Basic Principles

This guide reviews the fundamentals of colony splits, and then outlines some of the more common approaches. A good starting point of any split is to be clear about ***why***, ***how, and when*** to do the split. So this is where we start:

Why: Nucleus colony splits are a powerful colony management tool whose outcome affects all aspects of the bee yard. Beekeepers typically do splits to achieve one or all of four objectives: (1) Swarm management, (2) Loss replacement, (3) Pest, disease, and pollution management, (4) Apiary genetic improvements. Each of these goals might influence the type of split you choose. So it is good to be aware of the options before plunging in.

1. Swarm Management: Beekeepers tend to think of a swarm as a depletion of resources; a loss of bees that will reduce honey production or our ability to make a split. Bees have an entirely different view. For them swarms are an imperative for species survival. Colony splits are good way to balance the needs of the colony with that of the beekeeper.
2. Most beekeepers lose colonies, and sometimes they lose a lot. Colony splits enable us to recover from those losses without forking out cash to a breeder.
3. Pest, diseases, and pollution are a constant threat in any animal husbandry, including beekeeping. Pathogens build up in the comb and lay dormant, waiting for the right conditions, pests take up residence and can be hard to eliminate. Lipophilic pollutants accumulate in the comb. Colony splits offer an opportunity for a colony to escape these burdens.
4. Every split we make is an opportunity to select from the best in our bee yard. In the past, gentleness and honey production where dominant criteria. With the high colony losses of contemporary beekeeping, survival is now a key trait for selection. Regardless, the beekeeper can determine the selection criteria, and not have to rely on other breeders making that decision.

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How: No matter what type of split you choose, the basic principles apply. We think a colony split is analogous to a surgical procedure. Think of the colony as a patient you plan to cut open. This is a radical thing to do, and it should be done with due care and respect. Like any surgery, it requires good preparation and follow-up to improve the chances of success. It helps to break the colony surgery into three stages:

(1) Preparation: Review the different methods outlined in this guide (later), and pick the one you are most comfortable with. The one you pick will depend on your goals and skills.

Pick your time and prepare a location for the new hive. Have your new hive setup ready to receive the bees. Have a queen ready, unless you are raising one, and expect the procedure to take longer than you think it will. It usually does.

(2) Procedure: Follow the steps in the following illustrated pages. Work steadily and smoothly. Splits generally have better outcomes if you can find the queen. If you can't, just use one of the alternate methods in this guide.

3) Follow-up: Make sure to feed the colonies after the split, and shake some extra bees into the new hive about a week after the split to reinforce it. (Some of the foragers will return to the source hive, thereby depleting the split hive.

Fig. 1. Reading the brood is key skill. The strong brood pattern and plenty of freshly capped honey indicates this is a strong candidate hive for sourcing a split.

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When: Timing of splits is crucial. You need to pick the right time of year, the right colony conditions, the right weather window, and the best time of day.

Seasonality*: Follow the seasonal colony expansion/decline for your region.* We find our highest success rate for splits in Northern Oregon is April through June. You can do splits later, but the success rate might be lower. This is due to declining egg laying, declining forage, cooling temperatures, and increased hive robbing. If you do a late split, plan to feed heavily, and to protect the hive from robbing. The split hive might need extra winter protection if the hive doesn't have time to build enough strength.

Weather window: Here in the Willamette Valley, the spring weather seems to conspire against beekeepers. Persistent rain, and cool temperatures make it hard to find a good window for making splits. We try to have our split setup fully prepared to catch the occasional spell of dry weather between our incessant spring rain.

Swarming Window: Colonies preparing to swarm will wait for a weather break to issue the swarm. In this weather pattern, typically, swarms issue in the first sunny day following several days (or weeks) of rain. If you have some strong colonies, consider splitting before the sun break, even if this means making the split in poor weather. In this case, you will need to feed the split colony heavily as the foragers will not be flying much.

Time of day. If you do the split in the early AM, the split foragers will not have left the hive yet. This means the split colony will fly from their new hive and this will encourage reorientation. Regardless, some of the foragers will find their way back to the old hive, which is one reason for shaking extra bees in the split hive. The drawback of the early morning tactic is that the bees are less tolerant of intrusion before they are up and flying, so you might need a full bee suit.

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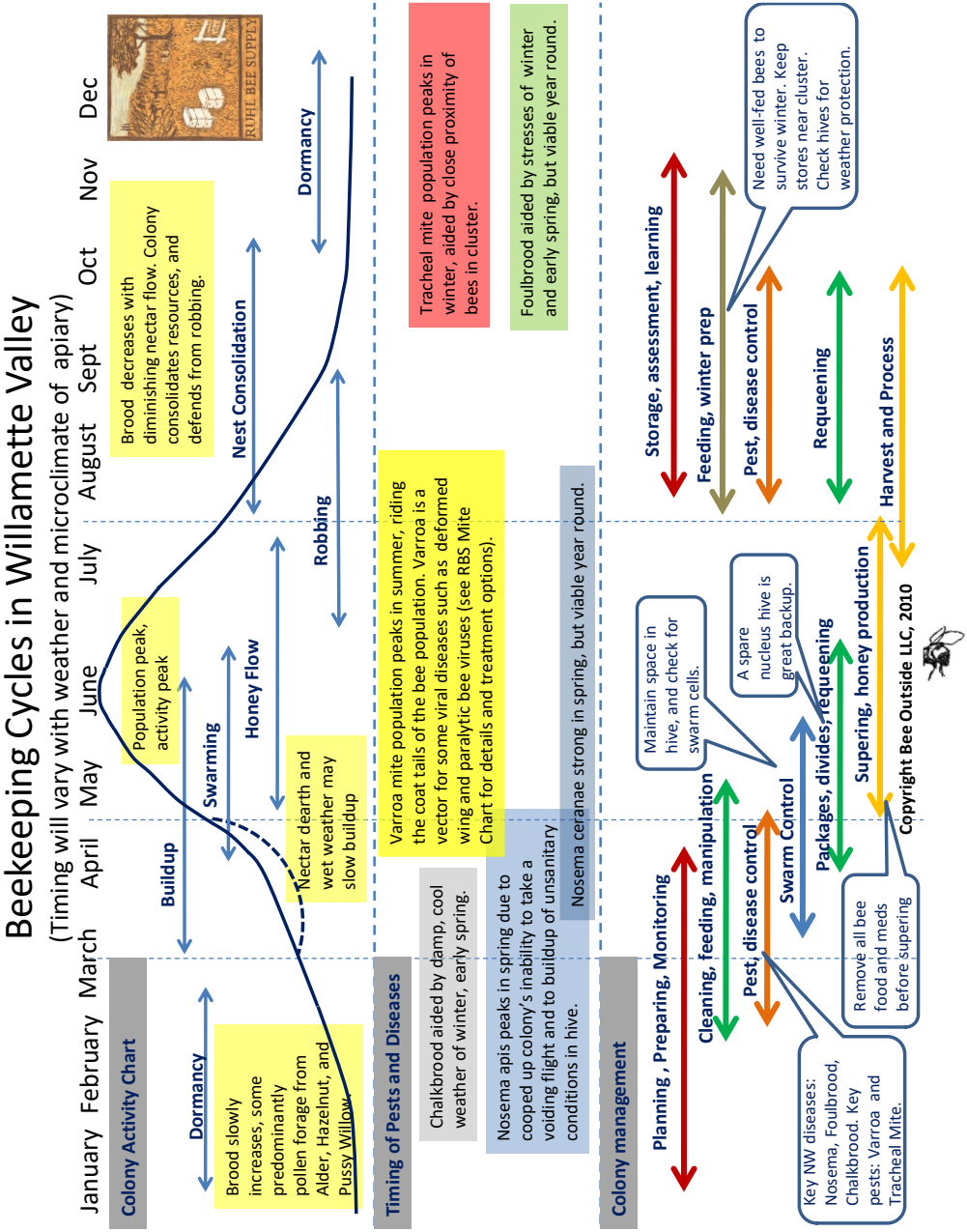

Fig. 2. Beekeeping cycles in the Willamette Valley. This is a useful summary of the honeybee development phases through the year, and of the beekeeper management tasks associated with each of these phases. Timing of these phases will vary with local climates. All curves in this chart are smoothed approximations.

Finding the Queen:
Finding the queen helps greatly when you are doing a split, and we recommend you practice finding her. Regardless, it is not absolutely required as some split methods don't require it. But knowing her performance and knowing the status of any queen cells influences both how you will do the split, the timing of the split, and the outcome. You might already have a good understanding of queen cells and queen development, but if not, the material below might help:

Stages of a Queen Cell:
As you can see in Fig. 3, queen cells have several stages of development and also different locations on the frame. Let's start with queen cups. These are contingency structures put to use as the colony needs them. When it decides to raise a queen, it prepares the cup with royal jelly (1) and guides the queen to lay in the cup. It then extends the cup (2) and feeds it more royal jelly. Once developed to a pupa, the cup is capped (3), and when fully mature, will tear through the cap to emerge (4). It will then go about killing remaining queen cells by tearing them out at the side of the cell (5). The new virgin queen will typically spend around a week preparing for its mating flight(s), weather permitting.

Types of Queen Cell:
Queen cells generally look like an unshelled peanut hanging vertically off the frame. They typically hang from the face of the of the frame or at the bottom. The cells on the face are typically ***supersedure cells***, and the cells at the edges (most often the bottom edge) are typically ***swarm cells.***

Supersedure cells are made when the colony senses an issue with the resident queen and goes about replacing her, using the contingency queen cups they have ready. See Fig. 3.

Emergency cells are supercedure cells built when the queens has suddenly failed. These cells are built from existing worker cells (ideally with first instar larvae), not from queen cups. This causes them to be tilted from vertical, and to appear shorter. Some beekeepers dislike emergency cells, either because they risk being made from older larvae, or because they appear shorter and therefore appear to be inferior.

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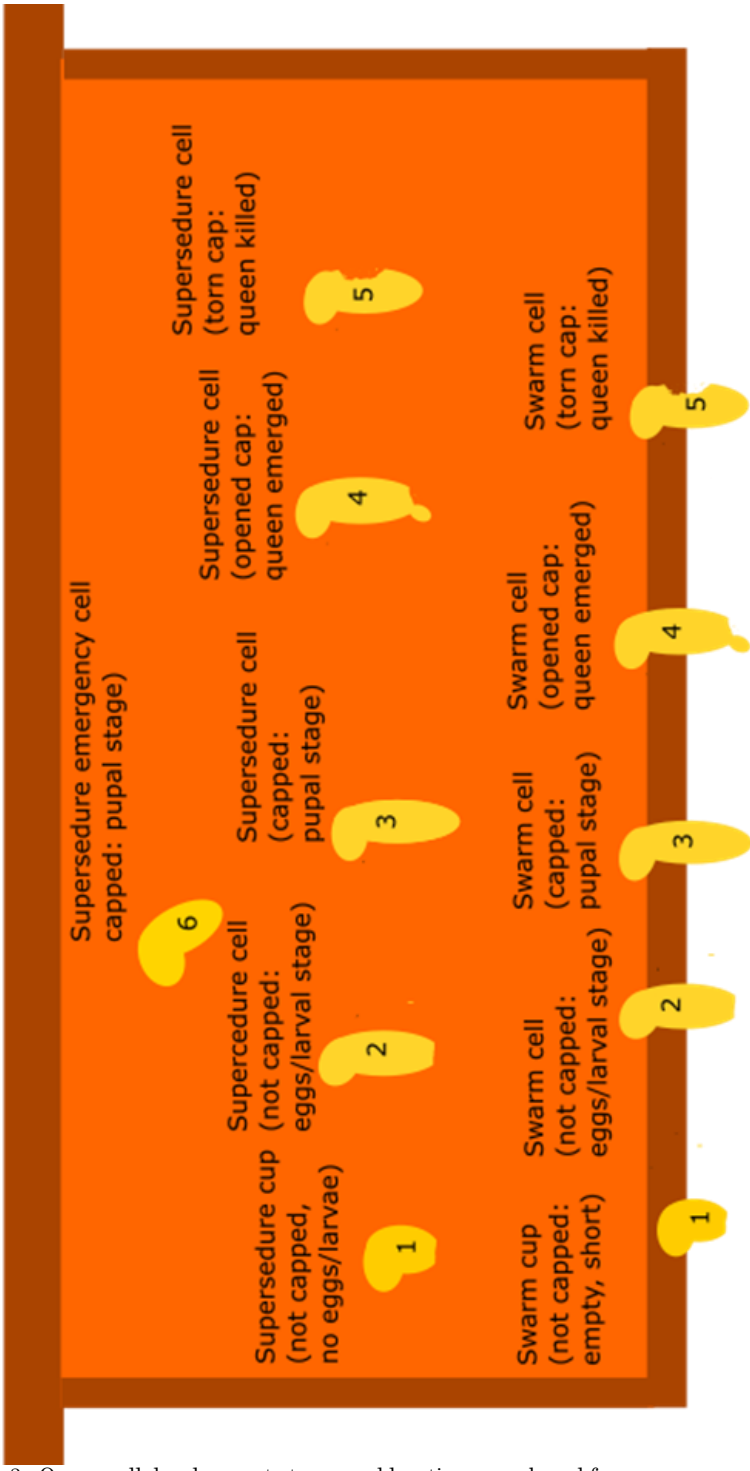

Fig.3: Queen cell development stages and locations on a brood frame.

The first reason can be managed by making sure the split brood has plenty of eggs and young larvae. The second reason is misleading. The queen is not actually shorter; but is positioned in the tilted cell such that she appears shorter.

Swarm cells are built as part of the colony reproduction cycle. Once a swarm cell has an egg, the swarm process has truly begun. You can preempts this by performing colony splits, but once the cell is capped, the colony might swarm even after the split.

Time Delay to Reach Laying:

We just discussed the development cycle of queen cells, but this is not the complete picture when considering splits. Just as important is the net time from queen egg to mated and laying queen. (See Fig. 4) Any splits requiring the development of an emergency queen are vulnerable to population depletion if there is a delay in mating of the virgin queen. In good weather, time from queen emergence to mated queen laying can be only a few days, but wet and cool weather (Willamette Valley) can delay this by weeks. This mating delay can lead to failure without remedial action. In such cases, consider shaking some more bees in such splits to keep them up to strength.

One useful indicator of a laying queen is the amount of pollen coming into the hive. This is certainly not foolproof, but if you see a sudden increase in pollen foraging, it is a good bet that the queen is laying. Of course, to be sure, you will need to inspect some brood frames in the split hive.

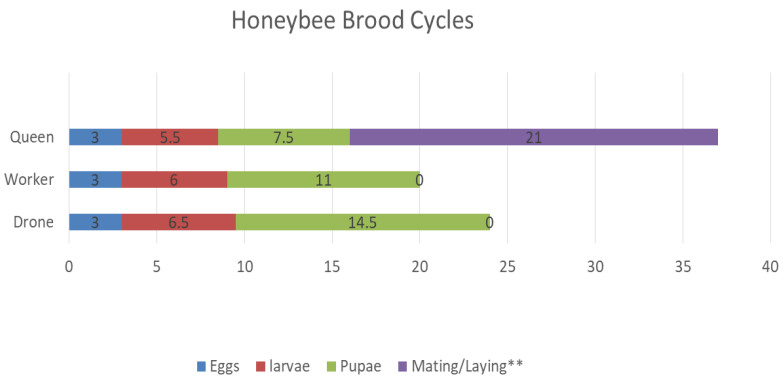

Fig.4: The time delay of the queen's emergence to laying is highly variable, and could be as short as a few day and up to three weeks.