The Ideal Nucleus

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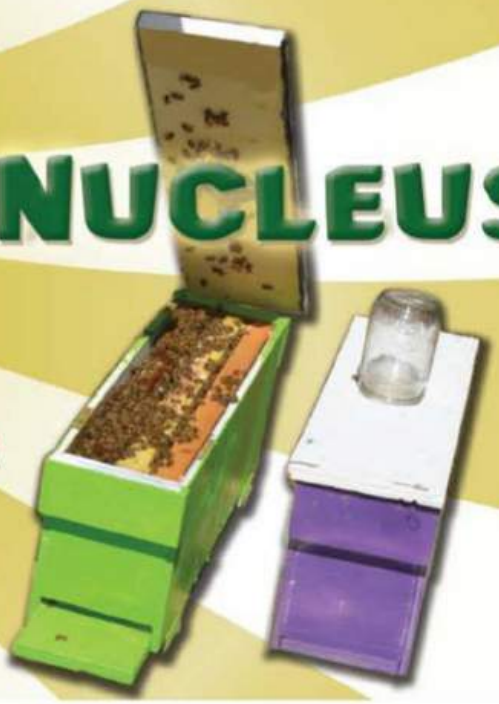


The double nucleus

Many beekeepers use deep frame hive bodies divided into two five-frame nuclei, often called a double nucleus. This provides room for one to three frames of brood, a frame of honey and one or two empty combs for the queen to lay into. Transferring the bees attached to the frames and maybe one shake more will give you about 3,200 or more bees, or roughly a pound. The combined heat from the two colonies growing side-by-side stimulates growth in each five-frame nucleus. These bees will keep the brood warm and care for the queen before and after she is released from the queen cage or emerges from the queen cell. In about a month, each colony will be strong enough to be moved into regular eight- or ten-frame equipment. Left in the small quarters, the nucleus will not expand further because there is not enough room or may swarm. Some beekeepers add supers to nucleus colonies to keep them growing and to prevent swarming.

Impact of the queen status used in increase colonies

You get the best results if you use a mated laying queen in a new nucelus colony, while letting the bees raise a queen from worker brood gives the poorest outcome. The latter includes queen failures when the queen dies and the bees must replace her from brood in the colony (if they have it). Let's discuss this effect, using these guidelines:

- Each nucleus was made with standard frames with an average of 75% emerging workers, or 4,800 bees/frame. I used three frames of brood for this model, which is on the strong side.
- For each frame of brood, I added one half pound of adult nurse bees to warm the brood and keep it alive until the sealed brood emerges—4,800 bees with three frames of brood.
- Each queen will lay an average 1,200 eggs per day after being installed and has reached maximum egg production. Some days she will lay fewer eggs because there is no place for her to put them. Even queens have bad days and labor-management conflicts.
- When the beekeeper assembles the nucleus, it contains primarily sealed worker brood, and some open brood (eggs and larvae). This affects the colony age distribution in all colonies as they develop.
- Various queen types, based on stage of development, are used this discussion. They include:

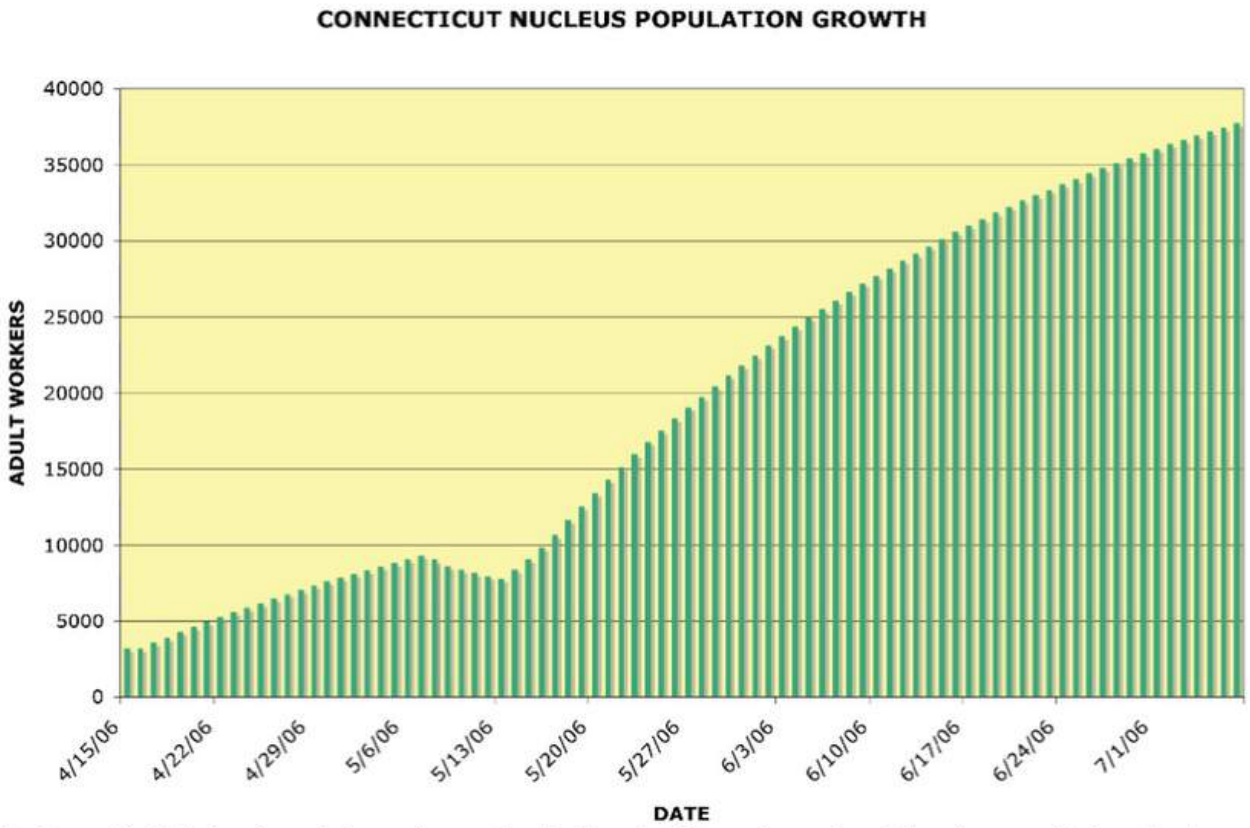
Mother queen—Time before brood emergence is 21 days. Here the nucleus colony receives the queen from the parent hive, and there is no interruption in egg laying. Then you will have bee emergence from newly laid eggs in about 21 days. In four weeks we expect to see about 27,000 bees in this three-frame nucleus; in seven weeks the population will approach 50,000 bees.

Laying queen—Time before brood emergence is 24 to 28 days. You must purchase or raise your own queen and introduce her into the nucleus. Allow seven days for her to be released and start laying (to be conservative), and add 21 days for her first adult daughter workers to emerge and join her in the hive. This is a total of 28 days. In four weeks we expect to see about 18,500 bees in the hive, in seven weeks the population will be around 42,000 workers.

Virgin queen—Time before brood emergence is 31 days. Overproduction of queen cells often leads to a supply of caged, sexually-mature, ready-to-mate virgin queens. We allow 10 days for release from an introduction cage and mating and then 21 days for first brood emergence. Week-old virgin queens will provide bees in just a few more days than a mated queen. Expect 17,400 bees at 28 days from the founder bees and brood; expect 37,700 bees at seven weeks. Because it is just a bit less than a mated queen, it makes me wonder why sexually ready virgins are not used more often, especially since the queen is emerged and can be inspected for color, size and certain behaviors? I have been marking and using virgin queens for several years with excellent results.

Queen cell—Time for brood emergence is 37 days. Many beekeepers put a mature or 'ripe' queen cell into mating nuclei. In fact, most commercial beekeepers use queen cells. Allow 16 days for a ripe queen pupa to emerge, mate and start laying, plus 21 days for the first worker bees. This is a total of 37 days for first emergence. At seven weeks expect 31,200 bees.

Queen raised from brood—Time for brood emergence is 49 days. Plan on a full seven-week delay when you require a colony to raise its own queen. While this may provide good varroa control by providing a total break in the brood rearing, it is very costly in terms of lost population buildup. The queen will be raised from a young larva, so add 13 days for her to emerge from a queen cell. To this add 15 or 16 days for the queen's maturation, mating and egg laying. Then, of course, you still must wait for 21 days for worker emergence. This puts the first emergence



The Connecticut Nucleus is made from a frame of sealed brood, a frame of open brood, bees to cover the brood and a purchased queen. In four to five weeks the population will increase rapidly and will require transfer into ten frame equipment.

at seven weeks! The colony has not yet added any new bees for seven weeks! The population has been shrinking from 17,400 bees since the last of the brood emerged. Of course, during hive inspections you have seen the formation of queen cells, bees preparing for the queen to mate and start laying, and then the new queen's brood appear. It's a fun and educational process to watch, but the 28-day lack of open brood may mess up colony balance by reducing the stimulus to forage for pollen needed for royal and worker jelly production, and limit comb building and food storage.

Colonies with queens that fail often fall into this last category. While the worker bees do not age as quickly when not rearing brood, they are none-the-less older when they raise brood. Either make the decision to requeen such a colony, or combine these bees with a growing unit so the bees will be of some benefit.

The beekeeper effect

As beekeepers work, they consciously and subconsciously impact the colonies they manipulate. A beekeeper creating a single-frame nucleus may pick the one frame with 95% sealed brood found during inspection. Likewise, a larger nucleus may be made from a number of frames containing less than 70% future worker bees. There are always frames with a combination of brood, pollen and honey. How do these compute into this discussion? The largest variables in all of increase production are often the decisions the beekeeper makes.

A beekeeper can boost a nucleus colony by adding a frame of sealed brood during the buildup time before a queen's daughter workers have emerged. This softens the age imbalance created by adding primarily sealed brood to the nucleus and it will increase bee population. Removal of bees from a strong colony is an effective swarm management tool beekeepers use during the swarm season. Beekeepers can also add a shake of bees to the entrance of a weak hive and add the bees from a brood frame from another colony. Small swarms may be used in the same manner, as long as you are not in an area where there is a risk of catching African honey bees, however remote, and with the understanding that captured swarms may carry diseases from their parent hives.

The Connecticut nucleus colony

This allows us to reach a compromise, in order to find an optimal plan for a nucleus. What is the perfect nucleus? Is there a perfect nucleus colony for a large number of beekeepers? One way to find out is to look at what successful beekeepers are doing for nucleus production.

Ted and Becky Jones are Connecticut sideline beekeepers keeping bees full time in their early retirement. They produce between 100 and 150 nucleus colonies a year for sale and for their own colony replacement and growth. They operate a nucleus-making operation that many would be wise to study. Over many years, they have learned from other beekeepers and have tried to improve their process.

In their program, they draw out new (and dated) combs the summer before the nucs are made so that they have fresh, new drawn combs to use in making increase. This reduces the risk of stored pesticide residues and disease spores in the old combs. They have surplus worker combs filled with honey and pollen, a key to their colonies' success. These combs are integrated into over-wintered colonies. The frames are dated by year, so Ted and Becky know they are using new comb in their nucs. They safely store one deep frame of honey for every nucleus they plan to make the next spring.

They give each nucleus colony one frame of sealed brood, and one frame of open brood. They have pre-assembled double nucleus boxes they carried to the apiary with two empty drawn frames, two frames of foundation, and one frame of stored honey. As they work colonies, they take turns finding brood frames while the other assembles the nucleus and moves combs around. Both of them check brood frames for queens. They add enough nurse bees to cover the brood.

They carry two frames of foundation into the apiary, holding the place of the future brood frames. Then, when the nuclei are assembled, these frames replace the two frames of brood removed from the

hive. The parent colonies will add wax to the foundation quickly if conditions are suitable. This means every colony produces at least two new brood frames each season. They may return a few weeks later and remove a second nucleus from each strong colony in the same season.

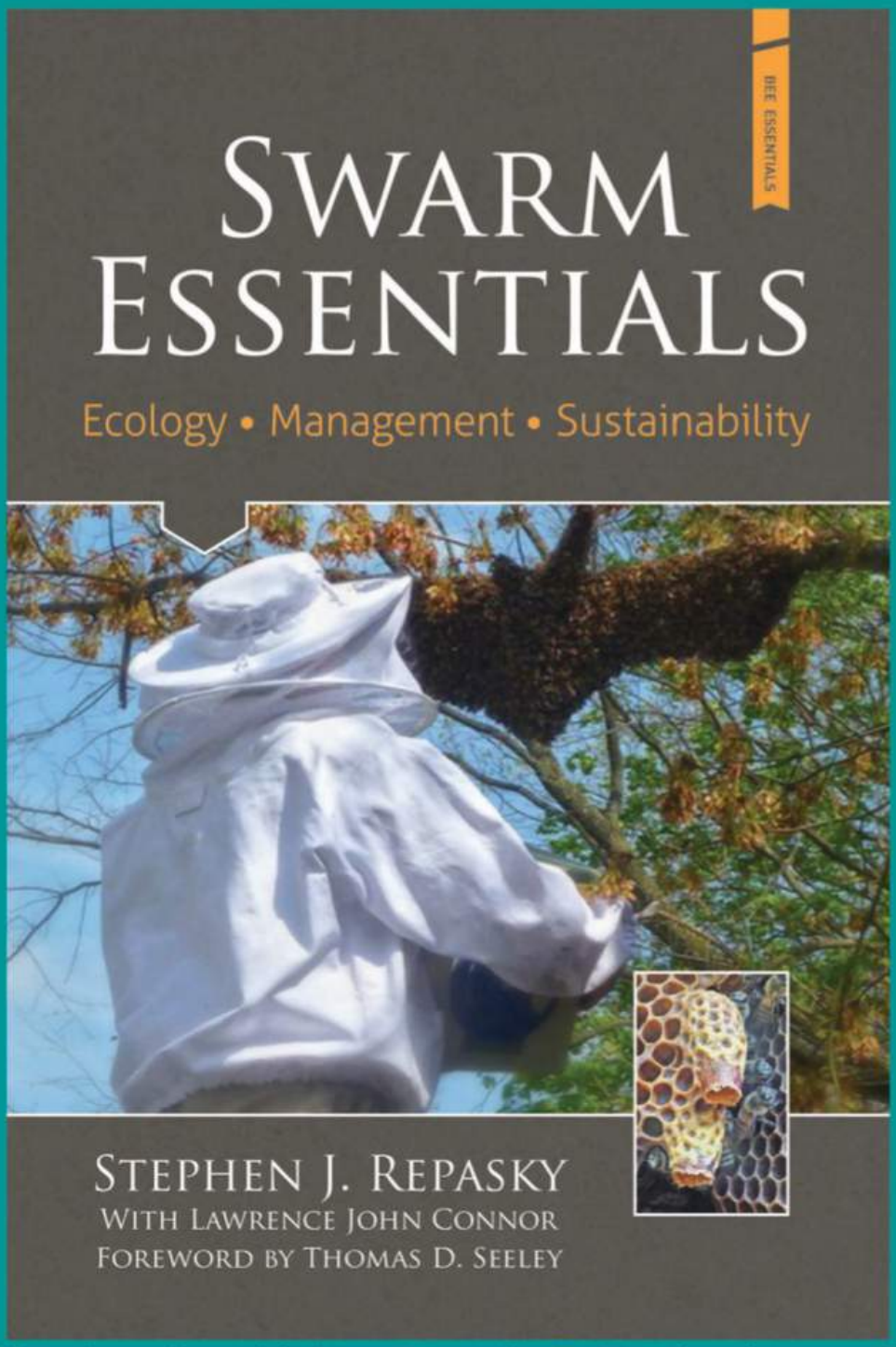
They schedule April queen shipments from California and Hawaii and introduce a queen to each nucleus as they make them up, putting the queen cage between the two frames of brood. They estimate the queen is caged for five to seven days before release. They return on the seventh day to check. If the queen is not out of the cage, they walk the queen out onto the frame. Then, they leave the colony alone for two weeks before they check the queen's egg laying and how the nucleus is doing. If there is a queen failure, they deal with it at that time. They do not let the nucleus just sit there.

All nuclei are moved to a new holding location, and kept fed by frames of honey. Lately, they have had to surround all their colonies with bear fences, part of modern life in southern New England. When the data for a Connecticut Nucleus is put into a spread-sheet, some of its strengths are expressed by rapid colony growth. Because they use two frames of brood, one emerging and one open (primarily larvae), there is continuous addition of emerging workers for 21 days. There is a minor seven-day decline in population due to the low level mortality built into the initial adult bee population. At 28 days, the purchased queen's daughters start to emerge and the nucleus rapidly expands. Ted Jones says the nuclei have brood on four frames about that time, and they are ready to move into ten-frame equipment (or cardboard delivery hive boxes for the customer) at one month. At that point the bee population is ready to explode with many new emerging bees. Ted Jones said, some years, the nuclei are ready for the customers at three weeks. Those were the springs when Ted and Becky found brood combs with 90% or more sealed brood. In other years, they may have to wait until the brood from the new queen has emerged to make up for a shortage of brood.

The system is far from perfect. The Jones didn't want to say too much about the year they had to delay nucleus delivery into the summer. That was when 'their' she-bear used several nucs as a snack as she moved from one apiary to the next. She was captured (by the State of Connecticut) and released 20 miles away only to return to continue her repast. Again she was moved from the area. Later Ted learned the bear was killed by a truck on an interstate highway. He did not say if the driver was a beekeeper.

Check www.wicwas.com for our new book *Swarm Essentials* by Steve Repasky and Larry Connor. Queen rearing classes (using the grafting method) are scheduled for Massachusetts, Kansas, Oklahoma and Ohio this spring. Check the website for further information and how to register—space is very limited.

New Wicwas Essentials



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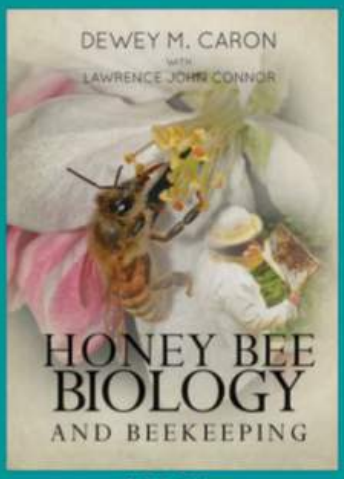

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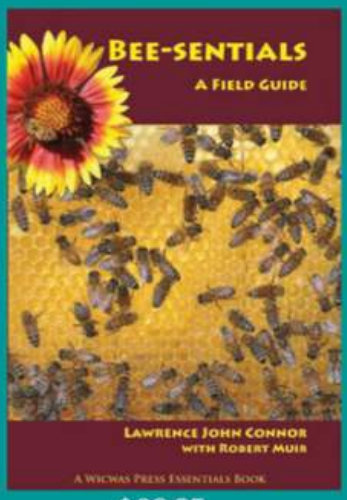

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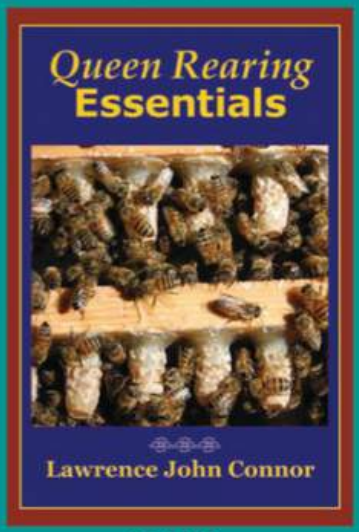

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