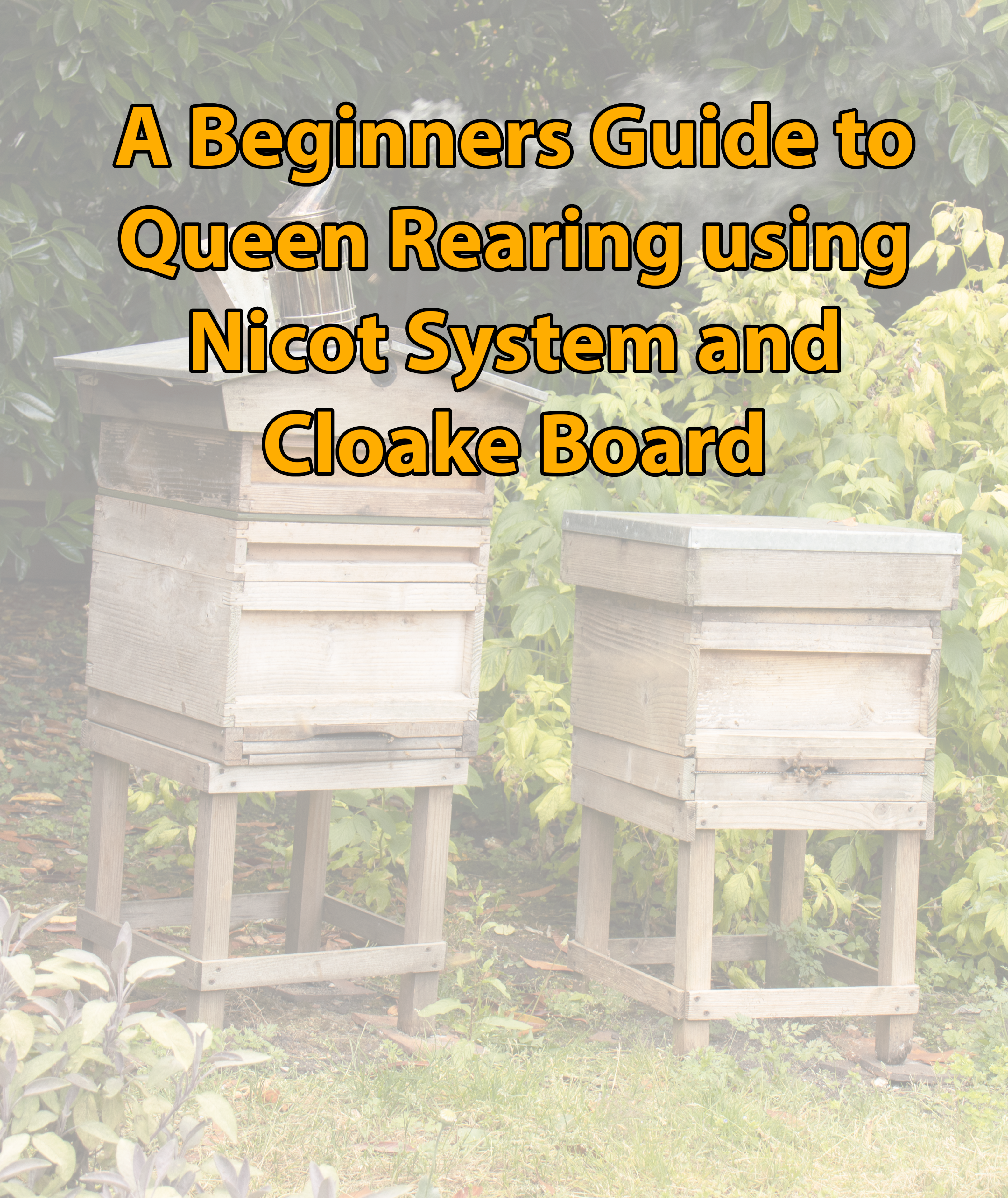
A Beginners Guide to Queen Rearing using Nicot System and Cloake Board



A Best Practices Guide to Swarm Control and Apiary Management

Introduction: Mastering the Swarming Impulse

Swarming is not a failure of beekeeping, but rather the honey bee colony's powerful and deeply ingrained instinct for reproduction. As leading bee scientists Seeley and Morse noted, "Mature colonies have a natural urge to swarm each year unless weakened by disease or mismanagement." For the apiary manager, understanding and working with this impulse is fundamental to success. Effective swarm control is simultaneously the most critical and the most challenging aspect of colony management required to consistently achieve good honey crops. Losing a significant portion of a colony's workforce just before a major nectar flow can decimate a season's potential harvest.

This guide provides apiary managers with a comprehensive framework of pre-emptive and re-active strategies to manage the swarming impulse. By applying these field-tested techniques, beekeepers can maintain strong, healthy colonies, prevent the loss of bees, and ultimately maximize the productivity and sustainability of their operations.

1.0 Understanding the Fundamentals of Swarming

To effectively manage the swarming impulse, one must first comprehend the biological drivers behind it. Attempting to implement control measures without understanding the "why" of the bees' behavior is an exercise in futility. The strategies outlined in this guide are not arbitrary; they are designed to directly counteract the specific internal and external triggers that compel a colony to divide.

The Core Triggers for Swarming

A complex interplay of factors inside and outside the hive signals to a colony that the time is right to reproduce. A successful manager learns to recognize and manipulate these conditions.

- **Internal Hive Conditions:** These are the factors the beekeeper has the most direct control over.
  - **Colony Size and Brood Nest Congestion:** As a colony grows, the brood nest becomes crowded with bees, restricting movement and impeding the distribution of critical pheromones.
  - **Space for the Queen to Lay:** A prolific queen can be limited by a brood nest clogged with honey and pollen, a condition often referred to as being "honey-bound."
  - **Brood Nest Maturity:** A high proportion of sealed and emerging brood contributes significantly to hive congestion.
  - **Nectar Storage:** Insufficient space for processing fresh nectar and storing honey can create back-pressure on the brood nest.
  - **Age of the Queen:** While not definitive, an older queen's pheromone output may decline, contributing to the colony's impulse to replace her and swarm.
- **External Environmental Factors:** While outside the beekeeper's control, these factors are crucial for anticipating swarm preparations.
  - **Time of Season:** The swarming urge is at its peak in late spring and early summer, typically May and June, declining thereafter.
  - **Weather:** This is an often-understated factor. A period of poor weather that confines the foraging force to the hive can rapidly escalate brood-nest congestion and trigger swarming as soon as conditions improve.

The Dominant Swarming Theory

Over the years, several theories have been proposed to explain the primary mechanism of swarming. These include Gerstung's "brood food" theory (1890), which suggested an excess of royal jelly produced by nurse bees, and Demuth's "congestion" theory (1921). However, the most widely accepted scientific explanation is the "queen substance" theory, postulated and proven by Butler in 1953. This theory holds that as a colony becomes congested, the queen's primary pheromone (queen substance) is no longer distributed effectively throughout the hive, signaling to the workers that the queen is failing and that it is time to raise new queens and swarm.

Understanding these triggers and the underlying theory allows us to transition from observation to action, employing practical management techniques designed to counteract the colony's natural impulse.

2.0 Pre-emptive Swarm Control: Proactive Colony Management to Prevent Swarming

The most effective swarm management is proactive, not reactive. Pre-emptive control is the first and most desirable line of defense, involving a suite of techniques that are synonymous with good beekeeping husbandry. These practices aim to alleviate the very conditions that trigger the swarming impulse. However, we must acknowledge the central paradox of beekeeping: the very success of our pre-emptive management—creating large, powerful, and productive colonies—makes an eventual swarming attempt *more* likely. Good management delays swarming, but it may not prevent it entirely. The goal, therefore, is not a guarantee of prevention, but a continuous process of balancing colony strength with the swarming impulse to keep the colony together and productive for as long as possible.

2.1 Comb Management

The primary objective of comb management is to maximize the available brood-rearing area below the queen excluder. This involves keeping stores of honey and pollen in the brood nest to a minimum, thereby encouraging the queen to lay and preventing the formation of a restrictive "honey ceiling" that limits the nest's upward expansion.

Practical steps include:

- **Systematic Frame Replacement:** Brood frames should be replaced on a roughly three-year cycle to maintain hive hygiene and ensure good quality comb. This translates to replacing an average of 3-4 frames per year in a standard brood box.
- **Strategic Introduction of Foundation:** Introducing new foundation serves a dual purpose: it provides fresh space for the queen and is thought to simulate brood nest immaturity, diverting worker energy to wax production. The placement of foundation is critical:
  - **Early in the season:** To maintain brood nest integrity, place foundation on the *edge* of the brood nest.
  - **Later in the season:** Once the colony is strong and crammed with bees, foundation can be *interleaved* with existing brood frames.

2.2 Box Management for Two-Box Systems

For beekeepers using a "brood and a half" (one deep, one shallow) or double-deep brood system, box management is key to preventing the formation of a honey ceiling that can confine the queen. This is a direct intervention against the swarm triggers we discussed earlier; it alleviates Demuth's "congestion" and ensures the widespread distribution of Butler's "queen substance" by giving the queen ample room to roam and lay. The correct action depends on where the brood nest is established early in the season.

- **Brood Nest High (Figure 2a):** If the brood nest is primarily in the top box, no management is required. The queen is free to expand downwards into the lower box as needed.
- **Brood Nest in Middle (Figure 2b):** If the nest spans both boxes, a honey ceiling will likely form in the upper box, restricting the queen. The solution is to swap the boxes, placing the shallow box *underneath* the deep box. This encourages the bees to move the honey stores up, opening the comb for the queen.
- **Brood Nest Low (Figure 2c):** If the nest starts in the bottom box, the upper box will quickly be filled with honey. The best option is to move the upper (shallow) box above the queen excluder to become the first honey super, and introduce a new shallow box of drawn comb beneath the deep brood box.

For **double deep hives**, the equivalent action is to move frames of brood into the top box. For **single deep hives**, the goal is simply to ensure all frames are available for the queen by minimizing stored honey and pollen.

2.3 Brood Relocation (The Demaree Method)

Dating back to 1892, the Demaree Method is a powerful technique for relieving brood nest congestion. The principle is to relocate frames of capped brood from the brood box to a new box placed at the very top of the hive, above the honey supers. The removed frames are replaced with empty drawn comb or foundation.

This manipulation works by creating immediate laying space for the queen while simultaneously drawing nurse bees upward to care for the relocated brood. This reduces congestion in the primary brood area and inhibits the swarm impulse. However, there are two potential downsides:

1. The bees in the top box, separated from the queen by several supers, may perceive themselves as queenless and begin raising emergency queen cells. This requires an inspection 5-7 days later to destroy any such cells.
2. Once the brood emerges in the top box, the bees will quickly backfill the empty cells with nectar. In my experience, the second problem is more common; those top frames almost invariably become honey-logged, so plan accordingly.

2.4 Splitting Colonies

Splitting a colony is the most powerful and reliable method of pre-emptive swarm control. While it may seem counterintuitive to divide a colony you want to be strong for a honey flow, a controlled split is always preferable to losing an uncontrolled swarm.

For a split to be successful, several critical factors must be considered:

- **Impact:** The split must be radical enough to control the swarming impulse for the remainder of the season.
- **Viability:** Both resulting portions of the colony must be viable, with adequate bees, brood, and stores to survive and thrive.
- **Timing:** The split must be timed correctly relative to the colony's development and upcoming nectar flows to allow for rebuilding.

When executed properly, a split not only prevents swarming but can also be used to make increase or re-queen another colony, turning a potential problem into a strategic advantage. This proactive step sets the stage for a productive season, but one must always be prepared for the possibility that the pre-emptive window has closed.

3.0 Re-active Swarm Control: Intervening When Queen Cells Appear

The presence of queen cells in a colony marks a critical biological threshold. At this point, the colony is committed to swarming, and our role must shift from calm prevention to decisive intervention. The stakes are now higher. The goal is no longer to stop the impulse but to manage the process in a way that prevents the loss of the colony's workforce and maintains control over our apiary's genetic stock.

3.1 The First Step: Determining the Swarm Stage

A Master Beekeeper's first rule of swarm control: Never act until you have diagnosed. Hasty action in a hive with queen cells is the quickest way to create a hopelessly queenless colony.

Upon discovering queen cells, the first and most important step is a careful investigation. Rushing to destroy queen cells without understanding the colony's status can be a catastrophic error. The beekeeper must diagnose which of the four main possibilities has occurred:

1. The colony has queen cells but has **not yet swarmed**.
2. The colony has issued the prime swarm but has **not yet issued a cast swarm**.
3. The colony has emerged queen cells and **may have issued a cast swarm**.
4. The colony **appears to be queen-less**, and its recent history is unknown.

To determine if the colony is in the most critical first stage (not yet swarmed), look for this key evidence:

- **The queen is seen.**
- **Recently laid eggs** (standing on end) are present.
- There is **no noticeable reduction** in the number of bees.

Master Beekeeper's Note: If your queen's wings are clipped, the discovery of queen cells is less of an immediate emergency. Clipping does not prevent swarming, but it buys you precious time by preventing the queen from flying away with the prime swarm, effectively extending your safe inspection interval.

Only after confirming the colony's status can the correct remedial action be taken.

3.2 The Primary Tool: Artificial Swarming

For a colony that has begun swarm preparations but has not yet left the hive, the definitive solution is an artificial swarm. The principle is to split the colony in a controlled manner that mimics a natural swarm, thereby satisfying the bees' impulse while keeping them within the apiary.

There are two main methods, with vastly different rates of success:

Method	Description & Success Rate	Key Considerations
Common Artificial Swarm (often misattributed to Pagden)	The traditional method described in many books. It involves moving the queen to a new box on the old stand. However, it has an **unacceptably high failure rate (over 50%)** due to secondary swarming.	Failure is often caused by *using frames of foundation instead of drawn comb* in the new box, or *moving a comb with too large a patch of brood*, both of which can trigger a secondary swarm.
Snelgrove II (modified)	The highly recommended alternative. This is a two-stage process that systematically eliminates the swarming impulse in both halves of the split, with a **virtually 100% success rate**.	Requires a second manipulation after 9-10 days but is far more reliable and effective at preventing swarm loss.

Step-by-Step Guide to the Snelgrove II (modified) Method

This method is a two-stage process that ensures the swarming impulse is extinguished in both the "parent" and "artificial swarm" colonies.

- **Stage 1: The Initial Manipulation (Figure 6a)**
    - **Goal:** To separate the queen and all brood from the flying bees, tricking the parent colony into abandoning its swarming impulse.
    - Move the entire original colony (all brood, the queen, and all queen cells) to a new stand at least three feet away. This is now the **"parent colony."**
    - On the original hive stand, place a new brood box, preferably with drawn comb.
    - From the parent colony, transfer two bee-free frames of brood containing eggs and young larvae (but no queen cells) into the center of this new box. This box is now the **"artificial swarm."**
    - **Rationale:** The flying bees will return to the original location, joining the artificial swarm. The parent colony loses the "swarm-impulse" bees and, sensing this shift, will tear down its swarm cells. The now queenless artificial swarm will begin raising emergency queen cells.
- **Stage 2: The Second Manipulation (9-10 Days Later)**
    - **Goal:** To make the artificial swarm queenright again and set the parent colony on a path to raise a new queen without swarming.
    - The timing is critical: this must be done before any emergency queen cells in the artificial swarm can emerge.
    - Carefully inspect the **artificial swarm** (on the old stand) and destroy *all* of the emergency queen cells it has created.
    - Find the original queen in the **parent colony** and transfer her back to the artificial swarm.
    - **Outcome:** The now queenright artificial swarm abandons its swarming preparations and settles down to rebuild. The now queenless parent

colony will raise a new queen from the eggs the original queen recently laid, but will make no attempt to swarm.

3.3 Managing a Colony Post-Swarm

If the investigation reveals that the prime swarm has already departed, the beekeeper's goal is to prevent the loss of subsequent "cast swarms" led by virgin queens. There are two effective options:

1. **Thinning Queen Cells:** Carefully inspect all frames and reduce the number of queen cells to a single, large, well-formed cell. A crucial point: if there are still eggs or young larvae present, it is best to delay this operation. Otherwise, the colony may simply make new emergency cells, defeating the purpose. Check again in a few days to ensure no new cells have been started.
2. **Releasing Virgin Queens:** A more hands-off approach is to wait until the queen cells are close to emergence. Manually open the caps on several cells to release the virgin queens into the hive, then destroy *all* remaining sealed cells. The colony will naturally select the best queen from among the virgins, and because the process is complete, they will not attempt to swarm again.

These re-active measures, particularly the Snelgrove II method, are highly effective. However, the principle of the artificial swarm can be adapted for another critical apiary task: pest management.

4.0 Advanced Application: Using Artificial Swarms for Varroa Control

The artificial swarm is not just a tool for swarm control; it is a powerful, bio-technical weapon in the fight against the Varroa mite. The National Bee Unit (NBU) has outlined a modified artificial swarm procedure that can be used as a form of Integrated Pest Management, claiming it **can remove up to 90% of a colony's Varroa mite population** during a nectar flow, without the use of medicinal treatments.

The Biological Principles

This technique cleverly exploits three biological facts about the Varroa mite:

1. Varroa mites mature and are found primarily on younger, non-flying house bees.
2. The foraging (flying) bee population carries very few mites—scientists calculate that an artificial swarm composed of flying bees will carry only about 1.7% of the colony's total mite population.
3. Mature female mites require open brood cells to enter for their reproductive phase. A broodless colony can therefore be "baited" to trap mites for removal.

A Step-by-Step Procedural Guide

This method, based on the NBU's timeline, methodically separates the mites from the bees and brood.

- **Day 1: The Initial Split**
  1. Move the parent colony (the hive to be treated) four meters to one side of its original site.
  2. Place a new, clean hive on the original site. This will become the 'swarm' colony.
  3. Examine the parent colony, find the queen, and place **only the queen** into the new 'swarm' hive. *Do not transfer any brood*, as this will transfer mites.
  4. The flying bees, which are largely mite-free, will return to the new hive on the old stand, forming a clean artificial swarm with the queen.
- **Day 7: Parent Colony Management**
  1. Inspect the queenless parent colony and destroy all but one unsealed queen cell. This prevents a cast swarm and begins the re-queening process.
  2. Place this single queen cell into a "nursery cage" or use a "cell protector." This is a critical step that allows the queen to hatch and be fed by the workers, but prevents her from flying and mating. Keeping a virgin queen in this state maintains the colony's social structure.
  3. (Optional) To boost the foraging force, any supers can be moved from the parent colony to the 'swarm' colony.
- **Day 21: Setting the Bait**
  1. By now, all the worker brood in the queenless parent colony will have hatched. At this point, the parent colony is broodless, meaning the phoretic mites have no cells to enter for reproduction. They are vulnerable and will be irresistibly drawn to the fresh, open brood of the bait combs.
  2. Take two combs of *open brood* from the healthy 'swarm' colony and place them in the center of the now broodless parent colony. These act as "bait combs."
- **Day 30: Removing Mites and Re-queening**
  1. Inspect the parent colony. The two bait combs will now be capped.
  2. Remove and destroy these capped bait combs, thereby eliminating the vast majority of the mites that were in the parent colony.
  3. The caged virgin queen is culled, and the parent colony can now be re-queened.
  4. **WARNING: Do not allow bait comb to hatch, as this will re-infest the colony.**

This advanced technique demonstrates the versatility of fundamental beekeeping manipulations. After successfully performing any such split, the final step is to decide on the future of the newly created colonies.

5.0 Post-Manipulation Strategy: Managing Your Colonies After a Split

Successful swarm control, whether pre-emptive or re-active, results in the creation of two colonies from one. This outcome requires a clear strategic plan. These newly created assets can be used for apiary expansion or to strengthen existing stock, but a decision must be made.

The Two Primary Pathways

After a split, the beekeeper is presented with two main choices:

- **Colony Increase:** The most straightforward option is to allow the new colony to establish its independence, either on a new stand in the same apiary or by moving it to a different location. This is the simplest way to grow the number of colonies in an operation.
- **Reunification:** The second, more strategic option is to recombine the two colonies later in the season. This is a powerful tool for stock improvement and maximizing production. A beekeeper might choose reunification for several reasons:
  - To create a powerful 'super-colony' just before a main summer honey flow.
  - To replace an old or unsatisfactory queen in another colony with the new, vigorous queen raised in the split, thereby improving the apiary's genetic stock.

The Uniting Process (Newspaper Method)

When reuniting colonies, the beekeeper should first decide which queen to retain; in most cases, the new, younger queen is the preferable choice. The old queen from the other colony should be removed. The safest and most common method for uniting the two colonies is the newspaper method.

1. Prepare the two colonies for uniting by removing the roof and crown board from the bottom colony and the floor from the top colony.
2. Place a single sheet of newspaper over the top of the brood box of the bottom colony. A few small slits can be cut into the paper with a hive tool.
3. Carefully place the brood box of the second colony directly on top of the newspaper.
4. Replace the crown board and roof on the newly combined hive stack.

Over the next day or two, the bees from both colonies will chew through the newspaper. This slow process allows their distinct hive scents to mix gradually, preventing the fighting that would occur if they were combined abruptly.

6.0 Common Pitfalls and Special Considerations

Even with the best techniques, certain challenges and common errors can undermine swarm control efforts. Acknowledging these pitfalls is the final step in developing a robust management strategy.

Common Reasons for Artificial Swarm Failure

The traditional artificial swarm is notorious for failure. The primary reasons for subsequent, uncontrolled swarming are:

- **Leaving more than one queen cell** in the queenless portion, which can lead to the first virgin queen to emerge issuing a cast swarm.
- **Using frames of foundation instead of drawn comb** in the new box for the artificial swarm. The lack of immediate laying space can trigger a secondary swarm.
- **Moving a comb with too large a patch of brood** into the artificial swarm, which can provide enough of a population nucleus to induce swarming.
- **Failing to clip the queen's wings.** While not a method of swarm control itself, clipping a queen's wings prevents her from flying away with the prime swarm. The swarm will return to the hive, giving the beekeeper a valuable safety net and extending the safe inspection interval.

The Challenge of Late-Season Swarming

A particularly frustrating scenario is when a large colony that has been managed well all spring suddenly develops queen cells just before the main summer nectar flow. An artificial swarm at this point would split the foraging force and compromise the honey crop.

A solution for this situation is the **"purdah" method**:

1. As soon as queen cells are found, remove the queen from the colony along with a frame of brood and enough worker bees to support her.
2. Place this small nucleus in a nuc box or, more commonly, in a box placed **on a split board on top of the hive.**
3. The main colony, now queenless, will proceed with re-queening but will not swarm. Critically, the vast foraging force remains intact to work the main nectar flow.

After the honey has been harvested, the beekeeper can choose whether to retain the new queen raised by the colony or to reunite the old queen from the nucleus box.

The methods in this guide provide a comprehensive toolkit for managing the swarming impulse, but we must remain humble. As my colleague Wally Shaw wisely notes, "...the beekeeper who claims to have achieved complete control is probably not of this world or is being economical with the truth." Swarm management is not a battle to be won, but an ongoing dialogue with the colony. It is a craft that blends science, observation, and intuition. By understanding the biology of the bee and intervening with purpose and precision, we can guide our colonies toward a productive and sustainable season, turning one of beekeeping's greatest challenges into an opportunity for mastery.