OUTBREEDING MITES AND OVERWINTERING HONEYBEE NUCS

Successful Beekeeping the Natural Way

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Introduction and background

Over the past fifteen years, beekeeping has changed dramatically due to the introduction of the varroa and tracheal mites. When the mites were identified about fifteen years ago, the losses to northern, overwintered hives ran from 30–70% . Already, within the past ten years, the number of hives in the U.S. has decreased to just half of what it was. We now have a serious bee shortage and I know of no one in the last ten years who could not sell all of the bees that they owned. The need for action is immediate.

I have interviewed beekeepers at the conventions that I go to namely, Pennsylvania State at Monaca, PA; Tri-County at Wooster, OH; Michigan State at Lansing, MI and the Indiana Meeting at Indianapolis, IN. Even after all of this time and after the investment in and development of all kinds of sophisticated pharmaceuticals, their losses are still as high as 70%. The scientific community has not yet been able to solve the mite problem. In fact, there is real concern now about drug contamination of our honeybee combs. This article is not intended to degrade or criticize anyone as I know all have done the very best under the circumstances and no one wants to see the industry suffer as it has in the last few years. But it is time for bee suppliers to get back on track and return to selling bee supplies again instead of becoming pharmaceutical outlets.

Doolittle's time-honored methods offer us a way around mites and pharmaceuticals

When I realized that our current management techniques and ways of thinking about beekeeping were failing to address the mite problem, I decided to step back and re-evaluate my basic assumptions about beekeeping. After reviewing and reflecting on my long experience with keeping bees and after reading and researching everything available on how to control mites naturally, I found myself going back to the Masters for answers. In my opinion, the greatest and most masterful beekeepers were Rev. L. L. Langstroth, G. M. Doolittle, and Dr. C. C. Miller. They gave us the moveable frame hive, modern methods of grafting queen cells, meticulously-designed beekeeping equipment, and the fundamentals of modern beekeeping. The entire world uses the contributions of these "KINGS" of beekeeping. Everything that we need to know about keeping bees was given to us one hundred years ago by these three men. Since their time, we have made great improvements in extractors, migratory equipment, and honey marketing but the essentials were all figured out one hundred years ago, long before pharmaceuticals were made available to beekeepers.

For ten years now, I have been studying and experimenting with G. M. Doolittle's well-documented beekeeping methods as found in his book entitled, A YEAR'S WORK IN AN OUT-APIARY, which was originally published in 1908 by the A. I. Root Company of Medina, Ohio. It was reprinted in 2005 by Dr. Lawrence J. Connor and is currently available from Wicwas Press. Doolittle's methods have stood the test of time. Following his lead has enabled me to recover my hives and increase my bee populations. Here I share with you my findings on how to:

- Overwinter honeybee nucs without drugs by outbreeding mites
- Avoid the expense and hassle of genetic determinism
- Earn $900/hive by selling bees
- Raise strong hives for honey production and pollination
- Produce more than enough increase to recover any losses

- Provide safety valves for overwintering honeybee nucs

Overwinter honeybee nucs without drugs by outbreeding mites

It has become clear to me that rather than focusing on why 70% of the hives died in the fall and winter, it would be more useful to understand why 30% survived. Here is where Doolittle's work comes into play. He observed that when a hive feels that the queen is failing, the colony will supersede that queen. This usually occurs in July. A newly-mated queen at this time will perform as does a spring queen and lays eggs so rapidly that she quickly outbreeds the mite well into the fall. The outbreeding of the mite will occur even more rapidly if there is a week of broodlessness which breaks the mites' breeding cycle.

Doolittle advocated fall requeening (meaning after the turn of days) and this is the way we can save our hives without any drugs at all. On page 49 of his book, Doolittle states,

> "I have made such with perfect success as late as September first, using six combs of brood and four of honey".

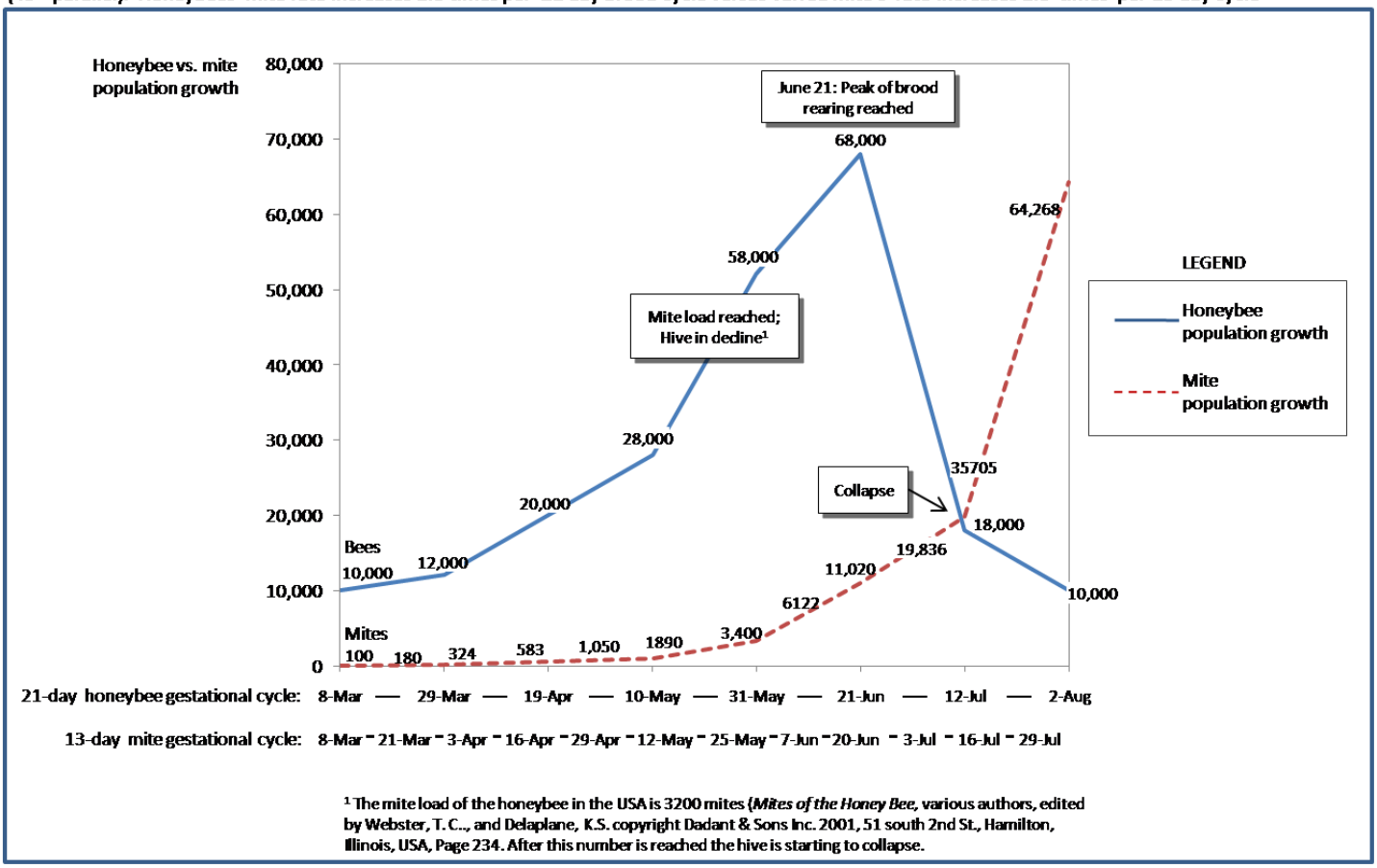
These single hives were then overwintered in a cellar. It is important to remember that Doolittle lived near Syracuse, NY which is located on the 43rd parallel (the same parallel on which I reside and which has made it ideal for me to test his methods). In chapter 7, on page 75, and on July 24 he requeens failing queens or ones that he doesn't think will make the winter. Quote,

> "As this is the season of the year when the bees do most their superseding of queens (it seems so natural to them), my loss in using this plan will not average more than one queen cell out of twenty given."

If you read between the lines here, Doolittle is implying that if you make a two brood frame split on July 24 and give them a cell she will be mated and laying on August 1. Then by September 1 she should be well on her way to six frames of brood. What they don't have is the four frames of honey needed for overwintering in the cellar. We would then have to give them the four frames of honey or feed them heavily throughout September as you want all feeding to end by November 1 (this is so they can process the syrup). You need 63 days or three brood cycles from August 1 through September 30 to have a population large enough to overwinter. Remember that a young, newly-mated queen will not slow down that late in the year but will act just like a spring and swarm queen. Therefore, she will outbreed the mite and you will go into winter with a hive of young, strong bees.

The solution is simple for overwintering nucs. As mentioned above, the honeybee can outbreed the mite. We see this every year when mite-infested, overwintered bees build up in the spring in response to the day length and the swarming season. But if left alone, the mites will eventually kill the colony, in some cases within the year (see Graph 1). It is important to understand the biological relationship between the honeybee and the mite in order to understand why hives eventually fall to mites. Because the mite has a shorter gestational cycle of 13 days versus the gestational cycle of the honeybee of 21 days, the mites outbreed the honeybees and eventually overwhelm the colony. Also, a honeybee queen mated *before* the turn of days, or June 21, slows down her egg laying *after* the turn of the days (June 21) and at that point the mites quickly outbreed the bees. You can stimulate a queen by feeding the hive sugar syrup in the fall but not long enough or at the level to be able to outbreed the mite. The only way to outbreed the mite in the fall is to introduce a queen cell at the end of July as that queen will not slow down her egg laying but instead will act like a spring queen, as observed by Doolittle. I reasoned that if we can find a way to continually outbreed the mite we can overwinter our bees without drugs but it may require rethinking our procedures and management.

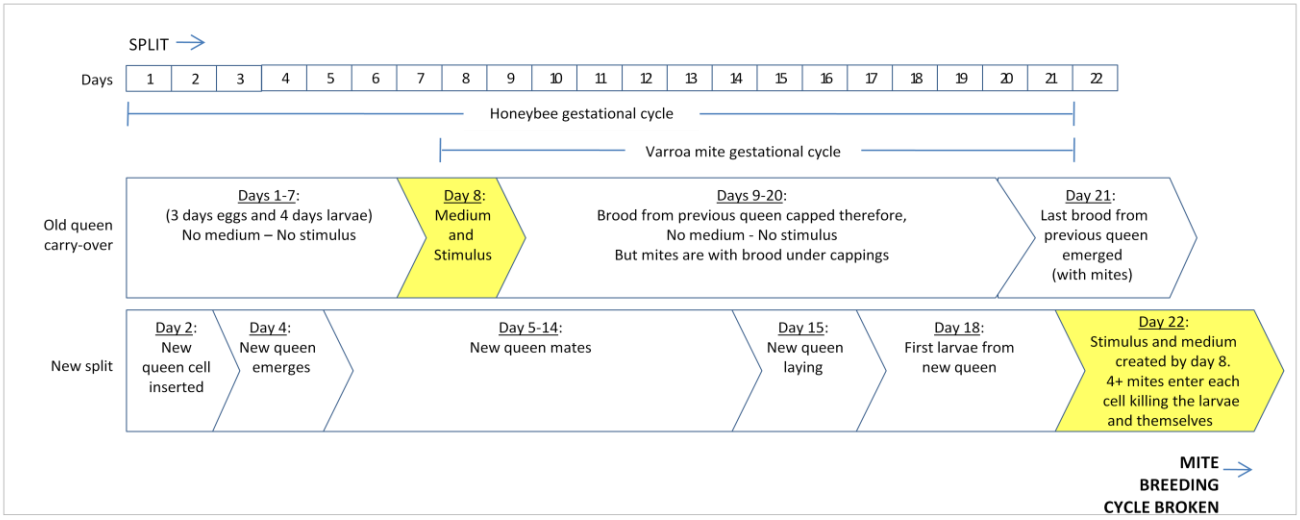
Graph 1: Hypothetical projection of honeybee and mite reproduction starting with 100 mites and 10,000 bees on March 1 in the Grand Rapids, MI area (43rd parallel). Honeybees' mite rate increases 1.8 times per 21 day brood cycle versus varroa mite s' rate increases 1.8 times per 13 day cycle



[1] The mite load of the honeybee in the USA is 3200 mites (*Mites of the Honey Bee*, various authors, edited by Webster, T. C.., and Delaplane, K.S. copyright Dadant & Sons Inc. 2001, 51 south 2nd St., Hamilton, Illinois, USA, Page 234. After this number is reached the hive is starting to collapse.

Aside from competing breeding rates, there is another aspect of the varroa-honeybee relationship that makes splitting especially effective for reducing mite populations. Since the ability of the varroa mite to reproduce is entirely dependent on the gestational pattern of the honeybee, there are two principles whereby we can control the reproduction of the varroa mite without chemicals. One is that the fertile mite must have a medium to lay her eggs and second she must have the stimulus to start reproducing. When you make a split you are breaking the normal breeding cycle of the mite because you are interrupting both the medium and the stimulus by creating a pause in the honeybee brood cycle when the old queen is removed and the new queen cell inserted (see Graph 2).

Graph 2: A fertile mite must have a *medium* to lay her eggs and a *stimulus* to start reproducing. The medium and stimulus are always on the 5th day of the larvae, day 8, one day before capping the cell. When you split a hive you break the normal breeding cycle of the mite by interrupting both the medium and the stimulus . . .



On days 9-21 of the split, we have taken away the medium so there is no stimulus. On day 22, when a medium again becomes available, the mites will instinctively have the stimulus with the help of larval pheromones.

Varroa mites are solitary and do not function as a colony. Each mite is an individual and will respond independently from any other mite to medium and stimulus. I reasoned that the first 200 larvae that become medium on day 22 will attract at least 4+ mites per larva. This is an unsustainable arrangement for the mites, as they are capped inside the cell with not enough haemolymph (larval blood) to feed them all, thereby killing the larvae and subsequently themselves. For that reason, after a fall split you will go into winter with a small mite population, thereby enabling the nuc to survive.

For example: Figures 1,2,3, and 4 show splits that I make on May 1. This is 2 months after March 1 as shown in Graph 1. Therefore my mite load of 3200 mites will occur 2 months later than May 25 or on July 25, when I make 4 splits with 800 mites each. Then, if a newly mated queen lays 1000 eggs per day, on day 22 the first 200 larvae will attract most of the mites. The larvae with 1 or 2 mites will survive. You may notice what appears to be foulbrood around day 30 because of the perforated cappings. This is normal as the bees are removing the dead larvae and mites. You only have to overwinter 1 out of these 4 nucs to have a 100% survival rate since you had only 1 hive in July. We are already achieving 75% survival in some areas of the country. It is my goal to achieve 75% survival on the 43rd parallel.

You may think that if all the mites have emerged on day 21, why not just put on chemicals and kill the mites. The answer is that you may kill 95% of them and be able to overwinter but what you leave is 5% of resistant mites that will breed on causing future problems. Chemicals are not effective because you cannot control the temperature or the dosage. Also, since varroa mites and honeybees are both invertebrates, there is the risk of overdosing the honeybee simultaneously.

Avoid the expense and hassle of genetic determinism

I have been a beekeeper for over 35 years and have operated 450 colonies that were part of a migratory operation which I sold so that the beekeeper could meet his pollination contracts. I now operate enough hives to continue my research and stay current in the industry. In years past, before the mites, it was normal to have a 10% winter loss. This was before we began to requeen our hives annually. Fifteen years ago, the honeybee had all the genetics to overwinter successfully. The mites have not caused the honeybee to lose its genetic ability to overwinter and never will. There is no reason to spend time and money chasing down or importing bees for their genetic ability to overwinter. I have nothing against different strains of bees but it is just not necessary. The best bee is the bee that can overwinter in your area and build up in the spring.

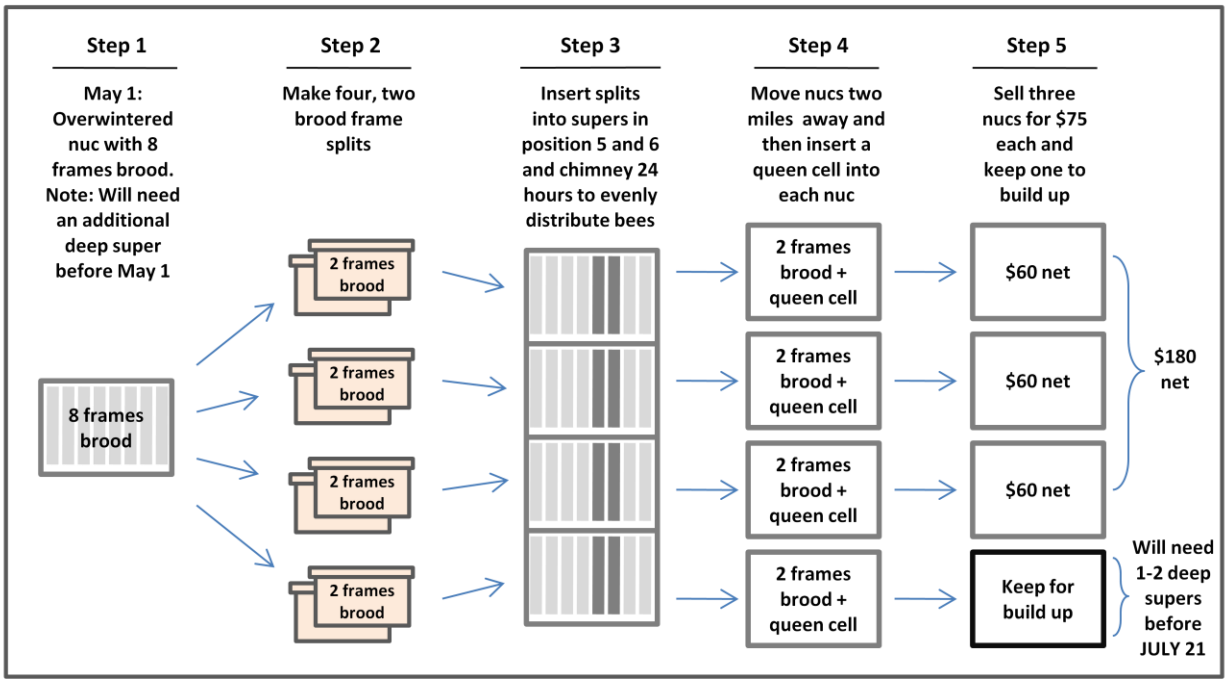
When I started to lose my hives to mites, it was a normal, logical assumption that the hives that overwintered successfully were genetically superior to the hives that did not. I started to raise queens from these successfully overwintered hives but to no avail, because they died just like the others. Thanks to Doolittle, I now know that hives overwinter successfully by superseding their queens in July, not by being genetically superior.

Several years ago I asked a respected authority whether Africanized bees have varroa mites. The answer was yes. I just said "thank you." The Africanized bee has a smaller cell size and a shorter gestation period and it is assumed that this is why they can survive the mites. While this is partially true, it still remains that they have the mites and the mites will eventually kill the colony. One thing that isn't mentioned much because it is considered a negative genetic trait is that Africanized bees swarm continuously. Beekeepers have always sought to avoid and reduce swarming but for the Africanized honeybee, swarming is fundamental to its survival. Swarming breaks the mites' breeding cycle and the young, newly-mated Africanized queens lay eggs rapidly enough to outbreed the mite. We can create the same scenario by doing the same thing with our stock up to every 13-15 weeks and then our queens can also outbreed the mites.

Earn $900/hive by selling bees

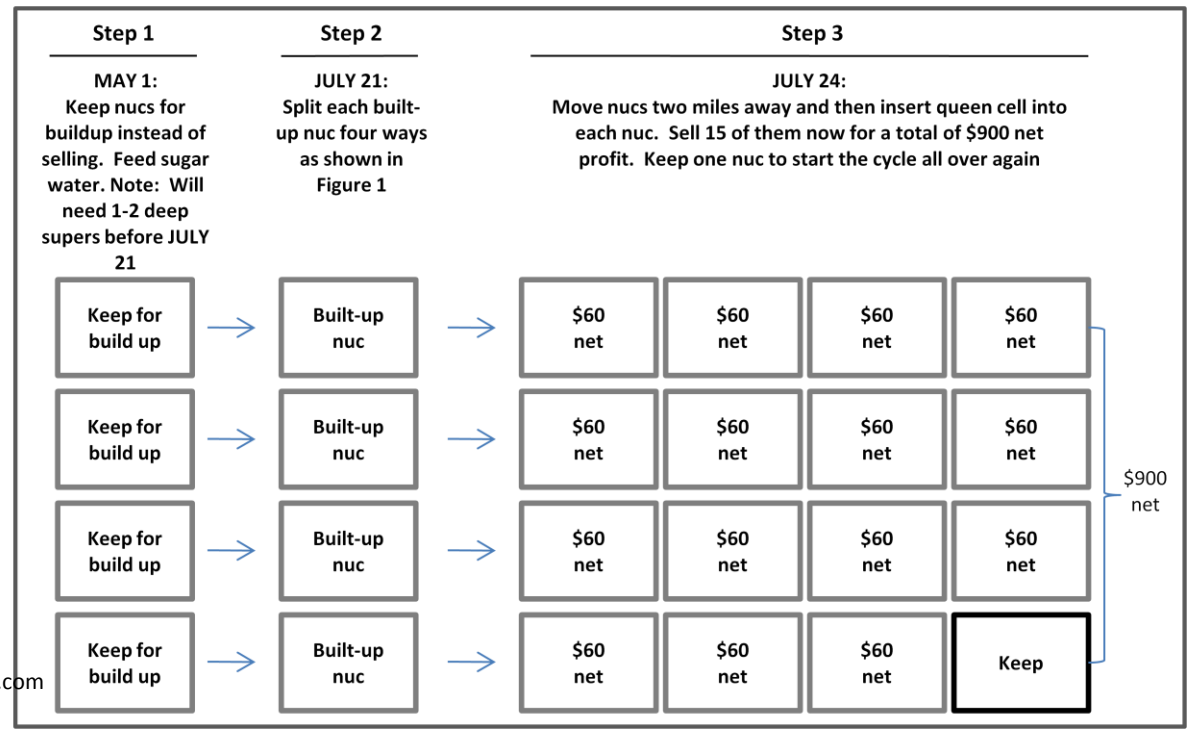
For income, I don't use my bees to produce honey or pollinate but, instead, I sell the bees themselves in the form of nucs. By the first of May in the Grand Rapids, MI area my overwintered hives will each have eight frames of brood. I then make four, two brood frame splits and give them a new queen. I can sell three of these nucs for $75, or $60 net profit and keep the fourth one to build up and be my parent hive the next spring to do all over again. So I can make $180 net profit on what was just a nuc back in the fall and which has overwintered and grown into a hive by May 1 (see Figure 1).

Figure 1: Sell three nucs at $75/each to make $60 net profit/each and keep one for build up



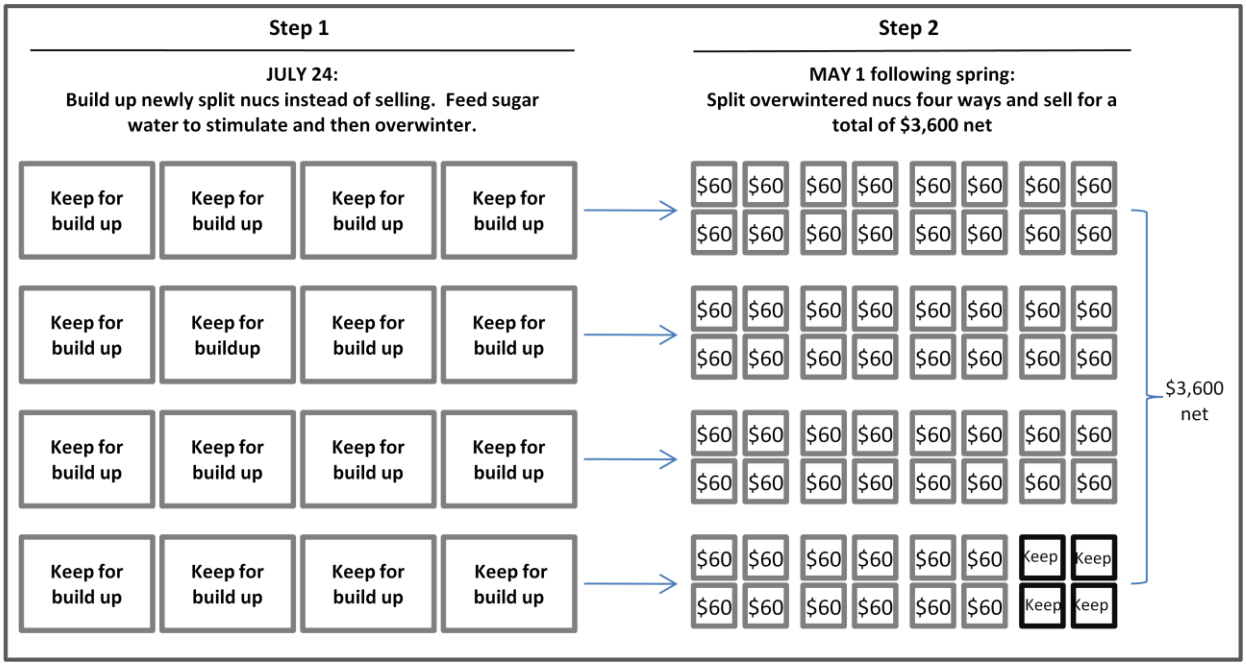
My other option is to *not* sell my nucs in the spring and, instead, build them up until the third week of July (July 21-24). By that time, each nuc will have grown into a hive with eight frames of brood. I can split each of these hives into four nucs again, as I did in May, so that I end up with a total of sixteen nucs. I can again sell fifteen of these nucs for $75 each to make $60 net profit on each nuc for a total of $1,125 gross or $900 net profit (see Figure 2).

Figure 2: Build up your May nucs to split and sell in July for $900 net profit



Again, you have the option to build up these sixteen nucs instead of selling them. After overwintering, you would split them into 64 nucs on May 1, and then sell 60 of them for a total net profit of $3,600 and still be left with four nucs as we had the year before to start all over again (see Figure 3). Remember, this $3,600 in income has been generated from one hive in one fiscal year.

Figure 3: Build up and overwinter your July nucs in order to split and sell them the following May for $3,600 net profit

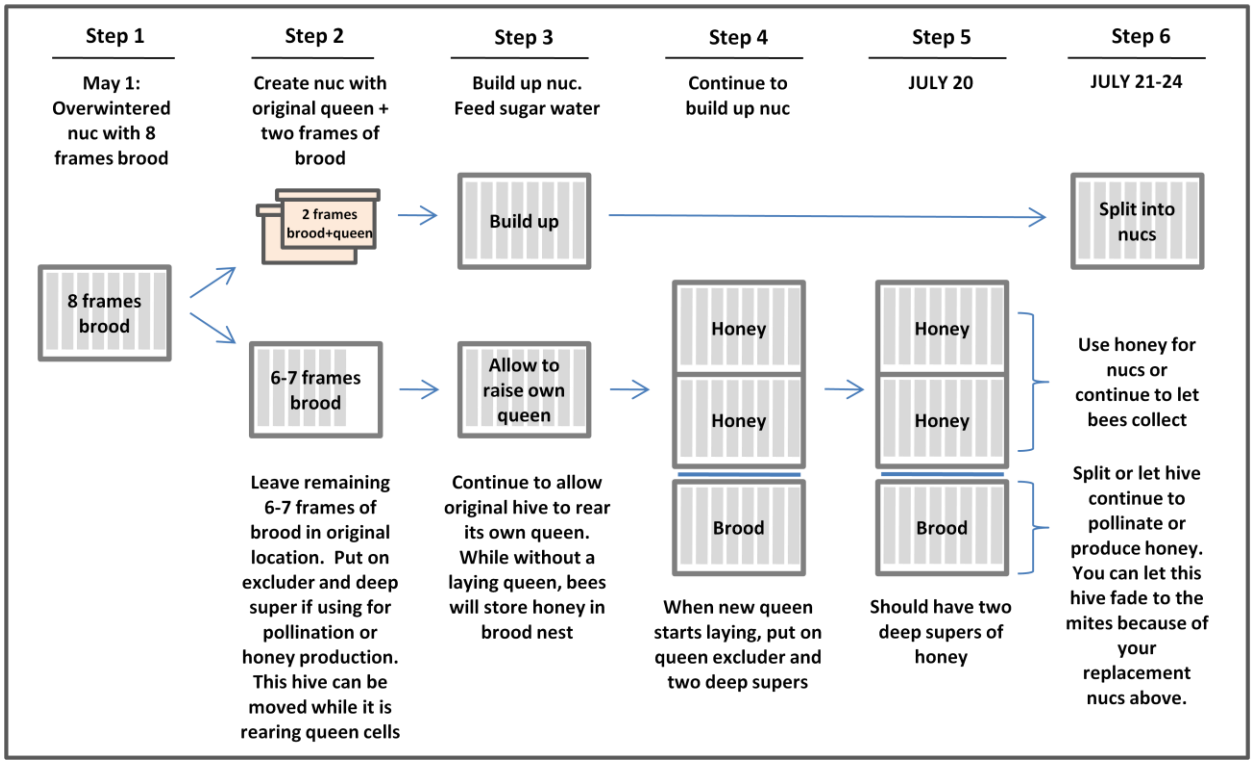


Obviously, you would keep for build up however many nucs you need to meet whatever intended financial goal you have for that year. There is a lot of flexibility in this system. If you don't want to produce that many nucs, you can always unite them into strong units to produce honey or to pollinate. It is also important to keep in mind that this is how the system works in theory and does not take into account mismating, weather, predators, or human error that can affect final results.

Raise strong hives for honey production and pollination

If you run for honey production or pollination, the first of May in Michigan you would remove the queen and two brood frames with adhering bees plus two brood frame shakes. That would leave six or seven brood combs on the original location. You would then allow this hive to rear its own queen. Without a laying queen, all the honey will be stored in the brood nest. When the young queen mates and starts laying, it is done with such vigor that it will explode in population. At that time, you would put on a queen excluder and two deep supers. Bees will not tolerate honey in their brood nest so they will turn that honey into brood or put it above the excluder into the supers. You should have two deep supers of honey by the 20th of July. For my purposes, I use this honey to help feed the nucs I will create July 21-24 from the original queen and two brood comb that I took in May which, by this time, have grown into eight brood frames. As for the hive being used for honey or pollination, you can also split it into nucs or just let it produce as much honey as possible. In Michigan we have a great Star Thistle flow of water-white honey the first part of August. This hive will fade as the queen was mated before the turn of days (June 21) and the mites are now outbreeding the bees but you will have the four nucs that you made from the original queen in the spring that you can overwinter for replacement (see Figure 4).

Figure 4: Use a ¼ split off of overwintered nuc to outbreed mites and raise strong hives for honey production and pollination



Produce more than enough increase to recover any losses

I have been working on overwintering nucs for several years with beekeepers that the editor of a major magazine calls the "brethren." Two summers ago, Chris Barnes, the manager of Dadants in Albion, MI, wanted to learn more about the system so I drove to Albion to show him first hand. That July we made four splits from each full-strength hive. Half of these nucs overwintered and built up to give us strong hives in the spring. So we had a 100% gain from the original hive that we started with in July but a 50% loss in the intended gain. Therefore we had a 50% loss but gained 100%.

You may say this is good enough, and you would be right, but we could have done even better. That spring we had a real late snow (April 9), around 9 inches, and some of the nucs starved. After that experience, I began to look for a way to install a feeding safety valve within the hive that would prevent starvation caused by surprise late winters.

From left: Ron Brooks, Bob Ramsey, and Lynn Quinn. Bob displays Ron's queen cells fresh out of the incubator and ready for transport to be inserted into the nucs

In the spring (2007) bee meeting at Lansing, MI, I was asked to speak on this subject with a lot of interest. Shortly thereafter, beekeepers from the Holland, MI bee club asked me to come to their meeting and give the same talk. It was at this meeting that I met Lynn Quinn and Bob Ramsey, novice beekeepers that had started four hives that spring and were interested in raising chemical-free bees. Just as I had done with Chris the year before, I drove to their homes in Allegan and Bloomingdale, MI, to show them the system first hand. In July, we made sixteen nucs out of their four hives. Meanwhile, I was creating my own nucs again, as was Chris Barnes, who felt that he understood the system enough by this time to be able to do it on his own. I had contracted queen cells for our nucs from Ron Brooks in Indiana, stinger0001@yahoo.com, and on July 22, we picked up the cells and inserted them into the nucs. Out of Lynn and Bob's sixteen nucs, two nucs failed due to mismating so they ended up with a total of fourteen nucs.

Provide safety valves for overwintering honeybee nucs

By the time winter rolled around, I had found a source for a feeding safety valve in the form of a candy board that I felt would help our nucs overwinter. I believe that had we had these candy boards last winter, we would have saved many hives.

From left: Bob Ramsey, Danny Slabaugh, and Lynn Quinn outside of Danny's workshop in Nappanee, IN, where Danny constructed Mel's specially-designed, one-inch candy board for nucs

Mel displays details of his one-inch thick candy board designed for nucs. The 3/8 inch hole drilled into the front serves as an upper entrance for the bees and also helps with ventilation. The one-inch thick insulation board is tacked to the top for further protection

I designed and then contracted special, one-inch-deep candy boards made by Danny Slabaugh of Nappanee, Indiana, dslabaugh@skyenet.net, to place on top of the nucs. To purchase the candy boards, I used the money saved from not having to purchase pharmaceuticals. I drilled a 3/8 inch hole on the front side for an entrance and for ventilation and then covered each candy board with one inch insulation board. After I installed the insulated candy boards over the nucs, I placed a deep super containing extra honeycomb to be used next spring and to also keep the telescoping cover from covering the 3/8 inch opening in the candy board.

For a winter windbreak that I had designed to use as an experiment, I used a circular windshield to protect the bottom supers where the bees cluster. This circular windshield can be built into any size from individual sections and breaks down easily for transport. It takes two sections to wrap around one hive or four sections to wrap around four hives. It rises to just two inches above the top entrance and vent hole. No matter which way the wind blows, the bottom box is protected. There is enough space for the bees to fly between the vent hole and the windshield. One panel costs $12.50 but it is made of galvanized sheet metal and should last ten years which makes it cost effective. Some of you might feel that this type of an investment cuts into your profits but it is important to remember that dead bees aren't profitable at all. Safety valves that provide different kinds of protection to your hives are long-term investments that will more than pay for themselves in the future.

Mel Disselkoen's experiment with windshielded, but unfelted, hives in his wide-open, windy apiary near Grand Rapids, MI

After installing the candy boards over my nucs on December 22, I wrapped the windshields around the hives. The next day we had 64-mile-per-hour winds which were an excellent test for the windshields and they held up perfectly well. I encircled all of my hives with these windshields this winter and did not pack them with felt paper as in years past because I want to see whether the windshield is enough protection on its own. I have my nucs in wide open apiaries so this will be a good test. I helped Lynn and Bob pack all of their fourteen nucs in felt, as that has worked well in years past, and we then encircled eight of them with windshields so that we will be able to do some comparisons at their locations between shielded and unshielded hives.


Lynn Quinn and her windshielded set of hives near Allegan, MI

The methods I have been using for overwintering nucs have been successful and should be even more successful with the addition of the candy boards and windshields. Nonetheless, there are always improvements and innovations to be made so I am asking for your help. I always listen to different points of view because there is a saying "You don't know what you don't know" and that is certainly true with me.

Overview and suggestions

By making splits and overwintering nucs to outbreed the mites and avoid expensive and harmful pharmaceuticals, we can easily double the hive count in this country within one year. We can also provide for our pollination and honey supply.

If you run for honey or pollination and remove two brood frames with the old queen and let the parent colony requeen itself in May or in July, this parent queenless hive is in perfect condition to accept a graft of queen cells for your own use. The reason I contracted queen cells is to let everyone know that there are beekeepers that will raise cells for you and that you can transport them over one-hundred-fifty miles.

I would also like to make a suggestion to older beekeepers: *Please, get rid of your old comb before you sell your bees to novice beekeepers*. There should be no comb over five years old in your outfit. Instead of selling junk comb to beginners, render it to wax. It is okay to use the old boxes and bottom boards but get rid of the comb. The best and most profitable way to sell your outfit is to nuc it out. In my opinion, it is also better for the novice to start his hive out with a nuc because in my experience I have seen it to be a healthier, less stressed, and more balanced starter colony than a package because of the different ages of brood contained within the comb.

As for investing in replacing your old comb, a frame costs a little over a dollar and a new drawn comb will sell for $2.50 so you can double your investment within one year which is a better return on your investment than either a CD or the stock market. To do this, just put two new frames in the brood nest and when there is brood in them leave them in the bottom box with the queen and give them a complete set of new comb. Put on an excluder and place the rest of the other brood comb above it. After the brood has emerged, remove the empty comb and render it. *All combs should be less than five years old*.

If you decide to read Doolittle's book as I suggested, you will find that G. M. Doolittle was a creationist and a naturalist as were the other "KINGS" of beekeeping, Rev. L. L. Langstroth and Dr. C. C. Miller. However, I have a very fundamental problem with Doolittle. If he was such a good naturalist then why did he overwinter his bees in a cellar? What is natural about that? I can only speculate on that question and this is the conclusion that I have made. Back in the 1880's through early 1900 most honey production took the form of comb honey and, in fact, Doolittle's book is about the 1905 section honey crop. All brood chambers were deep singles and they even went late into the fall to get the Buckwheat sections.

Therefore, the bees were in singles and not a lot of stores except from late fall flows. Even though Doolittle kept "reserve honeycombs" that he used in the spring to build up his overwintered hives, the use of the 2nd story honey super, which we now call a double deep food chamber, was not yet used. I think Doolittle was so intense on perfecting queen rearing and production of quality queens that he had not yet turned his expertise to that problem. I am quite sure that that would have been his next project because in the third chapter of his other book entitled, SCIENTIFIC QUEEN-REARING, he states,

> "But," says one, "You are always crying 'Nature! Nature!!' Don't you know that man's intelligence, by opposing Nature's laws at the right time, can get ahead of her ways, and thus secure better results?" No, I did not know any such thing: nor do I believe it. It is only as the intelligence of man moves along harmoniously with the laws of Nature that any improvement can be expected. Is this not true?"

Truly, Mr. G. M. Doolittle, Rev. L. L. Langstroth and Dr. C. C. Miller are the real "Master Beekeepers." Because I am in agreement with what these three great beekeepers believed in and feel inspired by their work, I have humbly dedicated my beekeeping to finishing the work that Doolittle would have finished. And just like Doolittle, I live on the 43rd parallel 500 miles west of where he lived and did his beekeeping. I take this work very seriously and, just as Doolittle, I am open to your comments, ideas, feedback, and suggestions. Successful, natural beekeeping methods are essential to the future of our bees and the beekeeping industry so we must bring forth all the creativity, intelligence, and spirit that we can muster in order to bring forth sustainable beekeeping innovations that are free to the world's beekeepers, just as the "Master Beekeepers" did when they shared the fruits of their discoveries with all . . .