Managing Honey Bee Population for Greater Honey Yield

Morris Ostrofsky

There are many reasons why people keep honey bees. When honey production is the goal, there are a number of things a beekeeper can do to increase yield. This article is a summary of different methods that can be used to increase the honey yield from hives. It is based on the premise that increasing population will increase honey production. The techniques and steps described are based on a compilation of my research as well as my own experience in managing populations to increase honey yield. There are two assumptions built into this paper. The first is that the main emphasis is on managing honey bee populations and not on bee keeping basics such as Varroa control. The second is the target audience is beekeepers with some experience.

A large and healthy population is an absolute must for optimizing honey yield. Large colonies disproportionally produce more honey than smaller ones. In other words one colony of 60,000 bees will produce more honey than two colonies of 30,000 each combined. This concept is illustrated by Richard Farrar's graph. As can be seen, the larger the colony population, the greater honey production per bee. My objective is to offer several methods of achieving optimum population for optimum honey yield.

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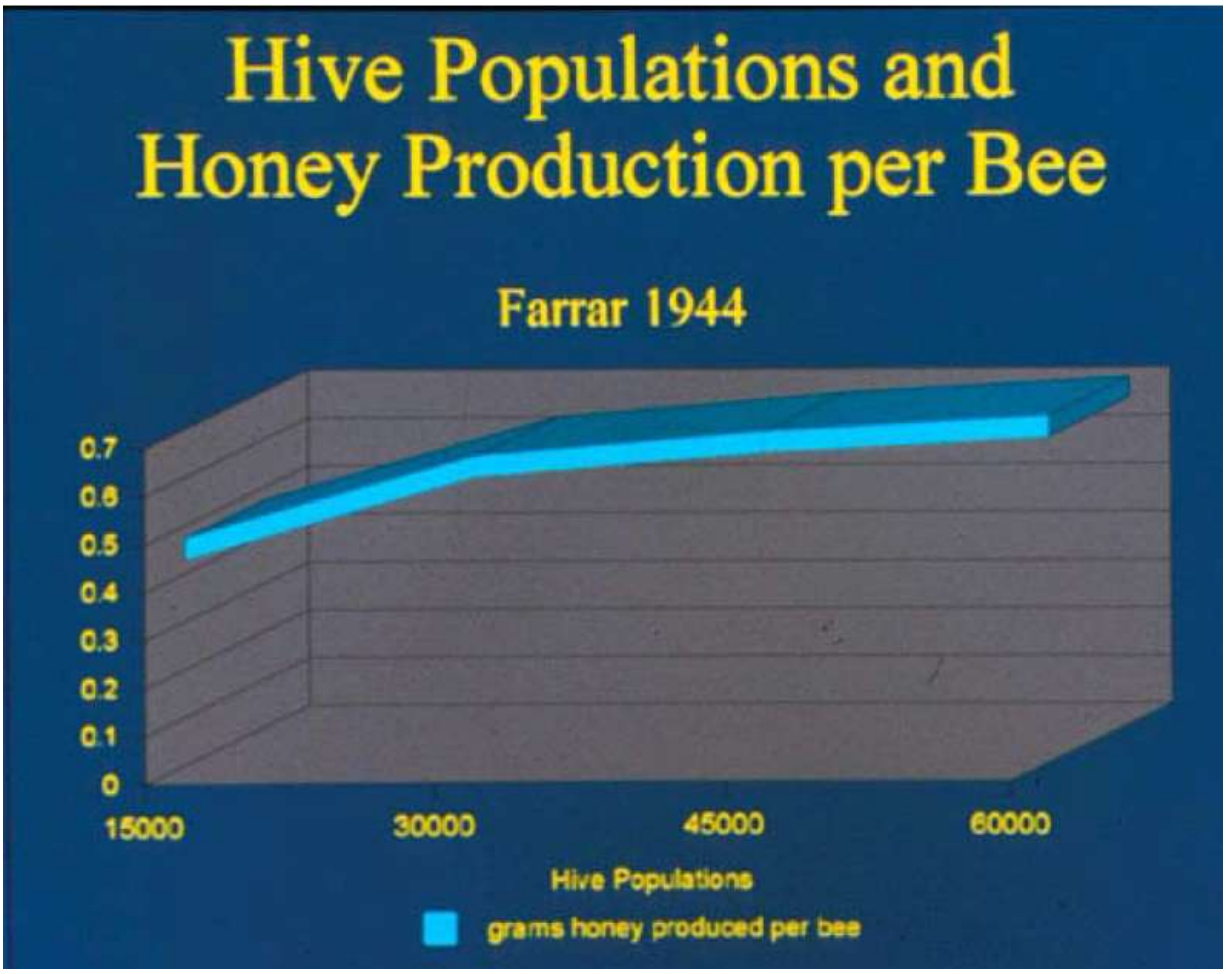

As the name "honey" bee implies, honey bees' natural tendency to prepare for winter by hoarding honey. So the methods and techniques described in this article are intended to support this natural drive. Since beekeeping is so highly localized, the effectiveness of the methods will vary according to location. However, the more methods utilized, the greater the likelihood of producing large populations and honey production. A seasonal approach is used to organize the methods.

Fall is when the preparation for population growth and subsequent honey yield begins. Keeping the bees healthy, strong and well provisioned is the first step in population management. Diseases and pests need to be controlled. Although Tracheal mites are not as common now, I still see them

occasionally. Since prevention is so easy, it makes sense to treat for them. A grease patty made of two parts sugar (sucrose) and one part of vegetable shortening should be available on the top bars year-round.

No discussion of fall would be complete without addressing *Varroa* mites. In order to achieve a strong spring population healthy winter bees are necessary. Healthy winter bees are produced by Varroa-mite free nurse bees. Nurse bees also need access to plenty of protein to produce long-lived winter bees. Pollen must be coming into the colony or the beekeeper must supplement with a pollen substitute or supplement. Bee Pro™ has been shown to compare favorably with other pollen substitutes according to Dr. Frank Eischen during his breakfast presentation at the 2012 Oregon State Beekeeper Fall Conference.

The place to start to insure the necessary strong population for honey production is a young queen. Young queens can boost honey production in a couple of ways. Queens less than a year old produce more brood than older queens. In addition young queens are less likely to swarm. This is a factor of bee biology. A first year queen is genetically programmed to focus her efforts on building a colony and storing honey for winter. It is not until the second year that they reproduce or swarm. A good comparison is a bi-annual plant that stores resources in its first year and then produces seeds in its second year. As George Imerie would say, “Young queens prevent swarming better than one year old queens and much better than two year old queens.”

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Ideally re-queening with a mated queen should done at the end of summer or in fall. Introducing a queen in the fall means you do not interrupt brood production in the spring. A less desirable alternative is to re-queen in spring. Spring re-queening has two disadvantages. The first is there is an interruption of brood production at the critical build up period. Secondly early spring queens are usually not as well mated as fall queens.

Race is a factor when building a strong population. A race of bees that is responsive to stimulative feeding is needed. An excellent choice for queens is Carniolans. This race originally came from the Carniolan mountains on the eastern side of the Alps. The Carniolans appear to survive in a cooler climate by maintaining a small population during winter and then building rapidly in spring when a protein source (pollen)is available. To quote Brother Adam, “Carniolans are known for their explosive, early spring build-up at the first sign of pollen.”

Russian bees, originating in Siberia, build up quickly in spring as well. The Russians need both the presence of a protein (pollen) and carbohydrate (nectar) source for rapid growth. In the February, 2002, issue of Bee Culture Russian queen breeder, Hubert Tubbs, reported that his Russian hives produced 130 to 150 pounds of honey. This compared to approximately 84 pounds of honey for non-Russians.

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An added advantage of Russian bees is greater resistance to Varroa and Tracheal mites. The downside to Russians is that they must be managed differently than non-Russians. For example, supers with drawn comb must be given early and more generously. Also Russians are more likely to swarm if not given enough space. Furthermore when re-queening a non-Russian hive with a Russian queen, the introduction process requires more time to be successful. Before purchasing Russian queens, it is important to take some time to learn how to manage them.

Fall queens of any race are generally easy to get because there is not a back log with breeders. Because the Carniolans and Russian build up very rapidly, swarming is a consideration. Although young queens help, nothing is 100% in agriculture.

Along with keeping the bees healthy and strong is making sure they have adequate stores to make it through winter. Going into winter in the Willamette Valley, Oregon at least 60 pounds of stored honey is required. If the bees have less than 60 pounds, then they must be fed to reach this weight goal before winter. An easy way to do this is to feed them sugar syrup. I use two parts sugar to one part water applying the mixture in a 1 quart mason jar with a perforated lid inverted over an inner cover. At the same time I mix Fumagillan with the sugar syrup to prevent Nosema. While I generally do not treat prophylactically, treating for Nosema is the one exception. According to Dr. Frank Eischen feeding Fumagillan prophylactically has a short term negative effect but a long term positive effect. Although Fumagillan is pricey, what is gained in honey production more than offsets the cost.

Another preparatory step that can be taken in fall is to decide on a productive location for the bees. To support a strong future population the bees must have access to a rich source of food. The very best yield I ever got from a single colony was 400 pounds of honey. The colony was located in a large undeveloped field shared with two oil wells and lots of wild flowers. The field was surrounded by a well developed urban housing area. Weeds and native plants were sources of nectar and pollen in spring. Ornamentals in urban gardens provided forage the rest of the year as well. It should be mentioned that this location was in Southern California where plant growing conditions were always favorable.

The conclusion I drew from this experience is that placing the bees in an area that has a diverse community of plants available over an extended period of time contributed to the large population and hence a personal honey yield record. The only things needed to improve this location were a source of water and afternoon shade that contributes to a more productive population. In the first case the bees travel a shorter distance and therefore expend less time and energy locating water. Shade means less time and energy spend trying to maintain the proper temperature within the hive. Time and energy expenditures mean less stored honey.

Late **winter** is a tough time for the bees. At this point the colony consists of older bees that have lived longer than the normal 6 to 8 weeks. Yet they are expected to increase brood production in preparation for spring. The colony may also be approaching the end of its food stores. If the bees are

still in cluster, they can be fed fondant candy or dry sugar. A final point - make sure that water condensation is prevented from dripping on the winter cluster.

Population management activities are numerous in **spring**. Maintaining Varroa mite populations below economic threshold and stimulative feeding are important seasonal activities. Before treating for Varroa mites, determine if treatment is needed. If it is, the treatment MUST be started early enough so that it is completed, and all varroacide residues are gone before supering.

Stimulative feeding in spring is one of the more effective population building techniques. Regardless of where a hive is located, the important thing to remember is that it takes about 6 weeks to go from egg to forager. Early stimulative feeding insures that there is sufficient population in time for the honey flow. In other words build your population before the flow and not on the flow. Keep up the feeding until the honey flow starts.

Stimulative feeding involves both carbohydrates (nectar) and protein (pollen). First I will discuss carbohydrates. I make stimulative sugar syrup using one part sugar to one part water and apply the same way as the fall feeding. The reason why this sugar concentration works is that it mimics a honey flow. During a honey flow the bees increase the feeding rate to the queen who in turn lays more eggs. More eggs equal more bees which equates to more honey.

If there is not an adequate amount of pollen in your area, you can supplement with a pollen supplement or pollen substitute. This should be done the same time that you feed sugar syrup. Although there are many ways to feed substitutes and supplements, I find the easiest is pre-made patties. A less expensive way is making your own patties from a formulated dry mix to which you add syrup. An even less expensive patty can be made from brewer's yeast and sugar water.

In the Willamette Valle the main honey flow comes from Himalayan Blackberries. They start blossoming the first week of June. Approximately 6 to 8 weeks before the main honey flow, or about April 7th I start stimulative feeding.

Stimulative feeding causes an explosive population growth leading to congestion and over crowding. Congestion relief can take many forms. We will look at several that support the goal of population growth. As feeding continues and the population increases, it is critical to make sure the bees have an adequate amount of space in the brood area. The objective is to avoid a situation in which the queen has restricted room to lay eggs.

Pyramiding is a technique that can be used to give the queen and workers instant access to two brood boxes thus increasing population while reducing crowding. Pyramiding is done at the time a second brood box is added to a hive that has one brood box. If at all possible, using drawn frames is always preferable to foundation frames. The following diagram assumes a brood box with 9 drawn frames. It illustrates how the frames are reconfigured when pyramiding.

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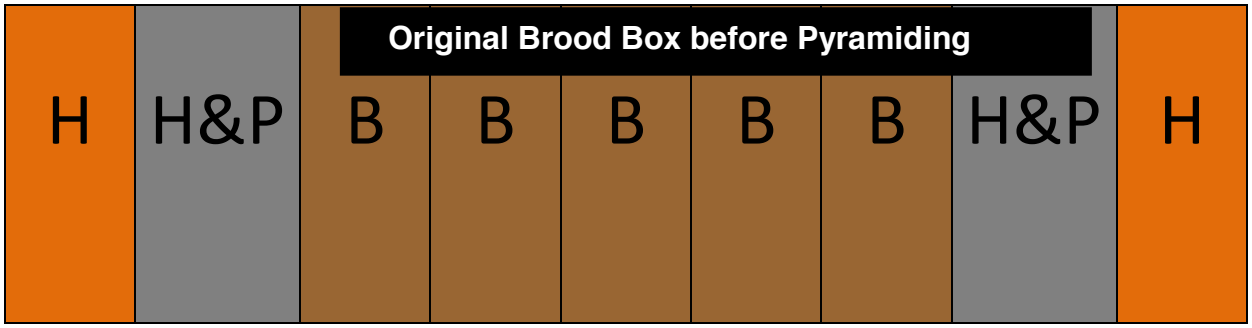
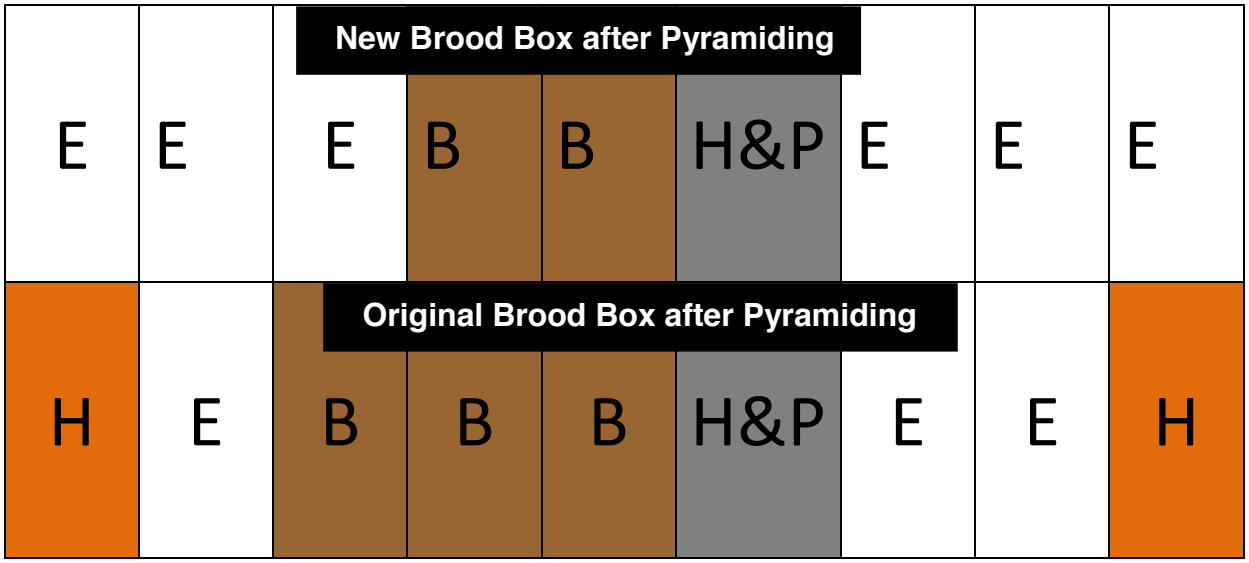
H = honey frame **H&P** = honey & pollen frame **B** = brood **E** = empty drawn frame



1. Make space in the new brood box by removing 4 empty, drawn frames from the middle of the box.

2. Take half the brood, in this example 3 frames, and 1 frame of honey & pollen from the original brood box and place them in the space created in the new brood box.

3. Center the remaining frames in the original brood box and fill the space created on the sides with frames (preferably drawn) that were removed from the second brood box.



When starting with a second brood box already in place, other options are available to reduce crowding and helping to prevent swarming. Due to the bees' natural tendency is to move up, they are probably only using the upper brood box. If this is the case, the upper and lower brood boxes can be reversed. This makes it possible for the bees to have access to two brood boxes instead of just one.

A less common situation is when the bees are already using both brood boxes. Reversing brood boxes would not be appropriate because it would result in dividing the brood nest. Something needs to be done whether pyramiding, or reversing brood boxes. If the bees swarm as a result of lack of space, you have lost not only your queen, some pride but also any hope of a large honey yield. Remember half as many bees will produce less than half as much honey.

Supering and checker boarding can be done in **late spring/summer** to help relieve congestion and reduce the swarm impulse. You have managed the population growth leading up to the honey flow. The time to add supers is before the main flow. Early supering reduces congestion in a hive whose population is growing rapidly. The bees will need lots of space to store surplus honey. The rule of thumb is to add a super when the bees are using 70% of the uppermost box (brood or honey super). The exception to this rule is **Russian bees**. I add two supers at the point the bees are using **60%** of the uppermost box.

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I can not overemphasize the need for using drawn comb (if available) in the supers. It takes quite a bit of energy (think nectar) to draw out foundation. By using drawn comb the bees are using nectar to

make honey instead of wax. An added benefit of drawn comb is that it stimulates the bees to store more honey. The drawn comb provides them with a large surface area to ripen nectar into honey. Nectar can contain from 50 to 80% water. The bees need to get the water content down to at least 18.6 % water or less. More than this percentage will cause honey to ferment. The nectar needs to be spread over a large area for the bees to fan and remove water.

While supering increases the amount of storage space for honey, checker boarding manages the placement of the stored honey. Both actions discourage swarming. Checker boarding is done **only** with the honey supers that are **directly above** the brood chamber. The brood is not manipulated at all! The idea behind checker boarding is to perforate the barrier of honey in the super above the brood area. Checker boarding is done in late spring before the bees start to backfill the brood area with honey. Backfilling is one of the early signs of swarm preparation. Checker boarding opens up the space above the brood area. Now instead of starting swarm preparation, the bees will continue to store honey in the supers.

Checker boarding results in an alternating pattern of full honey frames with empty frames in the first two supers. To checker board:

- Remove every other honey frame from the first super

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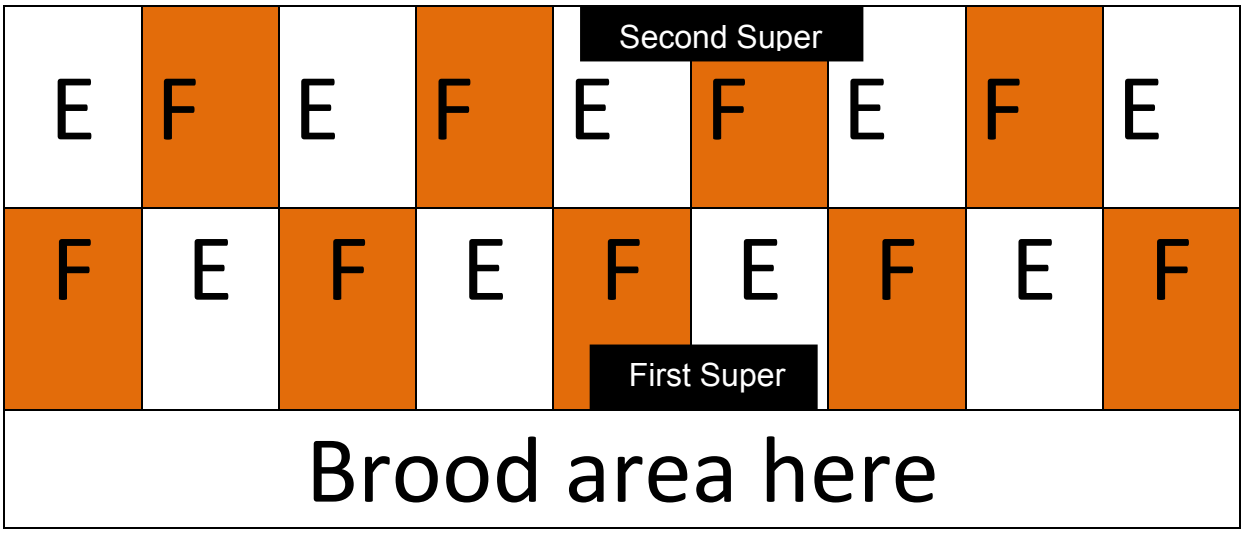
- Replace honey frames with frames of empty, drawn comb from the second super.
- Place the full frames of honey that were removed from the first super in the second super
- Alternate honey frames with frames of empty, drawn comb.

F = full frame **E = empty frame**



In **summer** the colony population reaches its peak. This is the time to coordinate equipment with the population to optimize the honey yield. Supers and Imerie shims are the tools. Continue adding supers based on the 70% rule. As with any hive, the brood chamber SHOULD NOT be disturbed during the honey flow.

An Imerie shim is nothing more complicated than a shim similar to one used to provide space for fondant candy or protein patties.

There are two differences between a regular shim and an Imerie shim. One is its location within the hive. The Imerie shim is placed between every two supers. The other difference is the dado cut about two inches wide made on one side of the shim.


Photo: Morris Ostrofsky

An Imerie shim benefits the colony in a number of ways:

- Provides upper entrance(s) to the hive. This makes it possible for foragers to gain access to the supers without having to cross a queen excluder (if used).
- Improved ventilation making it easier for the bees to vent the hive of the moisture produced from ripening honey.
- Upper entrance(s) relieves congestion not only on the landing board but also in the brood area. It provides the field bees a more direct route to the honey area where the nectar is ripened and stored.

Avoid the mistake I made once of using an Imerie shim between the upper most brood box and the first super. The result was a lot of unneeded burr comb. The first Imerie shim is placed between the first and second super. The next one would be placed between the third and fourth supers, etc.

Population management techniques leading up to the honey flow come together in the two queen hive. In the two queen hive configuration two queens and the workers exist harmoniously in a single colony. The configuration also allows the workers access to either brood box thus maintaining the

single population. Another benefit of a two queen hive is if one queen dies, the colony does not suffer an interruption of brood production. Additionally a two queen hive is physically more stable and provides easier access to supers than the traditional two queen hive in a single, tall column.

Photo: Bee Culture February 2009

Population in a two queen hive has the potential to be two times as great as in a single queen colony. As previously noted, a larger population has disproportionately greater potential to produce honey than a smaller populated colony.

At least two brood boxes and one honey super are needed to start a two queen hive. Ultimately the configuration will consist of four brood boxes and multiple honey supers. These are the steps to follow when setting up a two queen hive:

- When purchased queens become available around the beginning of May, select a strong healthy 2 brood box hive to be divided. (This can also be done in fall.)
- Separate the two brood boxes and place them adjacent to each other on the same footprint of the original hive. Using the same footprint, means the field bees will enter both hives roughly equally. Each box has its own landing board.

- Remove the old queen, make the division and introduce a new queen to each division.
- Place a single queen excluder and at least one honey super over the center of the two brood chambers and cover the super(s) with an inner and outer cover.
- Cover the exposed halves of the brood chambers with half sized migratory covers.
- Add the second brood box to each existing brood box as the population grows maintaining the queen excluder between the top brood boxes and the honey super(s).
- Add honey super(s) using the 70% frame coverage guideline.

Entering winter with a strong population, pollen, and honey stores results in the two queen hive emerging in spring with a robust population. In my limited experience my two queen hive out-produced my other single queen hives. The only reason I have not continued to use this configuration is that my current emphasis is raising nucs.

Managing honey bee populations to achieve great honey yield involves a number of sequential steps. The final step is to start. As George Imerie said, “I have led you to the water now you must decide whether to drink or not.”

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