Beekeeping in Arkansas

The Cooperative Extension Service is part of the University of Arkansas Division of Agriculture. With offices in all 75 counties, our faculty and staff provide educational programs and research-based information to the people of Arkansas. If you have questions or would like some information about honey bees or beekeeping, contact your apiculture specialist:

Jon Zawislak
2301 S. University Ave.
Little Rock, AR 72204
501-671-2222
jzawislak@uaex.edu
uaex.edu/bees

Beekeeping in Arkansas is regulated by the Arkansas State Plant Board. Beekeepers are required by state law to register the locations of their bee hives. There is no fee for hive registration, and registered beekeepers are entitled to free apiary inspection services. For more information, or to register your hives, contact the Arkansas State Plant Board:

Arkansas State Plant Board
Apiary Section
1 Natural Resource Drive
Little Rock, AR 72205
501-225-1598
www.aad.arkansas.gov/apiary1

Good Books on Beekeeping

- **The Beekeeper's Handbook (4th ed.)** *by* Diana Sammataro & Alphonse Avitabile
- **Honey Bee Biology and Beekeeping (3rd ed.)** *by* Dewey Caron
- **Honey Bees and Beekeeping: A Year in the Life of An Apiary** *by* Keith Delaplane
- **The Backyard Beekeeper** *by* Kim Flottum
- **First Lessons in Beekeeping** *by* Keith Delaplane
- **Bee-sentials: A Field Guide** *by* Lawrence Connor
- **Beekeeping for Dummies** *by* Howland Blackiston
- **The Complete Idiot's Guide to Beekeeping** *by* Dean Stiglitz & Laurie Herboldsheimer
- **Natural Beekeeping** *by* Ross Conrad

Beekeeping Clubs

Arkansas has numerous local beekeeping associations. These groups can be a great way to learn more about honey bees, and get to know others in your area who share your fascination with them. The Arkansas Beekeepers Association is a statewide organization open to all those with an interest in bees. The ABA sponsors two great conferences each year to promote and support beekeeping in the Natural State. For more information, or to find a local club near you, visit their website at ***arbeekeepers.org***.

Keeping Bees in Arkansas

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
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If you can garden, you can keep bees!

Honey bee hives can be managed safely and productively, even in urban areas. Keeping bees can be a relaxing and enjoyable persuit, immersing you directly in the natural world. As a hobby, or a sideline business, keeping honey bees can be a perfect activity for your family to enjoy together!

To get started keeping bees, you will need a little space, some special tools, some honey bees, and a hive for them to live in. Everything you need is available from mail order suppliers who specialize in beekeepers' needs. An internet search can instantly connect you with many of the leading manufacturers. A great resource is the website ***www.beesource.com***, which lists many suppliers of equipment and honey bees, and provides plans for building your own hives as well.

Setting up your bee yard. In Arkansas, we must register our apiary locations with the Arkansas State Plant Board. There is no fee for registration, just a simple form to fill out. For more information contact the Apiary Section of the Plant Board at (501) 225-1598. Honey bee hives don't require much space, but should not be placed near areas of excessive activity by your family, pets or neighbors. Use your common sense and be considerate. A barrier of thick vegetation or a 6-foot privacy fence will encourage your bees to fly higher as they come and go from the hive, avoiding most people.

The Bee Hive. The bee hive is the bees' house. It is where they live and raise their young, and where they store their delicious golden honey. A bee hive is full of wooden frames, each of which hold a single wax comb. By encouraging the bees to build their combs in these wooden frames, beekeepers can remove the combs to examine them without disturbing or destroying all of the bees' hard work. This modern style of bee hive helps us to keep bees healthy and aids in harvesting their surplus honey. The dimesions of a modern hive are standardized and should be very precise.

Honey bees are not naturally aggressive creatures, but they may react defensively (by stinging) when they feel that their hive is threatened. Honey bees communicate their alarm to each other by emitting a chemical odor, which the other bees detect, and which may cause them to become defensive as well.

Beekeepers use a **smoker** to temporarily mask the bees' communication. By applying a little bit of gentle smoke, your honey bees will remain calm and docile, and working with them will be much easier.

You will also want to invest in some protective clothing to wear while working with your bees. A **bee veil** keeps the bees away from your face and head, while **bee gloves** protect your hands and arms. Protective clothing is available in many styles, ranging from a minimal hat to full length coveralls with an attached zip-on veil.

Bee hives can get a bit sticky. A **hive tool** is designed to help you open the boxes and more easily remove the frames for inspection. Another item, called a bee brush ,can be used to gently move the bees around on the combs and hive without upsetting them. It is also useful to brush a stray bee from your clothing when you are finished examing your hives.

Amazing Honey Bees

A honey bee colony is composed of one giant family. The queen bee is the mother of all the other bees in her hive! One hive may contain 20,000 to 60,000 bees, all working together.

A queen bee can lay up to 2000 eggs per day. She must eat many times her own body weight each day to continually produce eggs.

A honey bee can fly up to 15 mile per hour. Its wings beat about 180 times per second, producing the familiar buzzing sound.

A honey bee may travel up to 3 miles from its hive to collect food. One colony of bees can forage across more than 18,000 acres.

An individual honey bee will take an average of 10 trips from her hive each day, visiting 50-100 flowers on each trip from home.

A honey bee will only visit a single species of flower on each trip, ensuring that pollen is transferred to the correct type of flower.

A worker bee who finds a good source of nectar will communicate its location to the other bees by performing a unique dance.

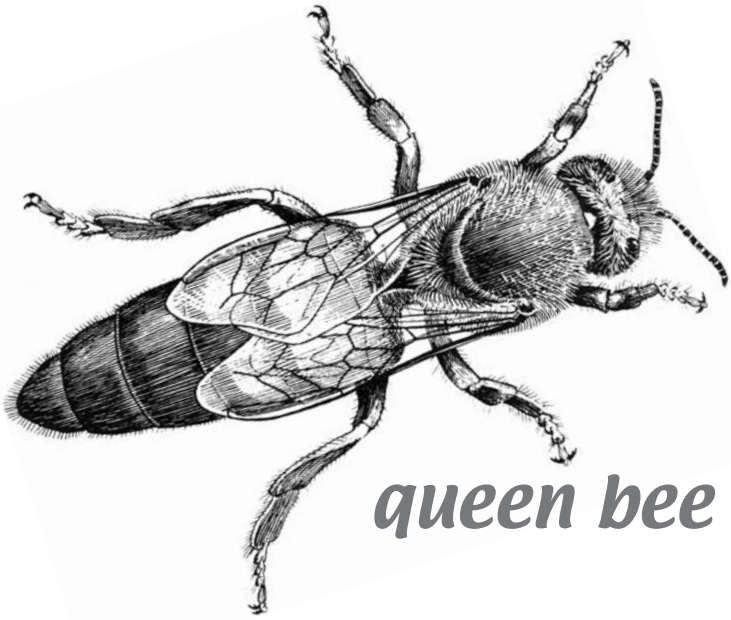
A pound of honey equals about 1 1/3 cups. Bees must gather nectar from around 2 million flowers to make a single pound of honey.

Together, the bees in a hive must fly about 55,000 miles to collect all of the nectar for just 1 pound of honey. By comparison, the earth is about 25,000 miles around at the equator.

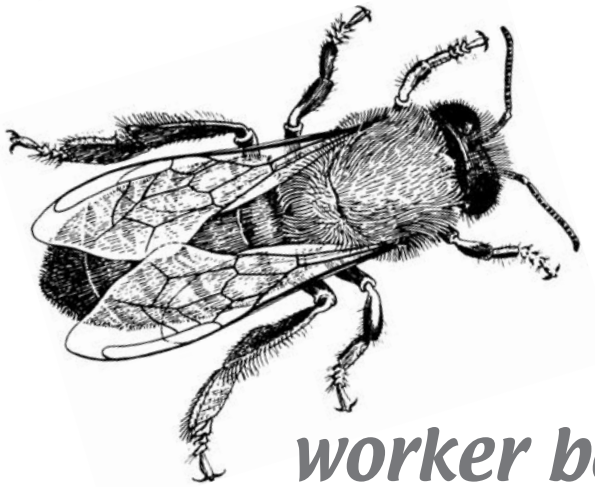
By working together, a colony of bees can produce between 50 and 200 pounds of honey each year. One individual bee will make only 1/12 teaspoon of honey in her entire life.

Honey bee will die soon after they sting, and are therefore not naturally aggressive animals. They sting only to defend themselves or when they feel their colony is threatened.

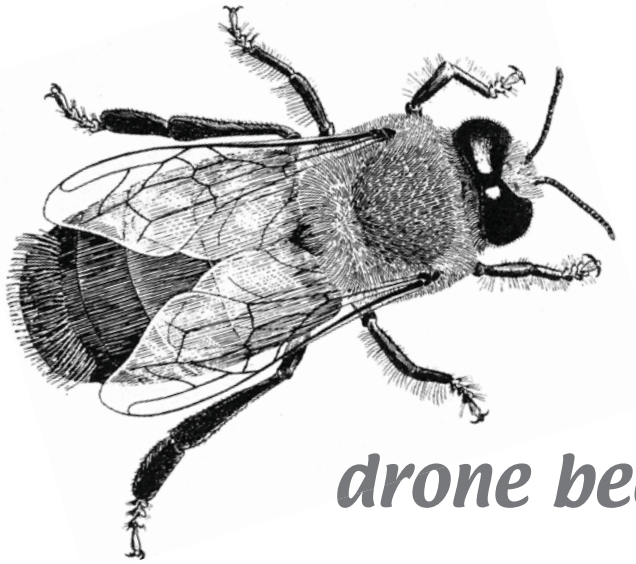
During their busy spring and summer, a worker honey bee will only live for about 6 weeks. But workers may live up to 6 months in the winter, during which time the bees cluster together to stay warm.



queen bee



worker bee

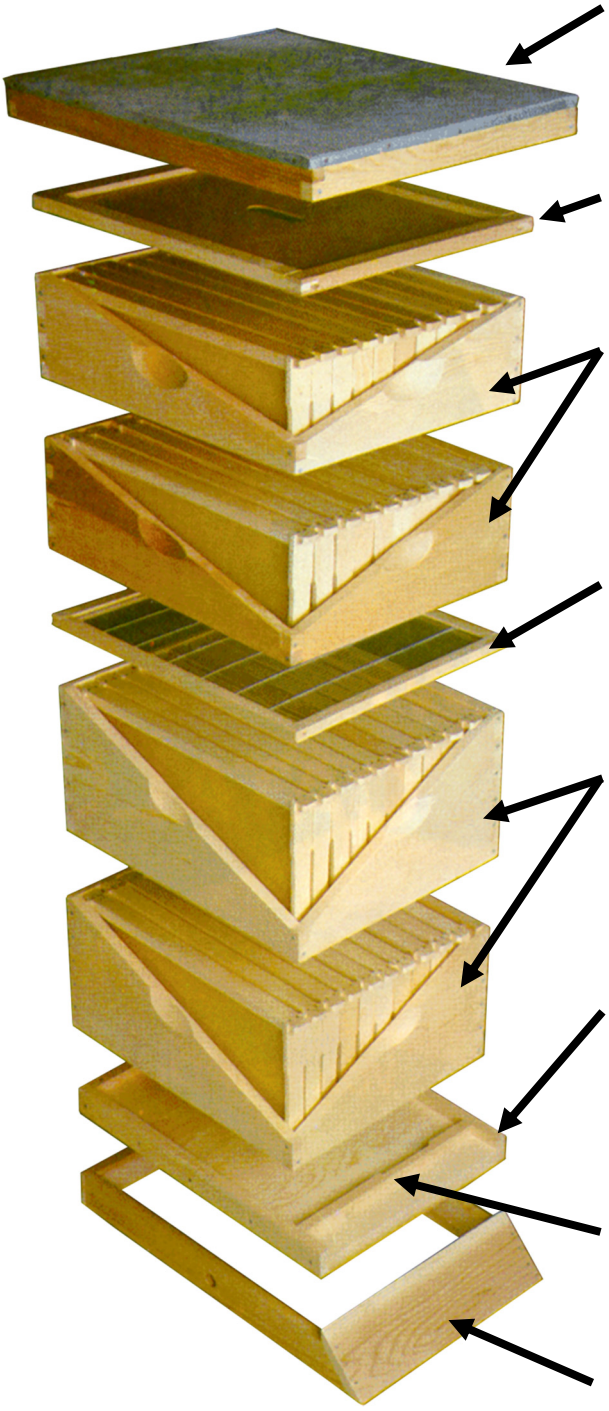


drone bee

learn more:
uaex.edu/bees

Components of the Modern Bee Hive

The modern "Langstroth" bee hive is like a highly efficient multi-storied factory with each "story" having a specific function. These "stories" work together to provide a home for the bees and a honey factory for the beekeeper. This modern hive design allows for easy manipulation of the frames of brood and honey to manage the bee population and encourage a surplus of honey beyond that needed by the bees to live on and rear their replacements. It is this surplus honey that the beekeeper removes and markets.



HIVE COVER – the telescoping cover "telescopes" over the sides of the top super to protect the hive. The aluminum or galvanized covering sheds water and helps to reflect some summer heat.

INNER COVER – creates a dead air space for insulation from the heat and cold, and makes the telescoping cover much easier to remove; an optional but useful item.

HONEY SUPERS – boxes added on top of the hive as required to give the bees room to store their surplus honey. These boxes are removed by the beekeeper when the honey is harvested. Various depth boxes are available from beekeeping suppliers.

QUEEN EXCLUDER – a device to keep the queen bee in the brood chamber, as she is too large to pass through the excluder and begin laying eggs in the honey combs above; another optional item.

HIVE BODIES – the "brood chambers" are the bee's living quarters. The queen bee lays eggs in the combs here, and the developing brood is raised. Pollen is also stored here, to feed the young bee larvae. Some honey is also stored here for the bees' use.

BOTTOM BOARD – merely the floor of the hive. A solid bottom board is traditional, but many beekeepers now use a floor of 1/8" mesh. The screened bottom board allows for better ventilation and helps to passively eliminate some varroa mites (a bee hive pest).

ENTRANCE REDUCER – can be placed across the entrance to help a small colony of bees better guard their hive. It is also placed on the hive during winter to keep out mice.

HIVE STAND – supports the hive off of the ground, keeping the hive dry, and allowing ventillation beneath the hive.

Beekeeping Woodenware

The term **woodenware** refers to the individual components of a bee hive. While these have traditionally been made from wood, today a variety of bee hives are available from plastics and even polystyrene foam. Treated lumber should never be used to make bee hives. Paint your hives with an exterior grade paint to protect your equipment from the elements, unless hives are constructed from cypress, cedar or some other weather-resistant material.

A **bee hive** is the structure that houses the honey bee colony. It could be a hollow tree or other cavity, or one or more stacked wooden boxes provided by a beekeeper, with a lid and bottom board.

A **hive body** is an individual box that makes up a part of a bee hive.

A **colony** refers of the group of living bees that occupy a bee hive. A colony is composed of many thousands of worker bees, a few hundred drone bees, and a single queen bee.

"Deep" Hive Bodies

Until recently, most beekeepers kept their bees in standardized stacked hives with **deep frames** (9 5/8") for both brood and honey. The deep frames provide a large, uninterrupted area for the queen to produce her brood nest. However, because a deep honey super can weigh more than 80 pounds, many beekeepers have begun to use shorter boxes for harvesting surplus honey.

"Medium" hive bodies

A full **medium frame** (6 5/8") honey super weighs about two-thirds of a comparable deep super. Using all medium hive bodies is increasing popular with hobbyist beekeepers. One advantage of using all medium frames is that the beekeeper only needs to have a single size frame and box on hand, rather than a combination of deeps and mediums. Beekeepers can use 3 medium boxes for the brood chamber, roughly equaling the volume of two deep boxes. However, when using all mediums, a beekeeper must handle more frames to do a complete inspection. Also, most nucleus colonies are sold with deep frames, making the establishment of nucs more difficult. When starting new colonies with all medium frames, a beekeeper should consider beginning with package bees, or seek nucs that were made with medium frames.

New VS. Used Equipment

It is not advisable for a new beekeeper purchase used equipment. The spore of some highly contagious honey bee diseases could be present, but not be obvious, in old equipment. If the history of the equipment is unknown, it should be avoided.

Beekeeping Woodenware

10 Frame Equipment

The 10 frame “Langstroth” bee hive has been the industry standard for nearly 150 years, and is still the most commonly used hive in the US. Because they are the most common, it is often easier to resell equipment to another beekeeper, or to find additional equipment for yourself. Another advantage in large hives is that each 10 frame box has more space for bees, honey and brood. A comparable 8 frame hive will be taller and use more boxes than a 10 frame hive.

8 Frame Equipment

An 8 frame hive is lighter by approximately 20 percent. When full of honey, a full 8 frame medium super will weigh 40 to 48 pounds while a full 10 frame medium may weigh 50 to 60 pounds. There is some thought that the smaller size and cross-section of an 8 frame hive is closer to the typical hollow tree cavity seen in nature. Some feel that overwintering is better in taller 8 frame hives than the comparable amount of stores in 10 frame boxes because the cluster can move up more readily in a smaller 8 frame hive as stores are consumed.

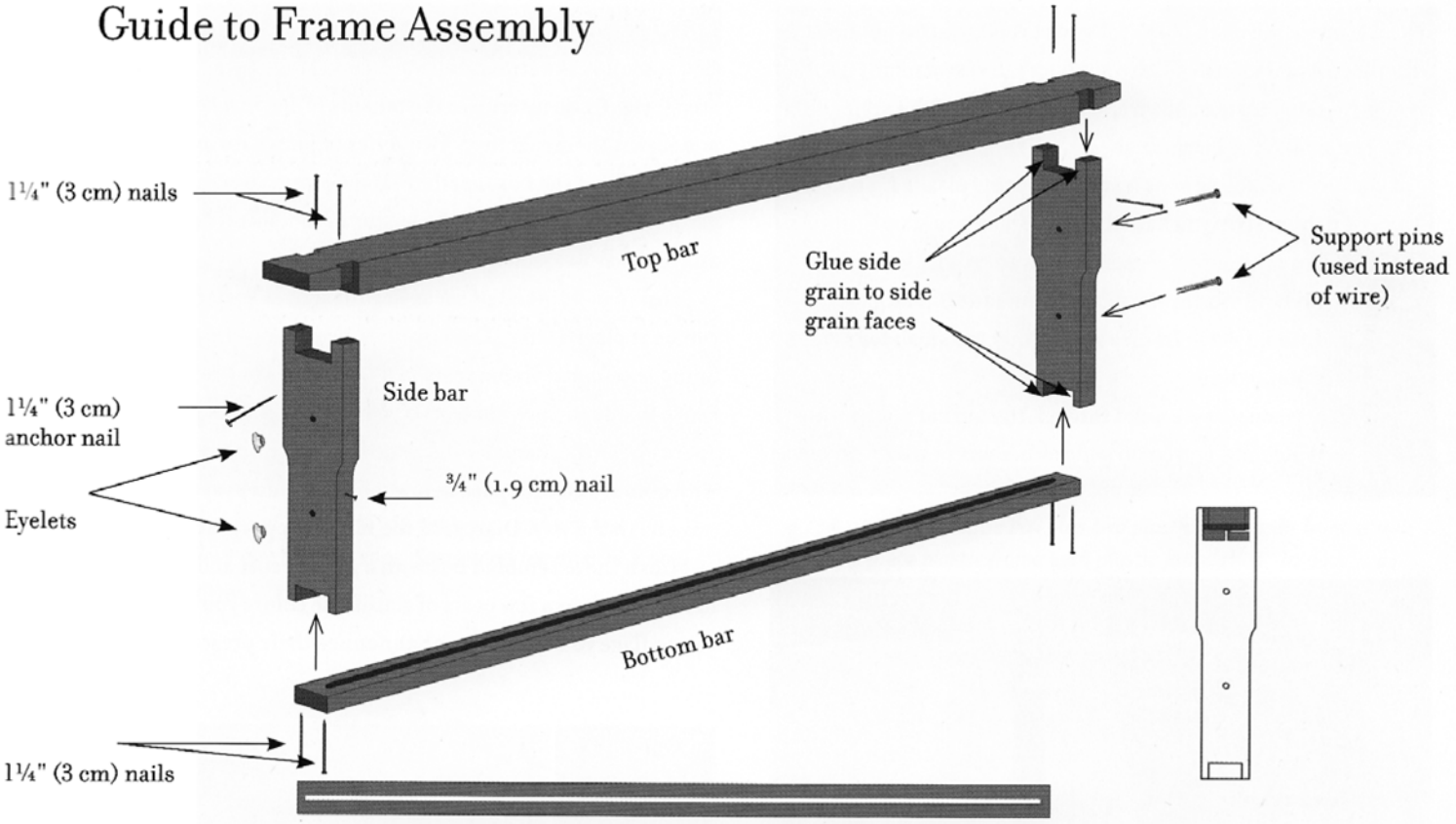
9 Frames in a 10 Frame Box?

Some beekeepers evenly space 9 frames in a 10-frame honey super. If done correctly, the bees will draw out the cells of these combs deeper, leaving the standard “bee space” between all finished combs. Thicker combs are easier to harvest, because the surface of the honeycomb that is removed when uncapping is not blocked by the edge of the wooden frame. Also, because there would be one fewer empty “bee spaces” between combs, there should be slightly more honey stored in a 9-frame setup. Do not use 9 frames in a 10 frame brood box, however, as this will only result in fewer cells in which the queen can lay eggs. When giving the bees new foundation to draw in any hive body, place all 10 frames (not 9), pressed tightly together, in the middle of the hive body. Once the combs have been drawn, a beekeeper can remove one frame and then evenly re-space the remaining combs. Starting bees with 9 frames of foundation to draw will often results in poor quality combs, because the bee space between foundations is too large, and comb may be built parallel to the foundation, or even perpendicular to it.

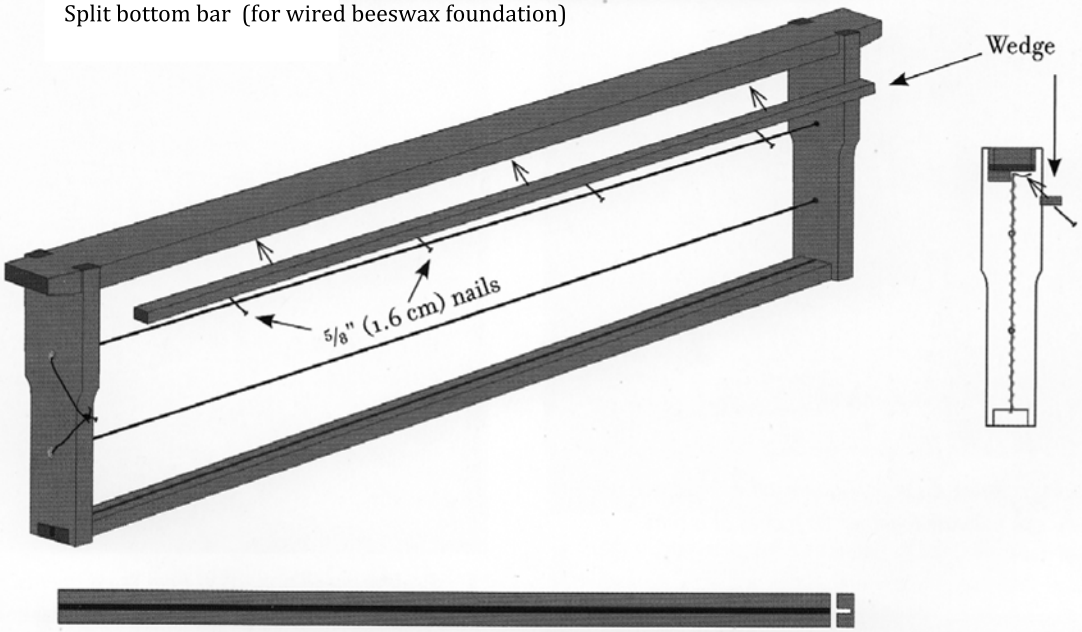
Other types of bee hives

Because of concerns about honey bee health, all managed colonies must be kept in hives with **moveable combs** that allow the brood nest to be inspected. The Langstroth style bee hive is the most common, and is therefore the easiest to purchase. It will also be easier to find advice and information on colony management when using these hives. However, there are other types of bee hives in use, including Warré hives and Kenyan or Tanzanian Top Bar hives.

Guide to Frame Assembly



Split bottom bar (for wired beeswax foundation)



Grooved bottom bar (for plastic foundation)

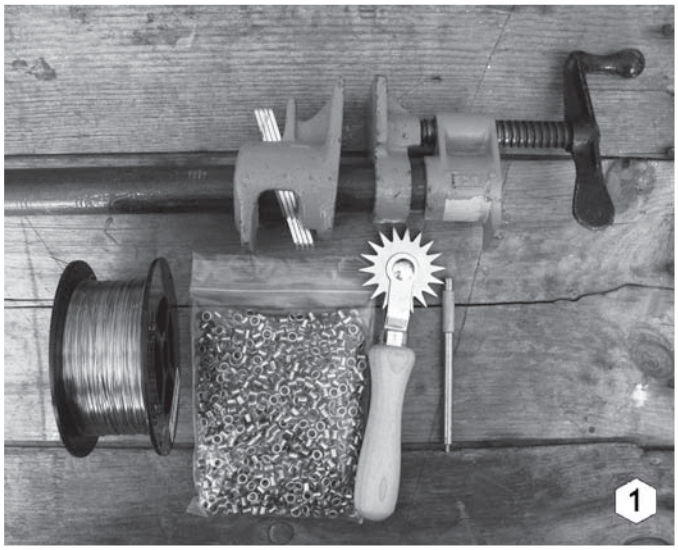
Frame assembly shows nails, nail sizes, eyelets, support pins, and other support structures (the wedge that holds the foundation to the top bar—a split-bottom bar which has a slot all the way through that the foundation fits through, and a grooved-bottom bar that the plastic foundation fits into).

The wiring diagram shows where to fasten the wire on a nail to hold beeswax foundation in place.

The two most important nails in this illustration are the anchor nails that go through the end bar and into the top bar. These will hold the top bar and end bars together forever, in spite of the pressure you will put on this joint when lifting a frame from a sticky box full of honey.

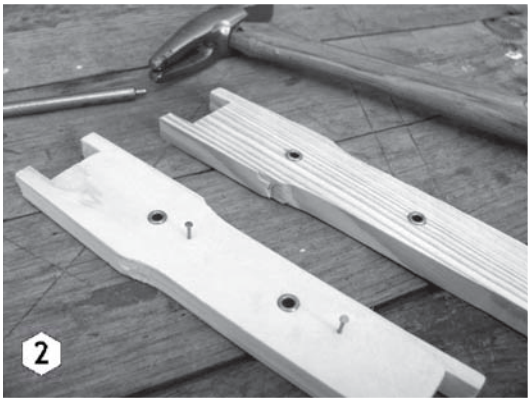
Frame Wiring Tutorial

Jen Larsen
nectarbeesupply.com



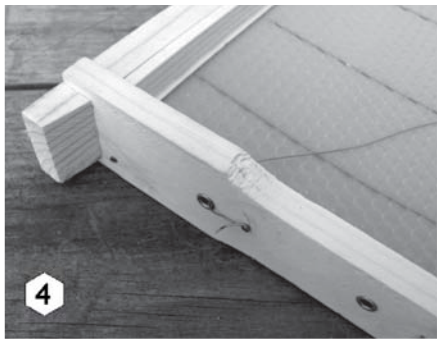
Wiring your frames is a necessary step to ensure your precious honey frames come out of the extractor in one piece and your gorgeous frames of brood remain tightly in place (especially on hot days). The following example illustrates the steps required to wire a medium frame.

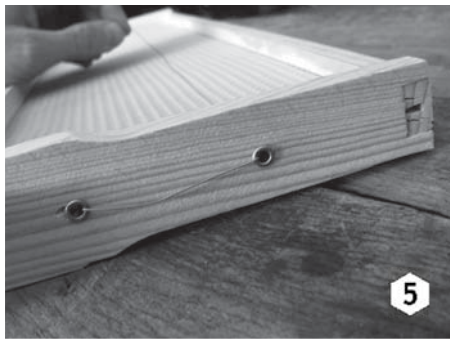
In addition to the frame and foundation, we will be using a spool of frame wire, some eyelets, an eyelet punch, clamp (optional but recommended), and a spur embedder (Fig.1).



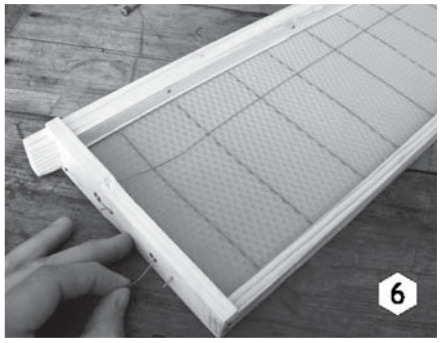
It is easiest to prepare your frame for wiring before assembly. Using your eyelet punch, insert eyelets into each of the predrilled holes on your frame side bars. In addition, place two tack nails to the sides of the eyelets on one side bar (Fig. 2). If you have already assembled your frames, hammer the eyelets and tack nails into the side bars with something underneath the side bar to serve as a shock absorber and to prevent breakage. Continue to assemble the frame (Fig. 3).

To begin wiring, cut a length of wire roughly double the length of your frame, plus a bit more (52" or so should work). On the side bar with the tack nails, thread the wire from the INSIDE OUT through the topmost eyelet, and fasten the end by wrapping it around the adjacent tack nail. Secure in place by nailing down the tack nail. Trim the excess wire (Fig. 4).

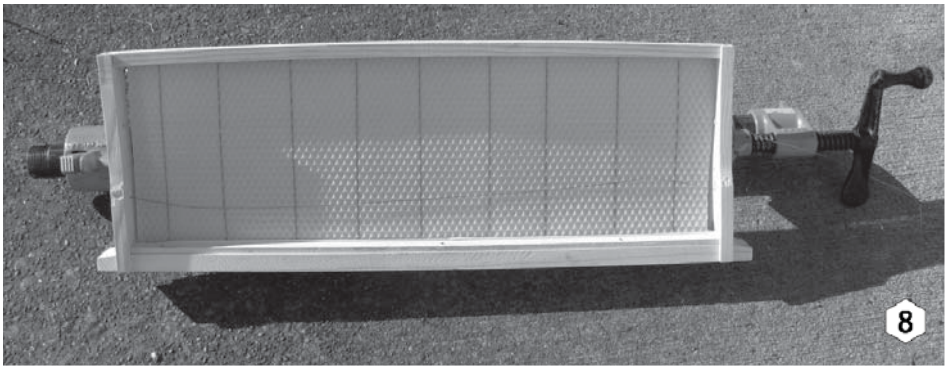




With one end now secure, thread the remaining length of wire through the topmost eyelet on the other side bar. Then thread the wire to the outside of the side bar, and back through the lower eyelet (Fig. 5).



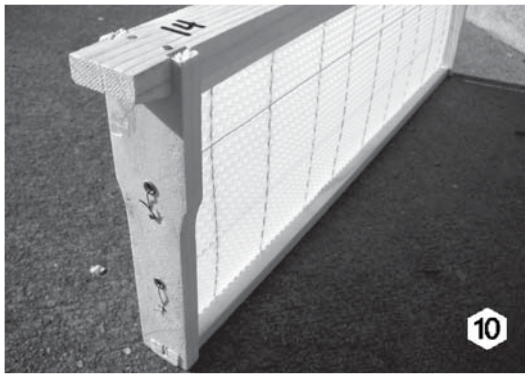
The trick here is to thread the wire across your foundation on the OPPOSITE SIDE from which you started, meaning that your foundation will be sandwiched between two lengths of wire, one running across the front side of your frame and the other running across the back (Fig. 6). Pull the end of the wire out through the eyelet and secure by wrapping around the bottom tack nail. Pull the wire as tightly as you can. Your side bar should now look like Fig. 7.
DO NOT hammer in the tack nail just yet.



A wood clamp is handy to get your wires guitar-string tight. Place the clamp on the side bar adjacent to but not covering the eyelets. You want the wire to be able to move through the eyelets when tightening. Tighten the clamp until you can just start to see your frame bow in at the sides – enough to slacken the wire but not so tight that you crack your frame (Fig. 8). Without removing the clamp, re-tighten the wire around the bottom tack nail as tight as you can wrap it (Fig. 9).

Tap the nail into place, and remove the clamp (Fig. 10). Your wires should now be so tight that they sing. Trim the excess wire and you are done! Notice in the picture that one wire runs in front of the foundation, and the other runs behind. Also notice that I dated my frame. This is a helpful way to keep track of the age of your frames in the hive – frames should be replaced after a few years of use by the bees.

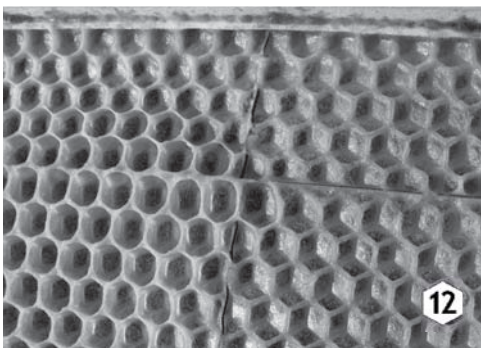
This is what the frame looks like against sunlight. Your wiring, combined with the wires embedded in the foundation (if using this type) should form a nice grid of support for your wax.



The process is exactly the same for deep frames (Fig. 11). The only difference is that you are placing four eyelets on each side bar. You would still place tack nails beside the upper and lower eyelets. Thread your wire back and forth across the frame, remembering to alternate from front to back. Tighten with the clamp, pull the wire tight, secure the tack nail, and you are done!

Some people choose to embed the wire into the foundation. Spur embedders are useful tools for this. It is helpful to do this on fairly warm wax to prevent cracking, and make sure you place the foundation flat on a surface (block of wood, etc) to provide resistance. Run the embedder across the wire until it sticks into the foundation. Another option is to use a weak electrical current to heat the wire and literally melt the wax around it.

Fig. 12 shows a slightly used frame of foundation with wax that has been embedded by me (right side), and further embedded by the bees (left side).



Congratulations on taking the extra steps needed to ensure solid frames for your bees!

Alternative Bee Hives

There is a growing body of knowledge and resources (both online and in print) available for those interested in top bar beekeeping:

- **www.fortheloveofbees.com**
- **www.tbhsbywam.com**
- **www.biobees.com**
- **anarchyapiaries.org**
- **www.backyardhive.com**
- **www.beekeeping.com/articles/us/small_beekeeping**
- **en.wikibooks.org/wiki/Beekeeping/Top_Bar_Hive**
- **www.bushfarms.com/beestopbarhives.htm**
- **outdoorplace.org/beekeeping/kenya.htm**
- **kandykasts.com/top_bar_hives/jim_satterfield/TBH_Beekeeping/main.htm**
- **petitepets.com/pages/bees_topbarhive.php**

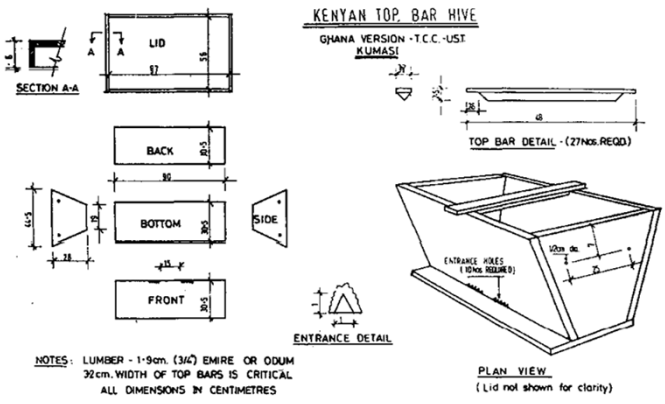
The above websites provide numerous photos and plans for variations on TBH design, but most lack good explanations on how to work bees in a TBH. While these hives are inexpensive to construct, they may require more frequent inspections and manipulations to ensure that the bees have adequate space for brood and honey storage. Also, TBHs typically do not produce as much honey as Langstroth hives, but they do produce more beeswax, since combs are not reused by the bees after harvesting honey.

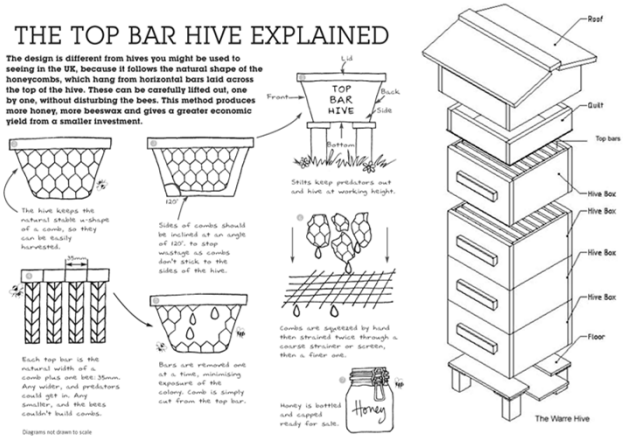
Resources for Warré Hive construction and management:

- **https://thebeespace.net/warre-hive/**
- **http://warre.biobees.com/**
- **https://www.thewarrestore.com/warre-hives/**

Download a free e-book copy of *Beekeeping for All* by Abbé Warré (in English):

- **http://www.users.callnetuk.com/~heaf/beekeeping_for_all.pdf**





Feeding Honey Bee Colonies

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

There is no better food for honey bees than their own honey. However, sometimes it becomes necessary for beekeepers to supplement their colonies' food supplies.

Establishing new colonies: When we establish a new colony, those bees have the tremendous job of drawing out new combs from foundation. Honey bees must consume the equivalent sugar in about 1 pound of honey in order to produce just 2 ounces of beeswax. Each colony must construct some comb before their queen can begin to lay eggs, and before they can begin to store pollen and nectar. In the spring we feed bees 1:1 syrup (1 part sugar to 1 part water). This thinner mixture is considered a *stimulating syrup*. It simulates a nectar flow, and because it has more water than the thicker *fall syrup*, it encourages the bees to draw out more comb in order to have room to store all the food coming into the hive.

Summer dearth: In heavily agricultural parts of the state, irrigated cotton and soybeans may provide a continuous nectar supply all summer. Urban colonies may be surrounded by plenty of well-watered gardens and landscape plants. Colonies in other rural areas may need a little help. When hot dry conditions prevail for extended periods, a colony can consume more honey than it produces. Particularly with new or weak colonies, the beekeeper may need to feed them to ensure that they can make it through the summer. Colonies also need a consistent supply of fresh water during this time.

Fall prep: The fall honey flow is extremely variable in Arkansas, and should not be relied upon to fully replenish the bees' stores for winter, especially if the summer was extremely hot and dry. Some years bring a fall with moderate temperatures and sufficient rains to keep plants in bloom for a while. Different regions of the state vary greatly. As soon as the last of a beekeeper's surplus honey has been harvested, hives should be consolidated to the overwintering volume. Place the queen and all brood frames, plus any frames containing large quantities of pollen, into the lowest hive body. All frames containing honey should be placed above. Put capped frames of honey in the outside positions of the upper box, with empty frames in the center. Feed as needed to encourage bees to fill in all upper frames, and allow bees to back-fill empty cells in the lower box as the brood nest shrinks for winter. Fall syrup is mixed 2:1 (2 parts sugar to 1 part water). This syrup is made thicker so that the bees will be able to store it more efficiently without having to remove excessive moisture before capping it.

Emergency winter feeding: Gently tilt the hive back on its bottom board periodically during the winter. The relative weight and center of gravity of the hive should give the beekeeper a fair idea of how much honey remains. If a hive seems light, emergency feeding is probably in order. Emergency syrup can be fed using any type of feeder, but internal feeders are recommended if daily high temperatures remain below 55^{o}F. Honey bees will not be able to efficiently take syrup from an entrance feeder during cold conditions. Granulated sugar can be fed to bees if syrup is not available. Place sugar directly on top of inner cover, or on a sheet of newspaper placed on the top bars, with an empty super around to provide space. Sugar can be fed in division board feeders or hive top feeders. *Candy boards* can also be used.

Medicating hives: If hives require treatment for Nosema disease or other conditions, mix the medication with syrup according to the product label and feed it to the bees as appropriate. Fall medications are stored in the combs and consumed by the bees throughout winter. Spring treatments can also be fed to bees if symptoms of disease are seen. Feed treatments to colonies early, so all medications will be consumed at least 4 weeks prior to placing the first honey super.

Never feed your bees honey purchased from any unknown sources. Many commercial brands of honey (particularly from overseas sources) contain spores of American Foulbrood. These spores are harmless to humans, but can induce lethal and contagious infections if fed to honey bee colonies.

Never feed brown sugar, molasses or artificial sweeteners (aspartame, saccharine, etc.) to honey bee colonies. Unrefined sugar contains excess plant material that cannot be digested by honey bees. Bees that are confined in the hive for extended periods (due to excess cold or wet weather) must store bodily wastes until conditions are right for cleansing flights. Bees that are fed brown sugar, for instance, will have substantially more waste, and exhibit symptoms of dysentery in the hive, which may be confused with Nosema disease. If you must feed your bees sugar syrup, *use only refined sugar*.

Should you feed them? If you aren't sure if you need to feed your bees or not, err on the side of caution. If the bees don't need it, they won't take it. Especially with granulated sugar, they may even toss it out of the hive if they don't want it. But a little wasted sugar is preferable to a starving colony. ***Do not feed anything to bees while honey supers are on the hive.***

How To Mix Sugar Syrup:

To make sugar syrup, first bring the water to a gentle boil. Reduce heat to a simmer, and then add the sugar. Stir until all sugar is completely dissolved, otherwise it may granulate in the feeder or in the combs. If any additives or medications will be mixed with syrup, wait until it has cooled to room temperature before mixing. Never feed hot syrup to bees.

Additives: Beekeepers often add a teaspoon of white vinegar, apple cider vinegar, or lemon juice per gallon of syrup to reduce the incidence of mold if the bees don't consume it all quickly. Thoroughly washing feeders between uses also cuts down on mold. Mixtures of emulsified essential oils (Honey B Healthy®, Essential Bee®, Nozevit®, etc.) are sold as "feeding stimulants" and may be added to syrup to encourage bees to consume it more quickly, but are not labeled as medications. Fumagillin (Fumidil-B®) is an antibiotic used to treat Nosema disease in honey bees. Mix it according to label instructions.

Note: Mixing sugar syrup is often directed to be done by weight, rather than volume. However, if you don't have an accurate kitchen scale, measuring by volume will generally be close enough for this purpose. You can add a little more water if you want to be precise (but for the purpose of feeding bees, it's not that important):

1 cup of white sugar = 8.82 oz.
1 cup of water = 8 oz, 1 tsp water = 0.167 oz.
1 cup + 5 tsp. water = 8.835 lb water

Candy Boards: A candy board is a block of hard sugar candy that is given to the bees to supplement their winter feed. The humidity that builds up inside an overwintering hive will usually soften the surface of the sugar enough for honey bees to eat. Candy boards were traditionally made by pouring the melted sugar into a wooden tray about the size of an inner cover, which fits on top of a Langstroth hive. If the bees run short of honey during the winter, they are usually at the top of the hive, and so will be in contact with the candy.

Some beekeepers will add pollen (or pollen substitute) to the mixture. Others will place a protein patty in the mold before the sugar solution is poured over it. This way, after the bees have consumed most of the candy, they expose the protein and begin to feed on it just as the brood cycle begins in the spring. Essential oil mixtures may be added to the candy to attract bees to feed on it. Additives should be thoroughly stirred into the candy mixture as it begins to cool down.

Candy can be made in smaller molds, such as pie pans, and stored in large discs or blocks. These individual blocks of candy can be placed onto the top bars of hives that need a little extra food. A spacer or shim may be needed to provide a little extra space in the hive for the candy. Even though this may violate the bee space, bees will not build burr comb in this empty space during the winter.

Cooking Candy: Boil 1 pint of water in a large pot. Add 5 pounds sugar (11 ¼ cups). *Using a candy thermometer*, heat the mixture to 240°F. At this point the candy mixture will foam up and nearly double in volume. Use a long spoon and a deep pot to allow for the sugar to expand! Stir the solution continuously to prevent caramelization. The candy mixture will become cloudy, but then clear as it reaches 240°F. Immediately remove the candy from heat and allow to cool to around 180-200°F, stirring continuously. At this temperature, the mixture is still runny, but *it will set up quickly!* Pour the mixture into the candy mold before it solidifies. This recipe will make enough candy for one mold that is 16 1/4" x 19 7/8" x 3/4" deep (a size that fits neatly on top of a Langstroth hive).

Be extremely careful when cooking candy! Boiling sugar is more dangerous than boiling water, as it will not run off of your skin if you spill or splash it — it sticks to you and continues to burn!

No-cook Candy Method:

- 5 pounds sugar
- 5 ounces cold water
- 1 tablespoon white vinegar or apple cider vinegar

Measure sugar into a very large pot. Add water and vinegar a little at a time, mixing well. When thoroughly mixed, it should have the consistency of wet sand. Feeding stimulants (essential oils) can be added to this mixture in place of vinegar. Pack sugar tightly into candy board mold and allow to dry until firm (1-3 days, depending on the temperature). Candy should not fall out of mold when inverted. Place the candy board in the top of the hive, sugar side down.

Integrated Pest Management for Healthy Honey Bees

[handout]

Integrated Pest Management is an effective & environmentally sensitive approach to pest control. It is *not* pest eradication. Eradication of most pests is not possible, nor practical. If it were, it would have already been done. IPM is *not* the same as organic pest control. IPM seeks to *integrate* all the tools at the beekeeper's disposal. This includes chemical pesticides, but seeks to reserve these for a last resort. IPM strategy relies on a combination of tactics to control, reduce or delay the build-up of pest populations so that the reliance on chemical treatments can be reduced or eliminated.

In beekeeping, varroa mite control provides an excellent example for understanding and implementing the principles of IPM. While the total eradication of varroa mites is impossible, an otherwise healthy honey bee colony can tolerate a low level of mite infestation without noticeable damage. Our goal is to improve or maintain colony health by reducing or limiting a colony's mite population, or by slowing the rate of mite population growth.

Knowledge of the pest

Key to managing varroa mites is an understanding of their biology and life cycle, and the ability to recognize damage to the host. Knowledge of the treatment tactics and their effectiveness is also important. Without this understanding, a beekeeper cannot be expected to make the best management decisions.

Cultural practices

Beekeepers can do numerous things to minimize the impact of mites without the use of chemicals. These cultural practices include modifications to the hive itself, such as screen bottom boards, which passively eliminate a portion of mites all season long. Other mechanical solutions include drone brood trapping and colony sugar dusting, both of which can eliminate a portion of mites. Using varroa-resistant queen stocks such as Russian strains or SMR hybrids can also reduce the impact of varroa mites without chemicals.

Routine pest monitoring

A vital component of IPM is regular monitoring of the pest population. Varroa mite infestations can be measured using any of a number of methods: sticky boards, powdered sugar shake, ether roll, alcohol wash, or drone infestation. Routine sampling can indicate if a pest population is increasing, and alerts the beekeeper to potential problems. It is important that chemical treatments should not be applied on a calendar schedule, but only **if** they are needed, only **when** they are needed and only **where** they are needed. Treatments should begin with the least invasive, most highly targeted chemicals first. Resort to harsher treatments only if necessary.

"Soft" chemicals

Treatments for varroa have been developed which specifically target mites, but have little impact on the bees and leave little or no residue in the beeswax. These include essential plant oils such as thymol, and organic acids such as formic acid. Both types of treatments vaporize in the hive, causing mites to die, yet are generally safe for bees when used within a specific daytime temperature range. However, when used below this range they may volatilize too slowly to be effective. Above this range, they can volatilize too rapidly and cause bee mortality. Some treatments are also hazardous to the beekeeper if not handled properly. *Read and follow all product labels and instructions.* Many of these varroa treatments are also effective against tracheal mites.

"Hard" Chemicals

The original tool for fighting varroa was the pyrethroid chemical fluvalinate (sold as Apistan®). It worked very well at first, but overuse by beekeepers soon led to resistant mite populations. An organophosphate pesticide, coumaphos (sold as Checkmite®), was introduced to combat this resistance. Within a few years, mites were also found to be resistant to this product. Both products can still be effective tools in combating varroa mites, but their use should be reserved for situations when other methods have not been successful.

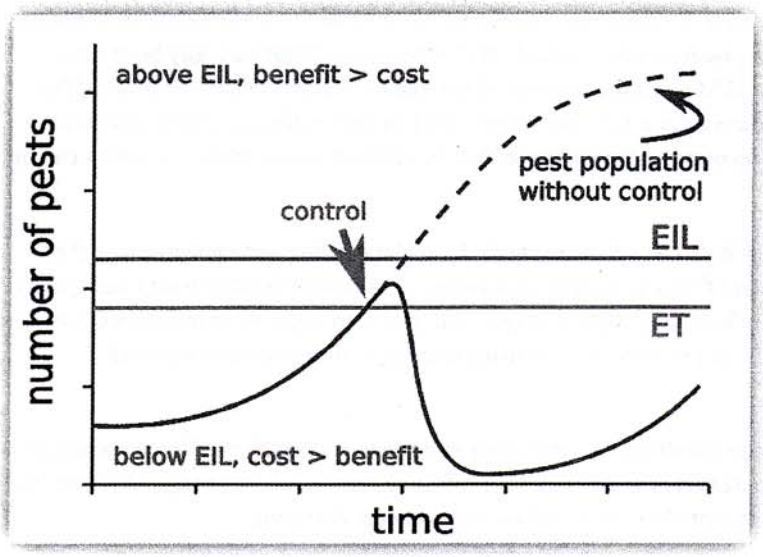
Remember that a pesticide label is a law. Read and follow all product labels and instructions.

UofA UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE

Jon Zawislak, Program Associate – Apiculture
jzawislak@uaex.edu
www.uaex.edu

Determining if Varroa Mite Treatment is Necessary

[handout]



EIL = Economic Injury Level
This is the point at which the pest population level is high enough to cause economic damage to the colony.

ET = Economic Threshold
This is the pest level at which we apply treatment, in order to prevent the pest population level from reaching EIL.

As long as the pest population remains below the economic threshold, it does not cause significant damage, and the cost of treatment will be greater than any benefit it may provide.

Determining the "economic threshold" for a bee colony can be tricky, and depends on several considerations. What is the value you place on your bees? Are you keeping bees for honey or wax production, for pollination or purely for enjoyment? What is the replacement cost for a colony that dies? How much honey is gained by treating for mites? How much is potentially lost by not treating? The number of varroa mites that a bee colony can tolerate without damage depends on the time of year, the population of bees in the hive, and the overall health of the bee colony. A small early spring colony cannot tolerate a heavy mite infestation without becoming stressed. A strong colony in mid-summer can tolerate many more mites. However, in the early fall, high numbers of varroa mites can have significant negative effects on the health and lifespan of the bees that will overwinter.

A mite sample from 200-400 bees, using the powdered sugar shake method, can fairly accurately reveal the level of varroa infestation in a hive. The percentage of infestation, or number of mites per 100 bees, is calculated like this:

% infestation = # mites ÷ # bees x 100

Suggested Economic Thresholds for Varroa Mites in the Southeastern U.S.		
time of year	***spring***	***fall***
powdered sugar (300 bee sample)	2-3	10-15
sticky board	5-10	60-120

In general, treatment should be considered if the mite infestation level is greater than 1% in the spring, or greater than 5% in the fall. For sticky boards, count the total number of mites that fall over three days, and divide by 3 to get the average daily mite-fall. If this number is more than 5-10 in the spring, or more than 60-120 in the fall, a beekeeper should consider treatment, taking into account the overall health and size of the colony. These guidelines vary widely by geographical region, time of year, the amount of capped brood present, and the overall honey bee population. Routine sampling of pest populations will help a beekeeper recognize increasing pest levels before they become problematic.

The broad goal of Integrated Pest Management is long-term sustainability of healthy bees, rather than a short-term quick fix for an isolated problem. By reducing dependence on chemical pesticides, beekeepers can maintain a healthier environment for their honey bees, reduce the risk of contaminating honey, and save money. When a pesticide must be used, alternating treatment chemicals will reduce the chances of resistance evolving in the pest populations, thus extending the useful lifespan of the tools at the beekeeper's disposal.

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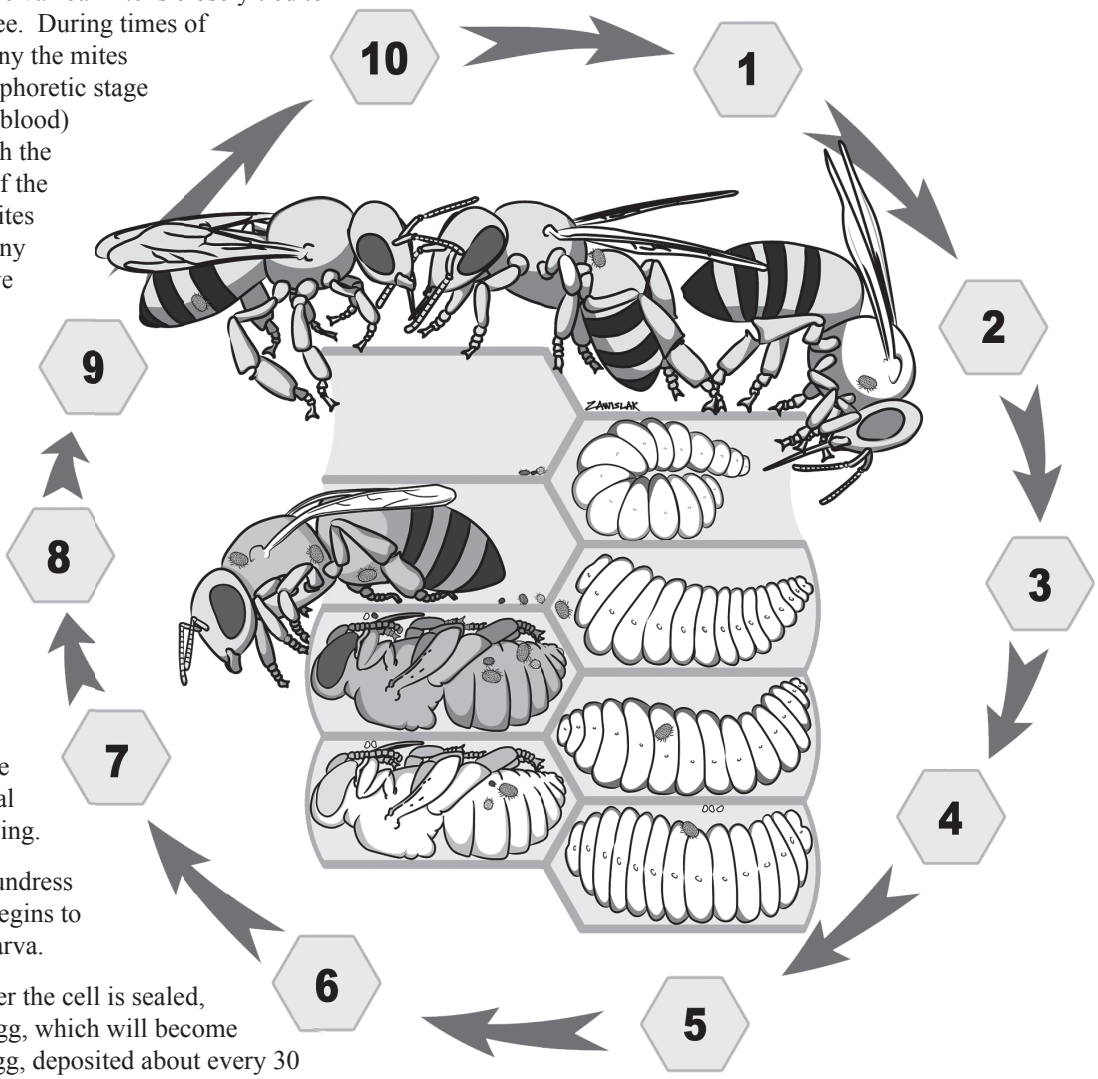
Jon Zawislak, Program Associate – Apiculture
jzawislak@uaex.edu
www.uaex.edu

Life Cycle of the Honey Bee Parasite *Varroa destructor*

[1] The reproductive cycle of the varroa mite is closely tied to the development of the honey bee. During times of no brood rearing in the bee colony the mites cannot reproduce. While in the phoretic stage varroa feed on the hemolymph (blood) of the adult bees, usually through the soft intersegmental membrane of the abdomen. During the winter, mites can remain on adult bees for many months. While mites can survive on adult bees of any age, they prefer young nurse bees.



[2] A pheromone signal tells nurse bees that a honey bee larva is ready for pupation, generally about six days old. Varroa mites also detect this signal and use it to locate suitable hosts as infested workers move from cell to cell, tending the brood.

[3] The foundress (a mated reproductive female mite) will hide in the food provisions in the brood cell while worker bees seal the larva inside with a wax capping.

[4] Inside the pupal cell, the foundress mite emerges from hiding and begins to feed on the hemolymph of the larva.

[5] Approximately 60 hours after the cell is sealed, the foundress will lay her first egg, which will become a male mite. Each successive egg, deposited about every 30 hours, will develop into a female mite.

[6] As varroa mite nymphs emerge, they will feed on the bee pupa, grow and molt over several days. Male varroa mature in 5-6 days; females in 7-8 days.

[7] The male mite is fully developed by the time the first female reaches maturity. The pair will alternate between periods of feeding and mating. As each successive female mite matures, the male will mate with her as often as possible until another female mite matures, or the adult bee emerges from its cell.

[8] When the bee reaches maturity, it chews a hole in the capping and exits the pupal cell, releaseing the foundress mite and her mature female offspring. The number of mature offspring is limited by the duration of the bee's pupal time. Mites reproducing in drone cells have greater reproductive potential, and are preferentially attracted to drone cells over worker cells when seeking a host.

[9] The male varroa mite, along with all immature female mites, will remain the cell after the bee emerges These mites quickly die and will be removed by the housecleaning bees, which are preparing the cells for the queen to deposit a new eggs.

[10] As mites exit a cell with the newly emerged bee, they usually move onto new hosts, where they will remain and feed for several days, occasionally changing hosts again. Soon the mites will seek a suitable host on which to comlete their reproductive stage. By remaining on nurse bees, varroa have easy access to suitable larvae. During times of brood rearing, mites will spend most of their time inside the pupal cells. Therefore the phoretic stage is the most vulnerable part of the mites' life cycle.

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Jon Zawislak ● Instructor, Apiculture
University of Arkansas Cooperative Extension Service
jzawislak@uada.edu ● uaex.uada.edu/bees

Bee Hive Inspection Record

hive name:			***date:***
bee yard location:			***time:***
# brood chambers:		***# supers:***	***queen excluder:*** ☐ no ☐ yes
hive temperament:	☐ calm	☐ nervous	☐ defensive
entrance traffic:	☐ high	☐ medium	☐ low ☐ with pollen
saw queen:	☐ no ☐ yes	marked?	☐ no ☐ yes - color:
laying pattern:	☐ excellent	☐ mediocre	☐ poor
eggs seen:	☐ no ☐ yes		
bee population:	☐ heavy	☐ moderate	☐ low
queen cells:	☐ no ☐ yes		***excessive drone cells:*** ☐ no ☐ yes
honey stores:	☐ high	☐ medium	☐ low
pollen stores:	☐ high	☐ medium	☐ low
diseases:	☐ chalkbrood	☐ nosema	☐ EFB ☐ AFB ☐ DWV
pests:	☐ varroa mite	☐ tracheal mite	☐ SHB ☐ wax moth
hive conditions:	☐ normal/healthy	☐ brace comb	☐ excessive propolis
	☐ normal odor	☐ foul odor	☐ equipment damage
	☐ other:		
actions taken:	☐ added feeder	☐ fed hive	☐ added super(s) #:
	☐ swapped brood chambers		☐ requeened
	☐ split hive - new hive name/#:		
	☐ other:		
medications:	☐ added	☐ removed	
recommendations:	☐ add supers	☐ split	☐ replace queen ☐ needs SHB trap
	☐ swarming imminent - needs monitoring		☐ test varroa level
	☐ replace equipment:		
	☐ other:		

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interesting observations: