

Beekeeping Basics

by

Jon Zawislak

University of Arkansas System

Division of Agriculture

Cooperative Extension Service

Part 3:

Introduction to Beekeeping Tools & Protective Clothing

Beekeeping catalogs are full of items you may have never seen. If you're new to beekeeping you may wonder what they're all for, and how many of them you really need to get started. A lot of these tools may serve very specific functions for manipulating colonies, rearing new queens, harvesting honey, or treating a hive for pests or diseases – all things you will likely not be doing on a regular basis. Most day-to-day colony management tasks require only a few simple tools to get you started on your beekeeping journey.

Of course you'll need some honey bees and a hive for your bees to live in. You'll also want a bee smoker, a hive tool, and (most likely) some kind of protective clothing.

Honey bees do sting, and bee stings hurt! They are supposed to. They are the bees' way of letting us know that we aren't welcome, or we did something wrong. Beekeepers use **protective clothing** to help prevent bee stings – especially around the head and face. There are numerous types of protective clothing for any budget or any level of safety. The most basic type of protective gear is the **bee veil**. A veil is a see-through mesh that covers your head and face, and keeps the bees away from your eyes and out of your ears. It's easier to focus on what we are doing when we don't have bees crawling around on our faces. A veil may fit over a hat, or may be designed to wear on its own. Some have a round screen that provides a wide field of vision, while others are made of joined panels that fold up for convenient storage. Your veil may have attached cords, elastic bands or other straps that pull the veil down snugly across the shoulders, to keep bees out.

You can also get a veil that is attached to a jacket, often secured with a zipper. It may open in the front or pull over your head. And some bee suits cover the entire body, with elastic cuffs at the wrists, and zippers at the ankles and flaps to secure the zippers.

Beekeepers often wear gloves to cover their hands as well. These generally have long gauntlets that are pulled up past the elbow, to prevent bees from sneaking in. Some bee suits and jackets may have an elastic loop sewn into the wrist. Place your thumb through this loop to keep your sleeves in place when you pull on your gloves. Bee gloves may be made of thick cow-hide leather, more supple goat-skin, or made from plastic.

Besides protecting you from stings, your beekeeping clothing also helps keep your regular clothes clean. Beekeeping can be a sticky job. Honey and beeswax can both be messy, but propolis is the real culprit. This resin is very sticky, and over time, tends to get smeared on everything you use in your beekeeping: your hive tool and smoker, your gloves, and your bee suit.

Be aware that bee suits and gloves are sting-resistant, but they are by no means sting-proof. A determined honey bee can sting through most suits and even through leather gloves. Even though all this protective gear makes us feel invulnerable, we should still focus on working with our bees gently, and doing our best to not upset them. These extra layers of clothing can also be hot and heavy, especially in the summer when we may have a lot of work to do with our hives. After a while, many experienced beekeepers tend to shed some of the more cumbersome gear for casual inspections and routine tasks. A minimal veil keeps your face safe, while you stay comfortable for casual inspections. Working with bare hands can actually be easier sometimes, because you can feel what you are touching, which you can't necessarily do while wearing thick leather gloves. Also, when we work without gloves, we tend to be much more careful about what we are doing, and we'll treat our bees more gently. Some beekeepers prefer to work their hives with thin disposable gloves. Of course these won't protect from bee stings, you can feel what you are touching, and you don't have to worry about cleaning propolis off of your fingers afterward. It may take a while to overcome a natural fear of being stung, and there is no shame in dressing up to visit your bees. You should feel at ease while you work, and not be nervous or afraid. Your comfort level with your bees will increase as you gain experience. It is recommended that you keep some bee gloves on hand, just in case. No matter how long you have worked with bees, there will be times when you will be glad you have them.

The **bee smoker** is probably your most important piece of equipment. People learned in ancient times that a little bit of smoke appeared to calm the bees and make them less defensive, and made it easier to rob the honey from a wild bees' nest. It was commonly believed that when the bees smelled smoke, they would think it was a forest fire, and gorge themselves on honey in case they had to abandon their nest, and being full of honey made them less likely or less able to sting.

We now know that honey bees communicate very effectively with each other using a complex language of chemical odors called **pheromones**. One of these is known as **alarm pheromone**, and it's used by a honey bee to quickly alert others that they sense danger. Alarm pheromone has a distinct and familiar odor that you will occasionally notice when you are at your bee hives. Its primary chemical component, *isopentyl acetate*, and this is what gives bananas their particular aroma.

When a honey bee feels threatened or senses danger to her hive, she will emit this alarm signal. Other bees nearby respond by becoming much more defensive, and also emitting more of this signal themselves, to pass the message on. Using smoke masks the odor of this pheromone signal, so other bees will not be alerted that a few feel upset or threatened. Bees also release a bit of alarm pheromone when they sting, which can mark you an intruder, and alerts other bees that you has been deemed unwelcome. If you are stung by a bee when you are working your hive, on the hand for instance, you'll want to remove the stinger immediately. But also use a blast from your smoker to mask the odor left behind on your skin by that bee. Otherwise, expect more bees to find and sting that same spot.

The bee smoker is a simple device that has changed quite a bit throughout its long history. In ancient times it may have started as simply a bundle of smoldering reeds, and later a clay vessel full of burning grass that people simply waved around or blew air into to create a cloud of smoke. Later versions incorporated a bellows and a funnel to better direct smoke, but some required two hands to operate. The modern "cold blast smoker" is simple and efficient. It consists of a fire can, with a funnel, and a bellows that can be operated with one hand. When filled and lit properly, the fuel will

smolder slowly for a long time, without burning up, but when the bellows is squeezed, the added oxygen causes the fire to flare up, and a thick cloud of smoke can be directed when it's needed.

There are plenty of things we can use as a **smoker fuel**. It's hard to beat **pine needles**. If you have any pine trees around, these are probably plentiful on the ground, they light easily, burn long, and produce a good smoke. Keep a bundle of them in a dry location in case you need to open your hives after a good rain and the ones outside are still wet. **Burlap bags** also makes a great fuel if you can find them. Cut the burlap into strips that you can roll up tightly and fit into the smoker. These rolls will burn for a long time and produce excellent smoke. **Jute twine, wood shavings, dry grass** or even **hay** can also work. The flowers of **red sumac** plant burn very well when they are completely dry. Bee supply companies also sell pre-packaged smoker fuels, made of compressed **cotton fibers** or **wood shavings**. You can even use **hardwood pellets** meant for wood stoves. Try to find natural plant materials, and avoid cardboard cartons, slick magazines and other paper products that contain a lot of inks, dyes and chemicals that aren't good for your bees.

To use your smoker, a fire is started in the bottom, and the can is then packed with fuel, without smoothing the fire. It should continue to smolder in the bottom. For safety, wear a leather bee glove, or use your hive tool to add more fuel to an already burning smoker. When the bellows is compressed, air is forced into the can from below, providing oxygen to the fire, which will flare up and release a cloud of smoke. Otherwise the embers should smolder slowly, conserving the fuel. The smoke coming out should not be hot, and no sparks or embers should be emitted while working the bees. The fuel packed into the top of the can catches sparks and cools the smoke before it exits. If your smoker begins blasting out flames or sparks, it is likely running out of fuel or has not been packed properly. You should pause to reload it. A layer of green grass or leaves on the very top of dry, loose fuel can also keep it from emitting burning embers. A well-packed smoker can burn slowly for an hour or more if not used, but it's a good idea to give it an occasional puff, even if you haven't been using it, to make sure it stays lit. You don't want to discover it's gone out right when you really need it.

A smoker is a simple invention, but they are not all created equal. The kind with a wire cage around the outside will keep it from getting dented during normal use, and can prevent you from accidentally burning yourself by touching the side. These also have a handy hook on the front, which you can use to hang the smoker right on the edge of the hive where you are working. Invest in a good smoker and it should last you for a long time. The bellows is often the part that wears out first, but these can be easily replaced. Learning how to light and properly use your smoker are both important skills.

Another essential piece of equipment is your **hive tool**. There are many types of hive tools available today. The traditional style is simply a flat steel bar with a broad blade, and a 90-degree bend at one end. Both ends are sharp, and there is a hole that can be used to pull out a nail or hang it on the wall of your shop. Another style, called the **J-hook**, is flat, with has a hook at one end, which can give you a good amount of leverage when pulling up a frame that is stuck in place with propolis. The **Kent Williams hive tool**, named for its inventor, a famous Kentucky beekeeper, combines elements of both. The **Italian hive tool** is long and slender, and is favored by some top bar beekeepers. There are many other styles and designs available promising extra features, but really the most basic and inexpensive tool design is perfectly functional and will do practically everything you need.

Your hive tool is used primarily for **scraping** and **prying**. When you need to open your bee hives, you will often find that the lid and boxes have become sealed together by the bees with propolis, which the old timers called “bee glue” for good reason. It can take considerable effort to pry them apart sometimes, especially if you have not opened the hive in a while. You will use your hive tool to separate the frames and lift them out for routine inspections and to harvesting honey. And you will use these tools to scrape away excess propolis and pieces of odd comb – called burr comb - that the bees have built in places we feel they shouldn’t. Once in while you may use it to pull a nail, or hammer one back in. It’s not a bad idea to have an extra hive tool or two. They are inexpensive, but they can be easy to misplace and you don’t want to be caught without one.

A **bee brush** can used to move bees without hurting them – or making them terribly upset. You can gently brush bees off of an area of comb so you can see into the cells underneath them. Or you can use it to remove all the bees from a comb that you are moving from one hive to another, so no foreign-smelling bees are introduced, which might be killed as intruders. Or you can use the brush to purposely shake a large number of bees into another hive when making up splits, or creating starter hives for queen rearing. They can be useful when hiving a swarm, or collecting bees for parasitic mite assessment. A brush is also handy to remove any last few stubborn bees when you are harvesting their honey. Finally, a bee brush is good to use when you are finished visiting your hives, to make sure there are no bees remaining on your clothing as your walk away, or on others who are with you. That last hitchhiker might surprise you when you take off your bee suit.

With these few simple tools, you can accomplish most of your beekeeping tasks. There are many other tools available to you from the equipment suppliers. Let’s take a look at some of them now just so you know what they are for.

A **frame grip** allows you to lift a frame straight up, and hold it with one hand. These can be handy when you are teaching others, or showing things off, because you can use your other hand to point out the queen, or various stages of brood, and other things. Just be sure to keep a tight grip on the handles, though. If you relax your grip for a second, you may drop a frame full of honey, or brood that is covered with bees who will not enjoy the landing.

A **frame holder** or **frame perch** sits on the edge of the box you have opened, and give you a convenient place to safely place a frame or two you have removed from the hive without worrying about harming the bees on it. As long as the frame stays vertical, and you have not shaken them around when removing it, most of these bees will continue working while you are inspecting the rest of the hive body.

A **frame spacing guide** is used to perfectly space out **9 frames in a 10-frame hive body**. This is sometimes done to encourage the bees to draw thicker honey combs that are easier to uncap. The same thing can be accomplished with a **fixed 9-frame spacer** that is attached to the inside of the hive. While acceptable in the honey supers, it is not recommended to use 9 frames in the brood nest.

A **queen excluder** keeps the larger queen from moving up into your honey supers, but allows worker bees to pass through and store surplus honey there. The bees will sometimes build burr comb above or below an excluder, or fill in spaces with propolis. An **excluder cleaner tool** fits the grooves and scrapes them clean.

Similar in appearance to a queen excluder, a **propolis trap** has slightly smaller spaces, which bees cannot fit through. A beekeeper can place this device on the top of the uppermost hive body and prop open the lid just a bit. Because the bees see sunlight and feel a draft, but cannot fit through the space themselves, they will seal the openings with propolis. This is best done in the late summer when there are fewer flowers in bloom, but the colony still has a surplus of foragers, so they will have a good workforce to devote to propolis gathering. Later, you can remove this trap, and place it in a large plastic trash bag in the freezer. Propolis is very soft and pliable when warm, but when frozen it becomes very hard and brittle, and can be easy to remove from the trap by simply flexing the trap back and forth. Clean propolis is another marketable product that beekeepers can collect from their hives.

Pollen traps can help beekeepers harvest freshly collected pollen directly the hind legs of returning foragers. Locally-collected pollen can be in high demand for people who consume it for its high vitamin and protein content, as well as the belief that consuming a small amount of local pollen on a regular basis helps to alleviate seasonal allergies. The scientific consensus on this claim is still an open question. It appears to work for some individuals, but not for others, depending on their own physiology and specific allergies, and the plants that the bees have visited over the season. If you decide to package and sell bee pollen, avoid making any unsubstantiated medical claims.

It's far easier to spot your queen when she's been marked with a dot of colorful paint. Common waterproof **paint pens** are useful for easy queen marking. Those sold in beekeeping catalogs should not harm your queen, but some you find in an arts and craft store could contain harmful solvents. There is an international color code for marking queens that indicate the year in which she was mated. The last digit of the year corresponds to the color. For years ending in 1 or 6 she should be marked with white paint. If the year ends with a 2 or 7, use yellow. For 3 or 8, use red. Years with a 4 or 9 will be green. And blue is used for years ending in 5 or 0. Marking them helps beekeepers keep track of how old individual queens are, and also alerts us to the fact that she has been replaced through swarming or supersedure. This can be particularly important in areas where Africanized honey bees may have become established, and a new queen is likely to mate with undesirable drones. There are numerous devices designed to capture and confine a queen, or to move her, or to hold her still while you mark her, or just keep her safely isolated when you are working in your bee hive.

Experienced beekeepers will often simply pick a queen up, right off of the comb to move her, mark her, cage her, or replace her. This is, of course, easier to do without wearing gloves. Quickly, but carefully, grab your queen by both of her forewings and lift her off of the comb. If you miss her the first time, she is likely to begin running across the comb, and may be harder to capture. With your other hand, grasp her by both of her hind legs and let go of her wings. Holding her by two legs prevents her from trying to twist around and potentially becoming injured. Alternately, grip her gently but firmly on both sides of her tough thorax. Never hold a queen by the head or by the soft abdomen, which can cause her severe injury.

With your paint marker, place a single dot of paint on her thorax, right between her wings. While it's rare, a **queen bee can sting** to defend herself, although her ovipositor is smooth, and not barbed like her workers. So it will not be fatal to her, but it can still be painful to you! You will want the mark to be visible and permanent, but don't overdo it. Take care to not get paint on her wings or head or anywhere else. You should hold the queen for 30-60 seconds to allow the paint to

dry before you release her, or place her temporarily in a cage. If you release her back into the hive while the paint is still wet, she will immediately be approached by other bees or she will disappear down between the frames, where the paint will likely become smeared or wiped off onto other bees. If you are not comfortable handling and marking an expensive and important queen bee, practice on some drones first! These male bees are large and easy to spot, and easy to pick up. Also they can be handled safely because they have no stinger.

Feeding a bee colony may be necessary any time of year when there is not a good nectar flow happening – that is, when there is not an abundance of flowering plants in bloom for the bees to gather their own food. When to feed them, and how much, depends greatly on your location and seasonal climate. It's generally advised to feed a stimulating sugar syrup to early spring colonies that you are trying to establish from swarms, packages or nucs – especially if they are given a lot of new foundation to draw. Colonies may also need to be fed during periods of prolonged rain if they are unable to forage much, or during hot, dry summer months (called a nectar dearth). During either of these times, the bees may consume their stored provisions without being able to replenish them. If the colony does not have sufficient food stored for winter, fall feeding is also recommended. There are many kinds of feeders you can use with a bee hive. Some are placed on top of a hive, others at the hive entrance, or they may fit down inside the hive, taking the place of a frame or two.

Entrance feeders or **Boardman feeders** are common and inexpensive. They typically consist of a glass jar or plastic container with a few small holes in the lid. When inverted, vacuum pressure keeps the syrup from running out, but honey bees can easily drink it by sticking their tongues to the small holes. These feeders fit into a holder that mounts on the landing board, and allows bees to walk under and feed. These are convenient to monitor at a glance, and can be refilled by gently swapping out the jar with no need to disturb the hive. However, they don't hold much syrup, and may need to be refilled every day. Also, their position at the entrance may make them attractive to robbing bees from other colonies, which might move into the hive itself if the feeder runs dry.

Internal feeders, or **division board feeders** or **frame feeders** fit inside the hive, and take the place of either one or two frames. At the simplest they are simply a trough filled with syrup which the bees drink. Because they are situated in the hive, bees don't have to go far, and robbing is not a concern, but refilling them requires the beekeeper to open the hive. They are best located near the wall of the uppermost hive body so that only the lid has to be moved to refill them, rather than disturbing the whole colony. It is advised to place wooden or plastic floats in the tray, to minimize bees drowning. Some have sections of window screen or other material inside, which the bees can also use as a ladder to climb in and out.

Hive Top Feeders – or **Miller feeders** sit on top of a hive and appear to be a shallow super from the outside. There will be a way for the bees to move up from below and access the syrup. Some have screened off sections that restrict bees to a certain area to reduce potential drowning. Others may feature a wooden raft which allows bees to sit and feed without danger of falling in. These feeders generally hold a large volume of syrup, which is ideal for situations where a beekeeper may not be able to visit the hive for an extended period. Some feeders are divided, which allows a beekeeper to feed both syrup and protein supplements at the same time.

Pail feeders or **bucket feeders** are just what they sound like. They consist of a large container with small holes – just like an entrance jar feeder. These are usually positioned above the hole in an

inner cover, so the bees can access the syrup. An empty hive body and cover are placed over it to keep out the weather.

Beekeepers can purchase elaborate versions of these feeders, or develop simple designs of their own. A modified inner cover with multiple screened openings can be used to easily feed from large jar feeders placed above, which can be refilled or changed without disturbing the bees. Another common and very inexpensive method is to fill a large **gallon-size zip-sealed plastic bag** with syrup. Seal the bags securely and simply lay them across the top of the frames in the uppermost hive body, then place an empty super around it to give it some space. Use a sharp knife or razor blade to cut several small slits or poke holes in the top of the bag. You might expect the syrup to gush out, but it actually stays put fairly well as long as the openings are not too large. The bees will quickly line up at these slits and take turns feeding. The bag simply deflates under them as they consume the syrup. You can peel up the old bag and add another if needed.

Beekeeping equipment catalogues are filled with many more tools and gadgets that might be useful for very specific tasks. We will discuss some more of those items in later lessons when we discuss honey processing and queen rearing and other topics in greater detail.

If you are new to beekeeping, or just considering giving it a try, you may be feeling overwhelmed by all this new information and unfamiliar jargon, or confused by all the different choices and options. Most dealers will offer a range of “**bee-ginners kits**” with all the most basic pieces of equipment you will need to get started. While you are shopping, don’t just look at the price, also compare at the details. You’ll find that it’s worth investing a little extra when you are starting out and purchase good quality equipment that will last. If you really don’t know what you need, and why, ask questions of other beekeepers. Attend some meetings of your local hobbyist club or association and visit with an experienced local beekeeper who can help make suggest a shopping list specifically for you and your goals as a beekeeper.

In our next lesson we’ll take a look at the honey bee in more detail, and discuss some of the important aspects of their biology and their behaviors.