

Beekeeping Basics

HELP! I NEED A QUEEN!

(ACTUALLY, YOU
PROBABLY DON'T)

by MEGHAN MILBRATH



June is a lovely time in Michigan. The nectar flow is coming on strong, the threat of frost is over, and we have survived another split and swarm season. After a long winter and demanding spring, the bees have settled in to make honey, and all is finally well in the bee world. Until ... the calls for queens start coming. "Help! I need a queen!" "Do you have a queen available for IMMEDIATE pick up?" "I need a queen today!" All of these calls are coming from beekeepers who are panicked because they opened their hive during an inspection, expecting to find brood and a queen, only to see no sign of her highness, and no brood in sight. Knowing that a colony needs a queen, they aim to "fix" the hive by getting a queen as quickly as possible, and they start frantically calling around for queens. Many are distressed because they can't find someone who has single queens available for sale. If they do find one, it will usually be incredibly expensive, approaching \$100 with shipping costs.

The worst part is that all the stress and the cost are completely unnecessary. The beekeeper thinks they are taking quick emergency action to save a hive, but in reality, a colony is never "fixed" by just adding a queen. In almost all cases, the colony is either in the process of making a queen (and is totally fine without "help"), or it is so far gone that it needs more than just a queen. While jumping to purchase a queen is a normal reaction for new beekeepers, it isn't usually the correct solution for a hive that appears broodless. It is also an incredibly un-

sustainable system for keeping your bees. In this article, I'll explain why colonies commonly appear queenless during summer, and ways that you can deal with this issue without buying a mated queen.

SITUATION 1: THE COLONY IS IN THE PROCESS OF REPLACING THE QUEEN. THERE ARE MANY SITUATIONS THAT COMMONLY LEAD TO QUEENLESS COLONIES IN EARLY SUMMER: SUPERSEDURE OF OLD QUEENS, SUPERSEDURE OF PACKAGES, AND CROWDED SWARMS.

SUPERSEDURE

Supersedure is the process where the bees replace queens by killing the old queen and raising a new one. Supersedure is common, standard, normal, and expected in colonies. It is a common beginner misconception that the queen will live for years and years, but in reality, most queens are replaced in under two years. In northern states, this replacement often happens right at the end of swarm season during the honey flow. Many experienced beekeepers replace queens after the honey flow every year to avoid this disruption of the honey crop. So, if you aren't requeening your colonies regularly and you have old queens going into winter, you should *be prepared* for the bees to replace her mid-summer the following year. Don't be surprised when your colony with an old queen goes queenless.

After the first big nectar flow is a big time for supersedure of old queens, and also of queens that arrive in packages. Based only off beekeeper phone

calls, my experience is that $\frac{1}{4}$ to $\frac{1}{2}$ of packages will supersede the queen mid-summer. While established colonies supersede queens as a normal part of long-term colony health, my guess is that packages supersede because they aren't normal.

Bees don't do things randomly — they have cues that guide their behavior. One of their main cues is different ages of bees and brood in the hive, which the bees detect by pheromones. The workers are constantly assessing the queen this way — if a queen was good and laying consistently, then you would have all ages of bees in the hive, in the right proportions. If she was laying inconsistently, then you would have bees of random ages, and a big break in brood laying. In nature, if the bees came across this scenario of random age bees, they would know the queen was failing, and they would replace her. Think about what we get in a package — bees from all different colonies and ages just thrown together, and a queen who just starts laying at a really key time in the season. She doesn't look that great to her colony, but there is no way to politely remind the workers to give her a chance because they were in a package. The queen starts laying, and they let her go long enough to raise some brood and then replace her to remedy the "problem." Queens also get replaced if they are sick or are damaged from transport — if your package was heated at all, or she was sick, then the bees may also supersede around the same time. It is really common for packages and overwintered colonies with old queens to supersede in late spring/

early summer. It is really important to remind beginner beekeepers that this will happen so they can be prepared for supersedures.

SWARMING

In Michigan, by June we are out of reproductive swarm season, where overwintered colonies build up to split themselves, but we are just getting into crowded swarming season — where any colony swarms because their beekeeper has not provided them with enough space (where space = drawn comb above the brood nest). It is a really common error for beginners to underestimate the honey production of an overwintered hive. They are used to putting on boxes one at a time, as the one below slowly fills. In Michigan, like many northern states with heavy flows, you may need to add two to three honey supers at a time. If not, the bees will start to fill in the brood nest with nectar, the queen has nowhere to lay, and the colony swarms. It is easy to have a colony swarm and not notice it, as you'll have thousands of bees at this time. If your colony is completely full of nectar, you could have a post-swarm virgin running around.



Honey between the boxes is a sure sign that the beekeeper (me) didn't put supers on early enough. Not only did I miss out on honey from this flow, but I likely shut down the queen (and put her at risk for swarming) by crowding the brood nest.

SOMETHING ELSE/YOU KILLED HER

CBS (Clumsy Beekeeper Syndrome) remains a serious cause of queen injury and death. In the spring, beekeepers are doing a lot of manipulations and splits, and it is easy to roll the

queen or crush her when you are tearing apart a hive. It is always a risk that you can hurt or kill the queen in your manipulations such as spring splits, and the bees will need to replace her.

Regardless if the queen was lost to swarming, supersedure, or your deadly hive tool, the bees will work on a replacement if they have young enough larvae. Usually the bees can raise a new queen just fine, and a virgin will hatch out of the cell. Most of the time, she will come back from her mating flight and the colony will be back on track.

Where problems generally arise is when the virgin doesn't make it back from her mating flight (she gets hit by a car, eaten by a dragonfly, blown off course), and the bees don't have any more young larvae to make a new queen. In that case the colony is "hopelessly queenless." To determine if we are just queenless or hopelessly queenless, we need to look at the timing.

Most of the time when a colony goes queenless, it is able to replace the queen just fine. We tend to panic rather than wait patiently because the process often takes longer than we expect. In most of the panicked queen calls I get, the colony is fine, and it is the beekeeper's expectations that are the problem. Even worse, the colony was on its way to requeening, but the beekeeper messed it up (threw off the virgin or squished a queen cell), because they went digging in there too early. Thankfully, bees are pretty consistent, so we can use basic math to tell us when we should start to freak out about not having a queen in the hive.

First, look for brood. Remember that workers hatch out on day 21, drone brood on day 24. If you only have capped worker brood, then you had a queen 12-21 days ago. If you only have capped drone brood (that was laid by a queen — along the edges and in drone comb) then you had a queen 21-24 days ago. You may even be able to tell how old the capped brood is by the color and amount, or see larvae, giving you even more information.

Day 1 — Queen death — no more laying in the colony.

The bees will raise up a new queen cell, using a young larva. If the colony is swarming or superseding, they will have started the queen cell before the queen dies. In an emergency (e.g., you squished her), they will start the next day.

Day 8-14 — The queen emerges from her cell.

It takes 16 days for a queen to go from laid to emergence. Generally a colony starts with a young larva, so we can expect a new virgin about 2 weeks after the queen is gone. In a swarm, where they don't leave until she is capped (day 8 after the egg is laid), she will hatch out in just over a week.

One week after emergence (Day 15-20) — The new virgin gets ready for her mating flights.

She needs about a week to just be a virgin, eat up, and harden her wings before she goes out to mate.

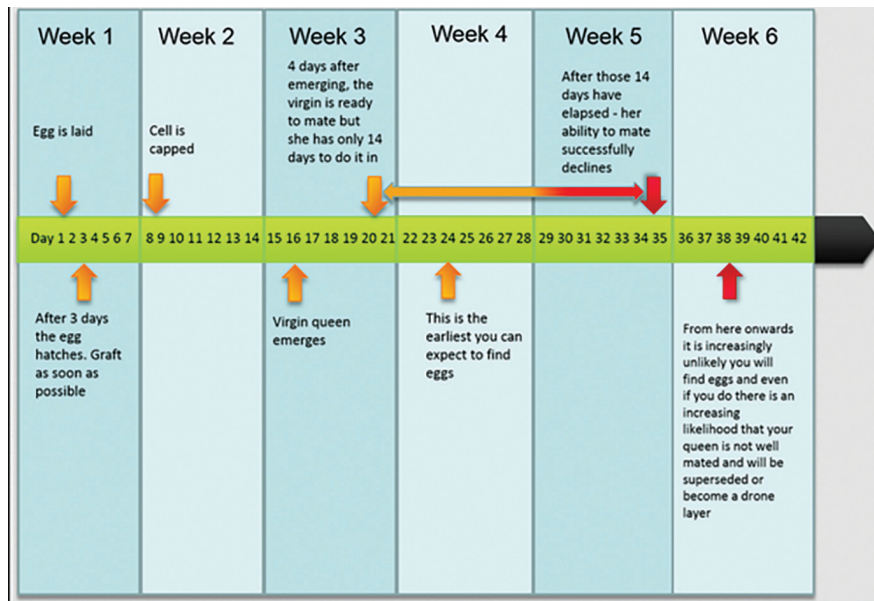
We are already 2-3 weeks out, and the queen may still need 2 weeks to get mated properly. Usually it is quicker than that, but if you have a lot of bad weather (like most Michigan springs), it can be into the second week.

This process can happen quickly (replacement after a swarm in great weather), or it can take weeks and weeks. A handy chart from Beespoke.info (next page), while written as a grafting guide, does a nice job of showing just how long it can be. It is starting to make sense why your mentors and teachers keep harping on you to take good notes, isn't it?!

Now, she is going to return, the bees will move nectar and polish the cells, and she can start laying. Remember she will only start with a small patch of eggs. If you can't normally see eggs, or you don't patiently and carefully look in the exact part of the nest where she starts, you may miss them if you search at this stage.

In the above scenario, the hive was without a visible sign of a queen for weeks, and do you know what? Everything worked out just fine. Let's say that instead of waiting, you bought and installed a mated queen. The bees would eat out the little candy plug, and then either kill her, or the virgin would kill her. She wouldn't even stand a chance, and you would have wasted a perfectly good, raised-with-love queen (and your time and money to get her). To avoid that scenario, we have to make sure the bees are not just in the process of happily re-queening themselves.

What to do if the queen is likely being replaced: Check your notes and wait. Most of the time, the replacement works out just fine. If you wait long enough it will be obvious if it worked (laying queen with good brood) or not (laying worker). See below for dealing with a laying worker colony.



<http://beespoke.info/wp-content/uploads/2014/06/QueenRearingTimeline.png>

SITUATION 2: THE QUEEN IS JUST FINE, BUT THE CONDITIONS ARE NOT GOOD FOR YOU TO SEE EGGS. THIS HAPPENS WHEN THE COLONY EITHER HAS TOO MUCH FOOD (NECTAR) OR TOO LITTLE FOOD (POLLEN) IN THE BROOD NEST.

Just because you don't see brood doesn't mean your colony is queenless. They may be in the process, as described above, or you may have a queen, but there are other reasons you don't see eggs.

NECTAR BOUND

Sometimes the queen will stop laying because there is nowhere for her to lay. The queen will only lay in cleaned, polished, empty cells in the brood-nest. If you don't have empty cells in the brood nest, you won't have eggs. When the nectar flow is too strong and there is no space in the honey supers to put incoming nectar, the bees put it in the brood nest. If the beekeeper adds supers in time, you may get just a temporary shut down of laying. If it is too long, the colony will swarm. Not only will you lose the queen, but the new queen will return, and won't have anywhere to lay. You can have a secondary swarm, or you'll have to wait until the bees can eat/move around the nectar. If your colony is nectar bound, you have to give them enough room to move the nectar out of the brood nest AND accommodate all the incoming nectar — this may be three boxes of drawn comb. That seems like a lot, and it is! It is a really clear example of just how far you were behind on

supering your overwintered colony! Get boxes on there as soon as you can, and mark your calendar to get your act together and get supers on your big overwintered colonies earlier next year. If you don't have drawn comb, it is much harder, because they can't just move nectar onto foundation. You can use a process called "checkerboarding" (<https://honeybeesuite.com/how-to-checkerboard-a-hive/>), but it will still take time for them to rearrange everything.

If you are impatient, your colony is nectar bound, and you want to know if you have a queen but she just doesn't have room, then add in a frame of emerging brood from another colony. As the brood emerges, the queen will have clean cells where she can start laying, and you can go back and peek to see if you have larvae in there in a week.

NOT NECTAR BOUND, BUT NO SIGN OF BROOD

What if you see no sign of brood in your colony, and the queen has plenty of cells in the brood nest where she could lay? You may be somewhere in the queen replacement schedule outlined above. If you don't want to wait a few weeks to see if it works out, you can do a test to determine if they are queenless. Give them a frame of eggs and young larvae from another healthy hive. If your colony is really queenless, then they will start to draw out queen cells. If they are in the process of doing it themselves, they won't draw cells, but will appreciate the bump of young bees.

NOT ENOUGH FOOD

Some colonies are really responsive to pollen availability. They will shut down brood rearing when there is not a lot of incoming food. This tendency varies by the strains of bees; some will ignore a dearth, and some will eat every last egg so as to not lose an ounce of protein. Before you assume you are queenless, make sure that your bees have enough protein (pollen or pollen patty).

Before you purchase a queen, make sure that the bees have enough protein and enough space to move nectar out of the brood nest. The queen needs ample room to lay, and the bees need enough food to raise the young.

SITUATION 3: THE COLONY HAS BECOME A LAYING WORKER COLONY.

LAYING WORKER

The final situation is that the queen has been gone for long enough that there is no more brood, and the workers have started to lay eggs themselves. Workers have ovaries, but their function is chemically suppressed by the presence of brood and the queen. When the colony is completely broodless and queenless, they can start to lay. Because the workers have never mated, the eggs are unfertilized and can only develop into drones. You can recognize a laying worker colony by multiple eggs in the cell (the workers are enthusiastic, but not talented at laying), and later, by scattered drone brood in cells where workers would normally develop.

A laying worker colony is genetically dead — they can't reproduce (swarming, raising new queens) to carry on their genetics as an organism. If you add a queen to this scenario, the bees will not accept her — they are too far gone. Plus, there is no mechanism for them to see a queen in a laying worker colony and think that she is okay. It isn't like a queen would just show up in a tree cavity in a little cage out in nature. Just like the package supersedure scenario, they would take one look around, and think she is doing a horrible job.

IF YOUR COLONY IS HOPELESSLY QUEENLESS, YOU DON'T HAVE A COLONY — YOU HAVE A BOX OF BEES.

Remember that a colony is so much more than a box of workers with a queen. It is a complex superorgan-



A typical laying worker hive. Note the “wavy” appearance of the comb as the drone brood is laid in worker-sized cells. Closer inspection would show poorly laid eggs and multiple eggs per cell. Photo by Ana Heck

ism, comprising eggs, larvae, pupae, nurse bees, house bees, and foragers. These different cohorts control and balance their behavior through a complex network of chemical signaling. As bees age, their bodies change — glands have different functions and signals. A colony that has gone through a sustained queenless period will not have all of these interacting age groups. Even if you add a queen (and they accept her), you are still a far cry from a functioning colony. If a queen were to start laying, there would be no nurse bees with fat hypopharyngeal glands to feed the young. All of the feedback loops are off, and you may not be able to get a happy functioning colony in time for raising winter bees.

If the laying worker colony is small, just add the box to another hive, or shake the bees off the frames in front of another hive. If it is big, you can combine it by placing it over a functioning colony, with a single sheet of newspaper in between the boxes. Just make sure that the bees up top have an entrance to get in and out. <https://honeybeesuite.com/how-to-combine-colonies-with-newspaper/>

You’ll read in some places that you can bring it back by successively adding frames of brood, and then adding a queen. That is true, but what you have done is combined it with another colony (you added brood, nurse bees, and a queen with entirely different genetics), you just did it in

a way that was slow and highly laborious. If you really want to have the extra colony, combine it now, and make a proper split later when it is all healthy and happy. Don’t try to resurrect a zombie.

What do I need to do to make the colony queen right and functioning (do I need to purchase a queen)?

Be patient. Usually the best course of action is to wait. Use the calendars above, and figure out when the very last day you could expect it to right itself would be. Write that date down, and put a note on your hive not to open it until that time. Go have a beer, build frames, watch them coming and going from the entrance, but leave them alone. If you go digging in there too early, you may not get any new information, and you may disrupt a queen cell, an agitated virgin, or a runny new queen. Let them do their thing. If your colony is hopelessly queenless (no queen and no brood), the worst has already happened. It can’t get hopelessly queenless-er. If you catch it now, or if you catch it two weeks from now (even if it is a laying worker), the actions are still the same (you should combine it with a hive or nuc). There is no “catching it just in time.” Either it is fine, and you will come back and there will be a queen, or it is not fine, and you will deal with it. There is no “beemergency” situation where you need to take action today.

Pay attention to what you see in the brood nest. “I didn’t see any eggs” is not that informative. When you look in the brood nest, where you expect to see brood do you see 1) nectar, 2) nothing, or 3) multiple eggs with spotty drone brood?

If you see nectar, then make sure they have room to which to move it. If you see nothing, then you can put a frame of brood in from a healthy colony to test for queen cells. If you see signs of laying workers, which is literally the worst case scenario, you can follow the instructions below.

Usually, if you wait, the bees just re-queen and are fine. If they aren’t fine, then you can add a frame of eggs, and they can try again, and then are fine. If they really aren’t fine (laying worker), or you don’t want to take the time for them to raise another queen, then combine them with another hive.

Remember that a colony is a super-organism. It needs to have a queen, brood of all the right ages, and all the right age worker bees (nurses, house bees, foragers, etc). Just because you have a hive with bees in it doesn’t mean that you have a colony or that it needs to be saved as its own independent organism. As a sustainable beekeeper, you will always be combining and splitting, so that all your colonies are fully functioning.

If you think you are queenless:

- 1) Make sure that the hive has enough space to pull nectar out of the brood nest, giving a queen room to lay.
- 2) Record what you actually see in the brood nest (don’t just say “no brood”). Is there capped brood? Drone brood? No pollen? Frames full of nectar?
- 3) Check your notes for the last time you were queen right, and look at a queen rearing calendar to figure out what you should be able to see at this point. Write down the day that you should check when you would expect to see a clear answer. Resist the urge to go digging in the hive early.
- 4) If you are an anxious person, you can add a frame of eggs and can check the next day. If the bees start to draw out queen cells, then you are for sure queenless. If they don’t you are probably fine.

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