bottom board but fly straight into the hive. They will retreat hastily when attacked by guard bees. Close observation will help you determine which colonies are in danger. During advanced stages of robbing, robbing bees trying to get in through any opening will literally surround the robbed hive.

If robbing starts, stop all handling of bees in the apiary and stuff green grass into the robbed hive's entrance to reduce its size. This will help keep out robbers and aid weak colonies in defending themselves. Since weak colonies are often the victims of robbers, uniting such colonies to make strong ones will help reduce this problem.

*Generally, it is better
to have fewer strong colonies
than many weak ones.
Don't be afraid to unite
colonies. You can split
them later when
conditions are better.*

Uniting Honey Bee Colonies

Occasionally, you will find it necessary to unite or combine a weak colony with a stronger one. To do this, determine which colony is the weaker. Place the hive with the weaker colony next to the stronger colony. Remove the outer cover and inner cover from the hive of the stronger colony. Place one sheet of newspaper over the top of this hive to form a temporary partition between the two colonies. Punch four or five small holes in the center of the newspaper with a pencil. Place the hive body containing the weaker colony on top of the newspaper. Be careful not to tear the paper. The cover of the top hive can be raised slightly with a matchstick or similar object to aid ventilation. The two colonies will gradually remove the newspaper and will mingle together with very little fighting and loss of bees. You can remove the less desirable of the two queens or you can let them fight it out. If the weakness of the colonies is due to poor queens, the united colony should be requeened as soon as possible.

Removing Bees From a Building

Most beekeepers will be called upon, at one time or another, to remove bees from a building. Removing a bee nest established in a wall is much different from hiving a swarm. First, be sure they are honey bees. Many people confuse wasps, hornets, and yellowjackets with honey bees. You have two broad options. Open up the wall and cut the combs out or use a trap and slowly trap the bees out of the wall cavity. Opening up the wall and removing the colony is more dramatic but much quicker. Inquire if you or the homeowner will repair the house. The higher the nest is from the ground, the greater the risk.

Opening up the wall. After determining the location of the nest cavity and using any tools necessary, open the wall. Obviously, you will need protective clothing and a lighted smoker for your protection. With bees flying all about, cut the combs from the wall or cavity. Save large pieces of worker brood comb and cut it to fit within the perimeter of an empty frame. Save as much worker brood as you can. Use cotton twine to hold the loose combs in place. Place honeycombs in a bucket and remove them from the area after the job is finished. After removing all bees and combs from the original nest cavity, fill it with insulation and close it up. Place a small colony as near as possible to the original nest entrance. You may need to build a temporary bracket on the wall of the house to support the hive. Ideally, the small colony would be queenless but have a brood frame with open brood. To this small hive, add the brood combs you have cut and fitted. If bees are clustering about, place them in the new hive. If luck goes your way, bees will begin to scent and will accept the new nest in lieu of the old nest being unavailable. Within a day or so after the bees have settled, you can move the colony to its final location. As soon as possible, remove the combs containing

cut brood comb and replace with new foundation and install a new queen. Many beekeepers use special vacuums to pick up bees within the nest but this would be an advanced procedure.



Beekeepers removing a bee colony from the wall of a house.

Trapping bees out. If time is not short, use a simple cone trap made of aluminum window screening. The cone only needs to be 4 inches to 6 inches in length. Place the cone over the nest entrance, being certain to exclude all other entrances. Open the tip of the cone enough for a couple of bees to exit. Bees can leave through

the cone but will return to the base of the cone when returning to the hive. Position a small queenright hive on an improvised bracket as near the cone base as possible. As returning foragers are unable to get into the original colony, they will adopt the new hive. Leave this system in place until no more foragers are leaving from the original nest. It may take several weeks. By then, only the queen and a few nurse bees will remain and wax moths will have probably started to ravage the original hive. Remove the screen and leave the new colony in place for a few days. Maybe they will rob out the parent colony. This procedure takes time (4 to 6 weeks) and may result in some honey being left in the wall, but the removal process did not damage the building structure.

Beekeeper Organizations

You may wish to join a beekeepers' organization to take advantage of educational programs and other activities pertaining to honey bees and beekeeping. There are local, state, national, and international organizations of beekeepers. Joining local and state bee organizations is an excellent idea. New information is constantly being spread through the beekeeping community. Staying updated and informed is now critical to becoming an accomplished beekeeper. Information on beekeeping organizations can be obtained from the state beekeeping association.

Beekeeping Literature

Numerous books and other forms of literature are available for the study of honey bees and beekeeping. Some of these may be in your public library. Get a more extensive list from your library or bee supply manufacturer.

Books:

Dadant and Sons, Inc. *The Hive and The Honey Bee*, Hamilton, IL 62341

Root, A. I., and E. R. Root. *ABC and XYZ of Bee Culture*. The A.I. Root Company, Medina, OH 44256

Tew, James E. *Beekeeping Principles*. The Walter T. Kelley Company. Clarkson, KY 42726-0240

Newspaper:

The Speedy Bee, Jessup, GA 31545

Magazines:

American Bee Journal, Dadant and Sons, Inc., Hamilton, IL 62341 1-800-637-7468 www.dadant.com/journal/

Bee Culture, The A.I. Root Company, Medina, OH 44256. 1-800-289-7668. bee.airoot.com/beeeculture/index.htm

Bee Supply Catalogs:

Dadant and Sons, 51 South 2nd Street, Hamilton, IL 62341-1397. 1-800-637-7468. www.dadant.com/

Rossmann Apiaries, Inc., P.O. Box 909, 3364A Ga Hwy 33 N, Moultrie, GA 31776-0909 Jrossman@surfsouth.com

Pierco Incorporated, 3900 Hamner Avenue, Mira Loma, CA 91752 1-800-233-2662 pierco@calmold.com

Mann Lake, Ltd., 501 1st Street, Hackensack, MN 56452-2001 1-800-880-7694 www.mannlake-ltd.com

Brushy Mountain Bee Farm, Inc. 610 Bethany Church Road, Moravian Falls, NC 28654 1-800-233-7929 www.beeequipment.com

Walter T. Kelley Company, Inc., P.O. Box 240, Clarkson, KY 42726-0240. 1-800-233-2899 www.kelleybees.com

Betterbee, Inc., 8 Meader Road, Greenwich, NY 12834. 1-800-632-3379

COMMON QUESTIONS AND COMMENTS FROM PEOPLE CONSIDERING BEEKEEPING

“I could never keep bees. Stings are painful and I swell when I get stung.”

Make no mistake; a bee sting is painful but not nearly as common as a beginning beekeeper might think. With experience and with appropriate protective gear, a beekeeper can reduce stings to a minimum. In just a short time, stinging occurrences approach being inconsequential.

“I would like to keep bees, but I don’t have a place to put them.”

While it is convenient to keep your colonies nearby—even in your backyard—it is not necessary. For pollination benefits, many farmers or other landowners are happy to have a few hives on their land. Ask around. You will be surprised at how easy it is to find a suitable location.

“Is there something other than chemicals that I could use to control mites?”

For absolute control, approved chemicals give the best results. If you keep a few colonies for fun, use resistant bee stock and screened bottom boards, and use chemicals sparingly. If you don’t mind buying replacement packages occasionally, you can omit all chemical treatments and simply replace the bees as needed. Otherwise, mites are here to stay.

“How much time does beekeeping require?”

Simply put, as much or as little time as you want to put into it. Depending on work schedules, some people spend time nearly each day with their hives, while other people with more restrictive schedules may only get to tinker with their colonies occasionally on weekends. Minimally, you will need to spend just a few hours per month for a few hives with nearly no time requirements during cool months. It’s a hobby for most people. Spend only as much time as you enjoy spending.

“How can I completely stop swarming?”

You cannot reasonably completely stop all swarming all the time. You can greatly reduce it by providing plenty of brood nest area and by keeping a 1- to 2- year-old queen in the colony. Swarming is a strong natural impulse that is nearly impossible to completely stop.

“Should I subscribe to a bee magazine?”

Absolutely, subscribe to at least one bee magazine. Beekeeping magazines provide a wealth of information and current knowledge—plus they are not particularly expensive.

“I need help recognizing bee diseases. From the sound of it, a beehive is sick with something nearly all the time.”

Thankfully, that is not true. Most of the time a colony is remarkably healthy. In time, the new beekeeper will grow to recognize common bee diseases and pests. Until that time, ask questions of your bee friends and of state and university specialists. Photographs and descriptions are helpful, but they don't always tell the whole story. Don't be shy. If it doesn't look right, ask.

“Can I take a super of honey that is not completely capped?”

Most of the time—yes. If you are mixing the partially uncapped honey with other honey that was fully capped, you should be okay. If you have doubts, wait until the colony completes the capping process. Honey is 18.6 percent water, but few of us have the device, a refractometer, needed to determine honey moisture content. If you process honey with moisture content higher than that, it is likely to ferment while in storage.

“What is the best queen for my hive?”

Though a common question, there is no easy answer. It is much like asking, “What is the best car currently manufactured?” The important thing is to keep young queens from commercial producers heading your hives. Ironically, there is not much difference between a good queen and a great queen. Choose a queen exhibiting characteristics you like and order from a dependable producer.

“I'm a new beekeeper. How many hives should I start with?”

Ideally, two, and they should be from packages. By starting with two small hives, the beekeepers and the hives can grow together. By having two hives, the beekeeper can potentially correct mistakes by using bees or equipment from the other hive. Frequently, new beekeepers get too many hives too soon, and their hobby quickly becomes tiresome. Beekeeping is enjoyable, but don't let it grow so fast that it becomes too much work.







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