A Beginner’s Guide to Keeping Bees Thriving in the Boston Area

Beekeepers School

BABA Beekeeper’s School 2026

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Using A Hive Tool

Lesson | Performing Inspections

What is Covered in this Lesson

- Smoker Basics
- Where to Make Entry
- Gaining Entry
- Using the Gap
- Restoration of Frames
- Working from the Far Side

Smokers

- **Enemy of New Beekeepers**
  - Most if not all new beekeepers (**and some experienced ones**) struggle with keeping a smoker lit
  - With the right technique, and fuel choices, you can master this and avoid the struggle
  - Use Pine Needles
    - Shavings, pellets, burlap, are alternative choices, but pine needles as smoker fuel are abundant and one of the easier fuels to use in a smoker

Getting Setup

- **Things you will need**
  - Some Paper
  - Pine Needles
  - Hive Tool
  - A Smoker

Working with a Smoker

Smoker Basics

- You fill the smoker with fuel (pine needles are popular)
- You start a fire in the bottom with a piece of paper
- Then you put some pine needles (say a half cup) in and get them burning
  - Puff and see fire come from the top
- When you see fire at the opening, you add another installment (1/2 cup) and get that burning
  - Puff and see fire from the top
- One more time – 1/2 cup of pine needles – push it in with hive tool
  - Puff and see flames, and yellowish smoke…

Finish filling the Smoker

- **Add more fuel, and close**
  - After stoking it, add more (1 cup) and push it down with your hive tool
    - Puff and see yellowish smoke
  - Give some puffs and get it burning underneath, with a lot of smoke coming out of the top
  - Add another cup of needles and push it in/pack it down with your hive tool
    - Puff, no flames, only cool gray smoke
  - Close the lid and give the smoker a few puffs. It should emit cool light colored smoke for at least one hour for you

Smoker do's and don'ts

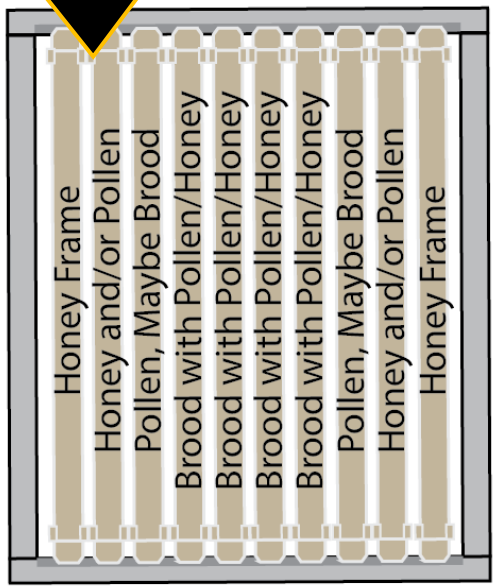
- **Pack it full of fuel**
  - Most beginners use just a little installment of needles
    - You want it to be solidly packed full of pine needles
- **Be mindful of smoker placement**
  - Do not let it come into contact with your bee suit
    - Easy to loose track and burn your suit, melt the exterior, burn holes in your veil
  - Do not lose track of where you set it down
    - Easy to set brush on fire or burn things it leans against
    - Use extra care when transporting a smoker in your vehicle

Proper Hive Tool Use – and Hive Entry

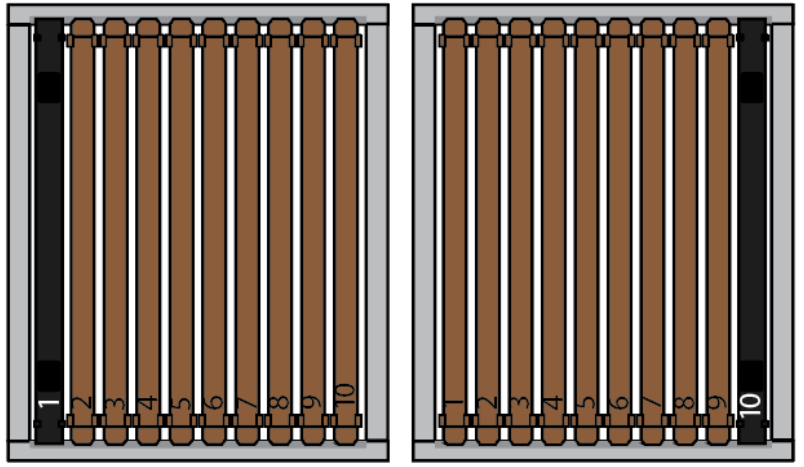
- **Where you enter the hive matters**
  - You want to extract the first frames where it least likely that you will harm the queen – and/or harm bees
    - Enter the hives on the areas away from the brood nest
    - Make a space (GAP) and then extract. Do this in conjunction with a quiet box or frame hanger
- **Using the tool properly**
  - The following is a visual guide of how to use a hive tool to gain entry

A quiet box is a small hive (typically a nuc) set to the side. Frames are placed within for holding during inspection

There are fewer bees
On the outside frames



Left-Side vs. Right-Side Bias



- **Working Hive Preferences**
  - Standing back left is typical
    - How one works a hive is personal preference.
      - Theory (and Observation) – Right-handed dominant people like to work things off to their right.
        - Work should be positioned on the dominant side
        - You might have put your feeder in position 1 so you can work with it close to you – or maybe you did not give it a second thought.
    - The instructions in this lesson consider the bias
      - Illustrations assume you are working back left. Just switch it if you do it differently

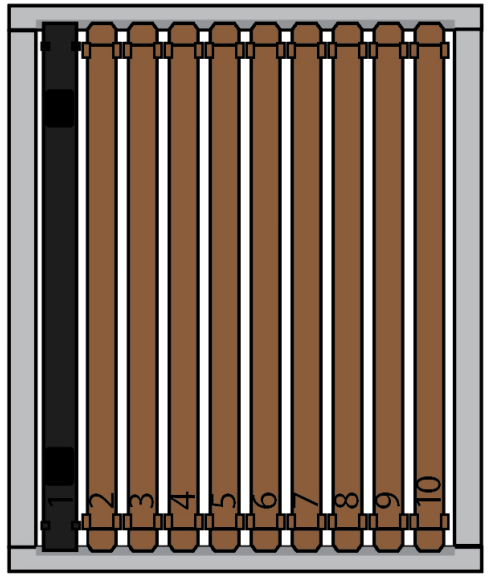
Research shows that eye dominance and dominant hand preference are associated, though not directly related.

Someone who is right-handed is more likely to be right-eye dominant,

Of course It is possible to be right-handed and left-eye dominant as eye dominance can vary from person to person

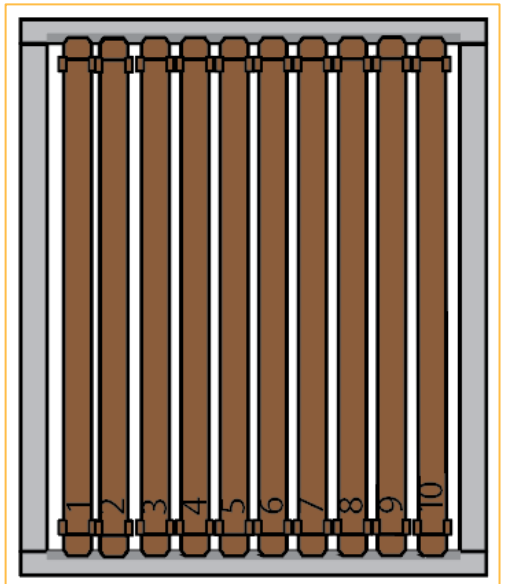
Quick Aside

- **Frame Setup**
  - Initially we recommend having a feeder
    - The illustrations have a feeder in slot 1 or 10…
  - Eventually, you will remove the internal feeder and host 10 frames in the hive.
    - This lesson advances the hive layout to the 10-Frame State
      - This will become the conventional layout in time



Back of the hive

Becomes This



Back of the hive

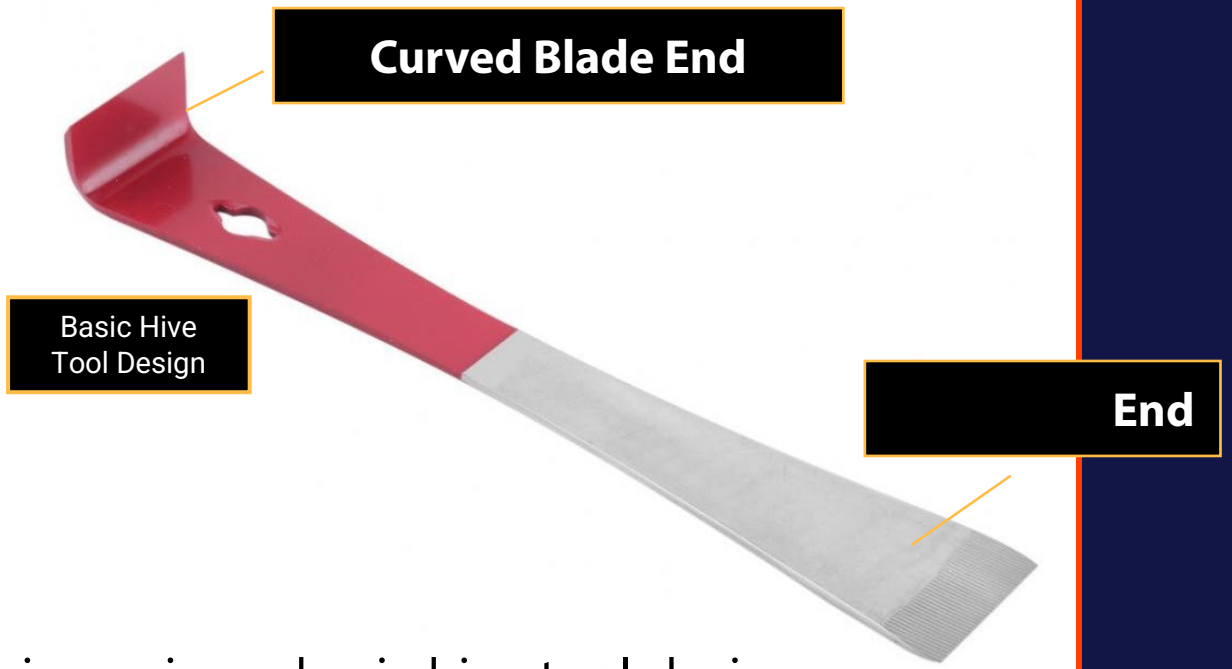
Entry to the Boxes

- **Smoke the entrance, 5 count….**
- **Remove Roof**
  - Lift front away and smoke the underside
- **Remove the Inner Cover**
  - Smoke hole, then remove Inner cover
    - The bees may propolize the inner cover.
      - In time you will likely also need to insert the flat blade between the inner cover and top edges of the box to free it from propolis seals.
    - Gently pry it up with your hive tool, it will yield

When the bees propolize the inner cover, take the flat blade end and scrape the propolis off

Also do the the top edges of the inner cover where it would make contact with the roof.

Hive Tool Assumption

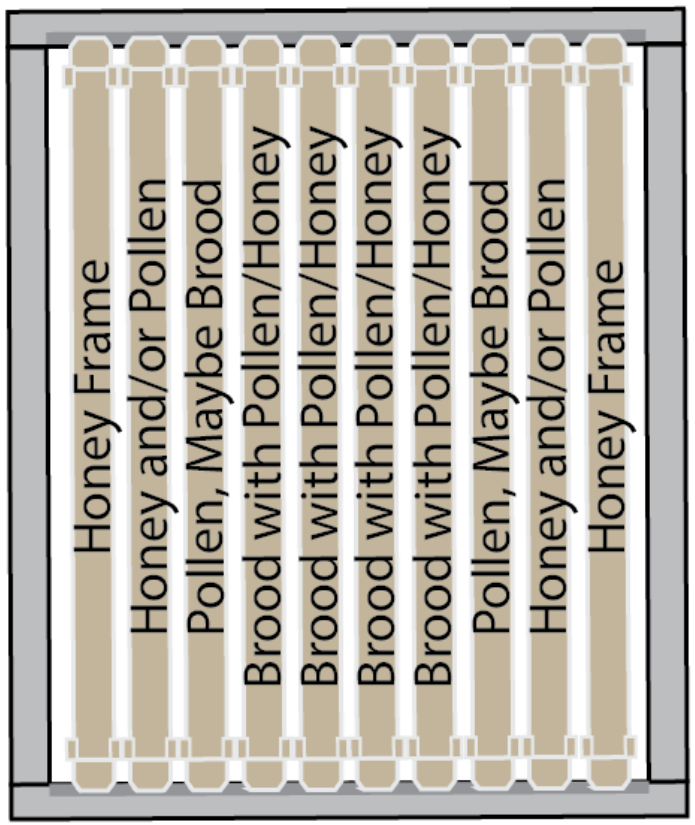


- **Hive Tools**
  - This is common hive tool
    - It is a good idea to start beekeeping using a basic hive tool design
    - In Beekeeping there are dozens of hive tool designs…
      - It is not possible for us to go down the path of providing instructions for alternative styles. There are a multiple variations of a J-Hook style tool as an example.
    - If you are using something else, you will have to adapt to these instructions.

Where to make entry

Left Side…

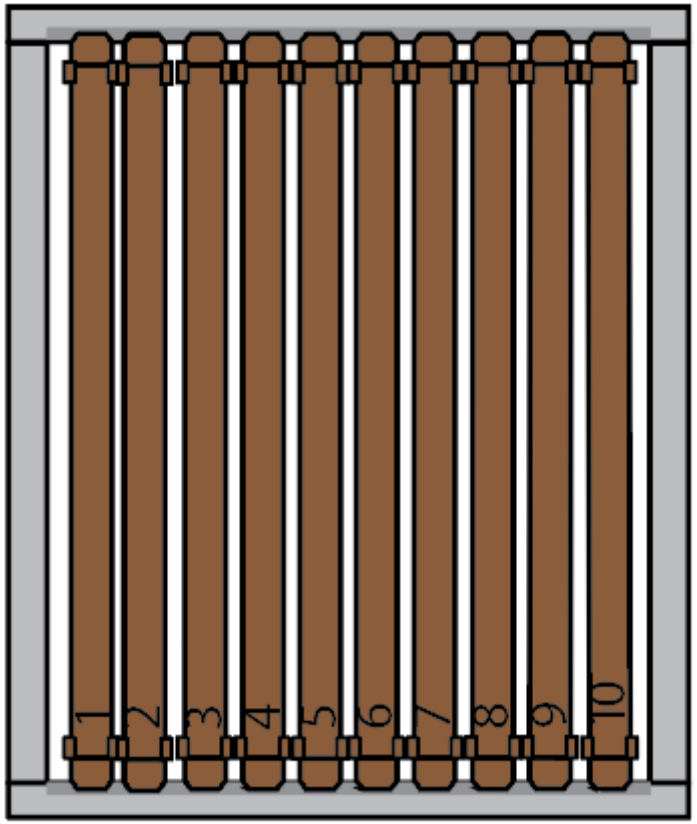
- **Pull Frame 2 – Less bees**
  - We are going to pull frame #2 First
  - We separate that from its neighbors
  - We start here because there are less bees on the outside frames (away from the nest)



Where to make entry

Left Side…

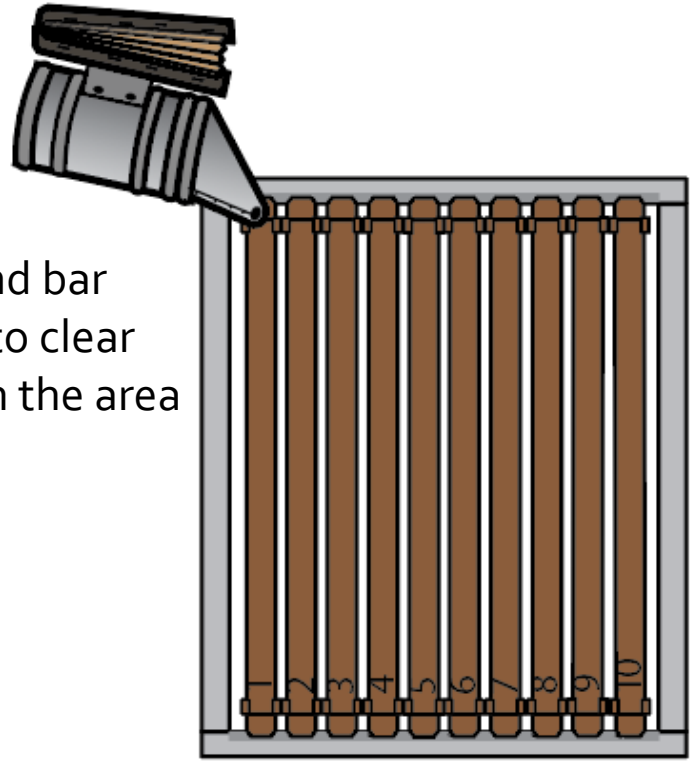
- **Standing at the back of the hive**
  - We separate Frame #2 from its neighbors
  - Pull it, and put it in a safe place
  - Proceed to inspect frames by pulling them into the gap created
  - We will use the smoker first, then use the hive tool to make entry



Back of the hive

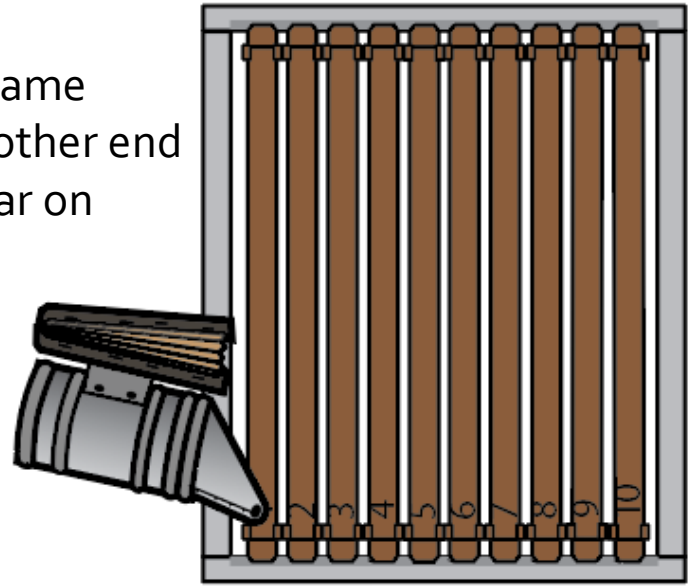
Clearing the Bees

Smoke the end bar of Frame #2 to clear the bees from the area



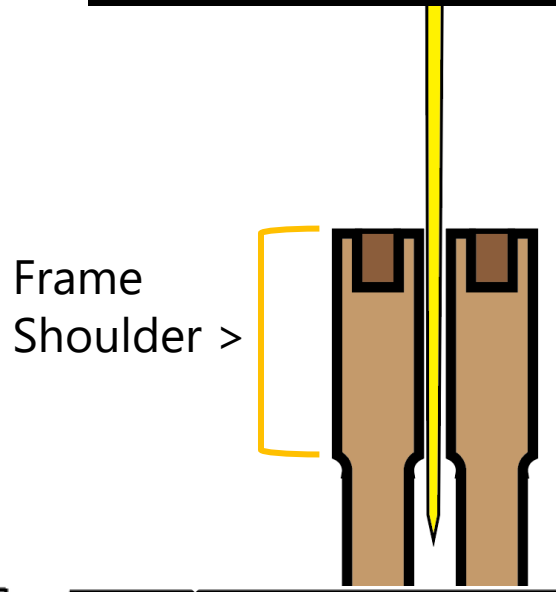
Back of the hive

Smoke the same area on the other end of the end bar on Frame #2

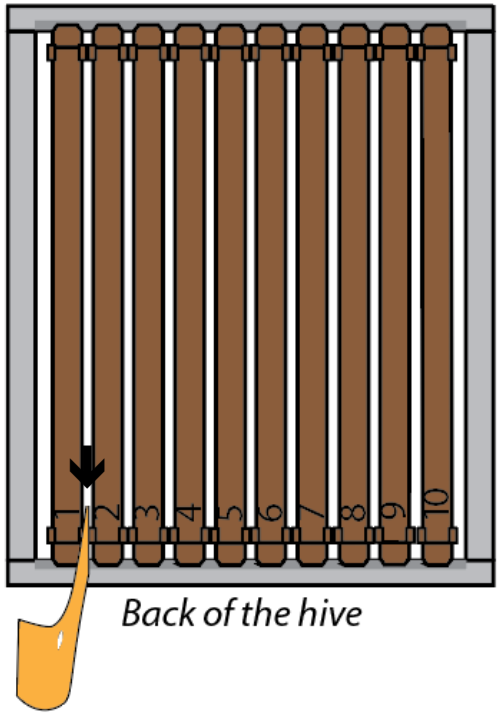


Back of the hive

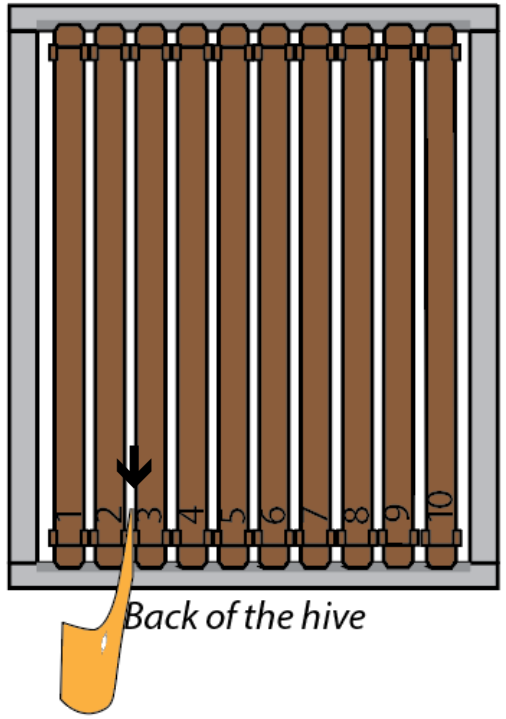
Use your hive tool to separate the shoulders



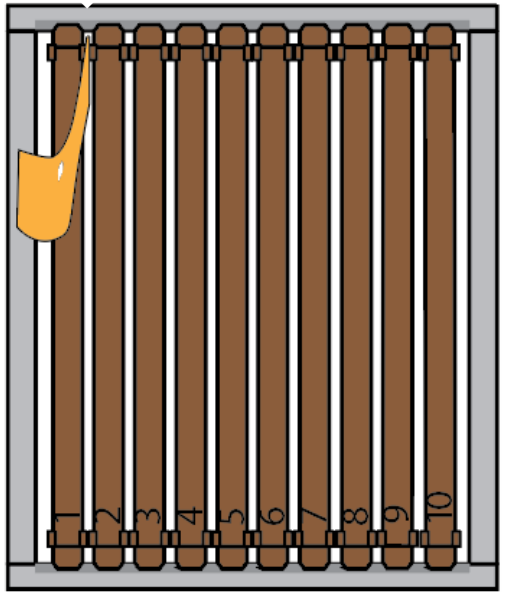
Insert the hive tool blade between the shoulders

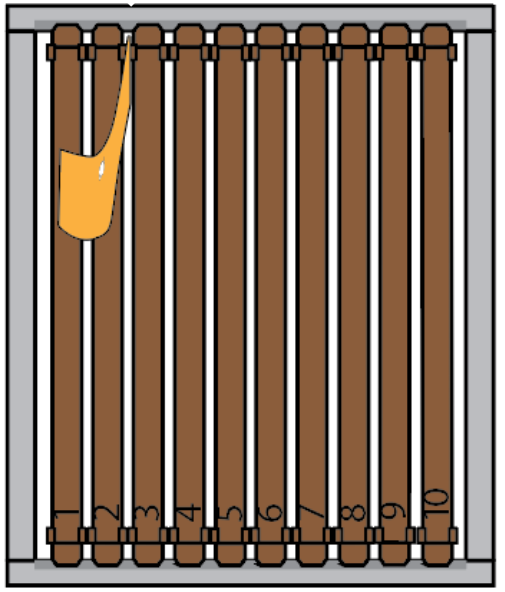


One side, then the other

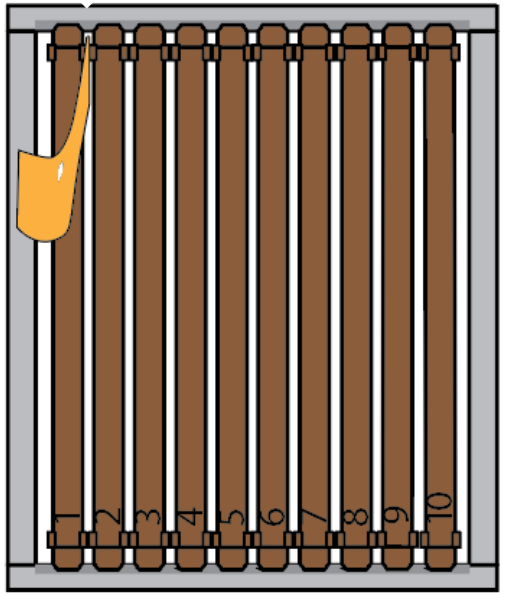


Repeat the process on the other side

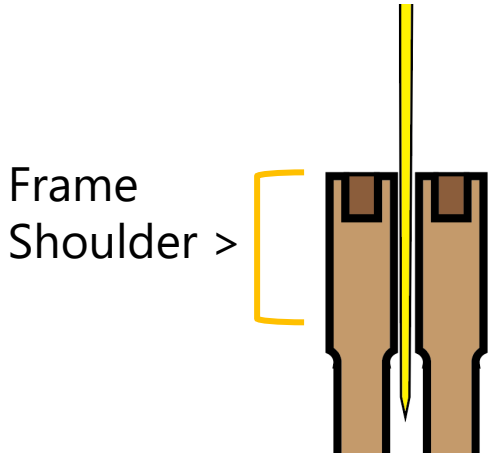




Not common on new hives
Verry common on established hives

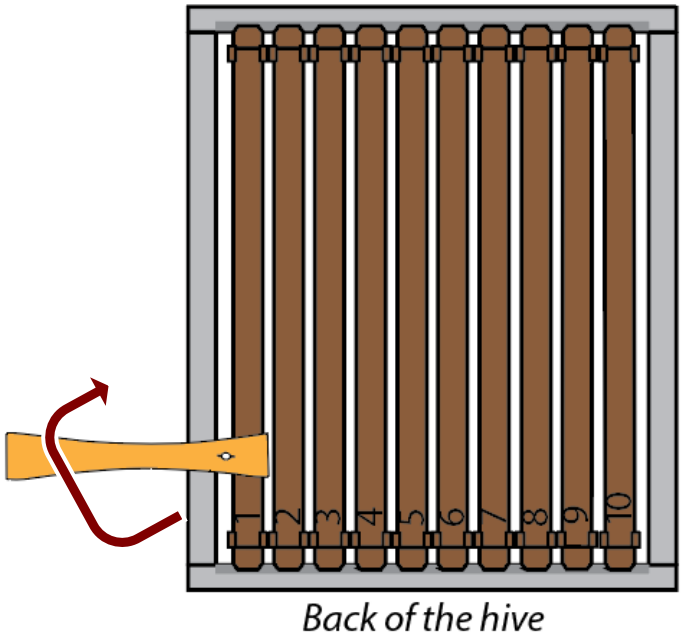


Back of the hive

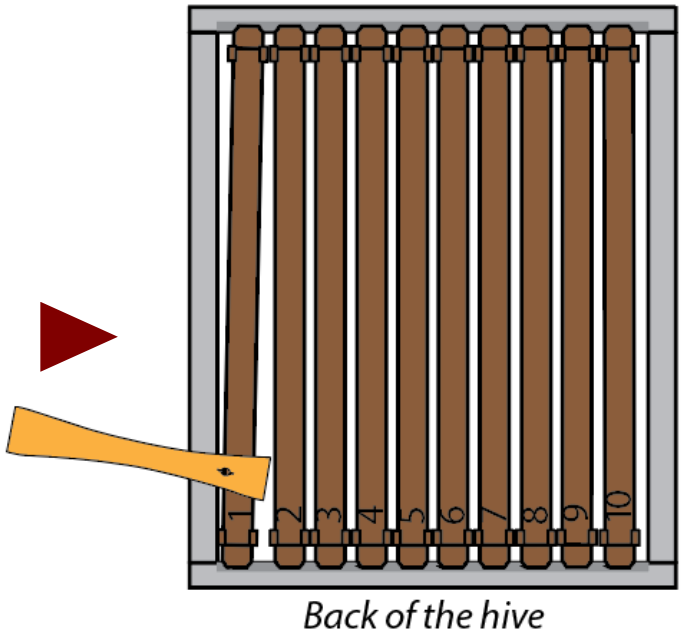


- **New Hive vs. Established Hives**
  - Inserting the blade in a new hive is probably not needed initially
    - In newly established colonies the bees will not have enough time to propolize the shoulders together
  - Very likely on established hives
    - You should anticipate that the longer the hive is in service, the more likely this will be needed.
      - Most times you can use the blade to pull the frame into the gap.
      - However, with some hives, you may have to slice the shoulders frame after frame, after frame.

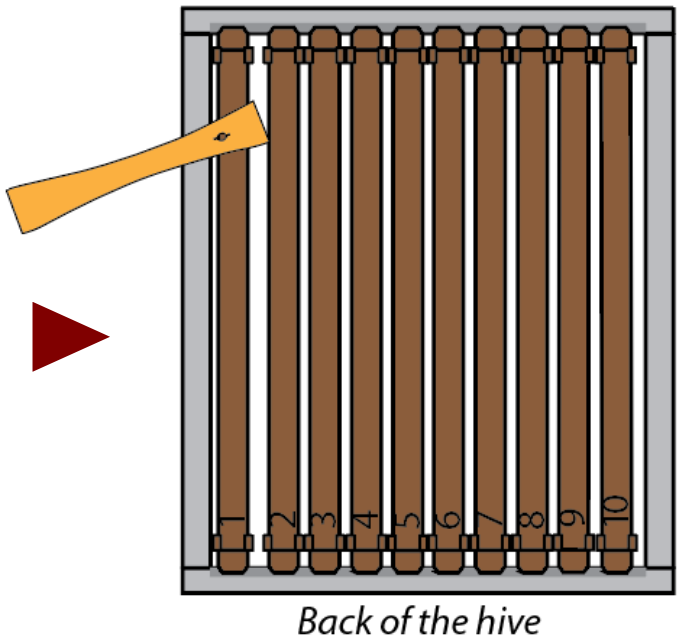
Pull #1 away from Frame #2, using a twisting hive tool motion: blade down



Rotate the hive tool and use the curved blade to separate the frames

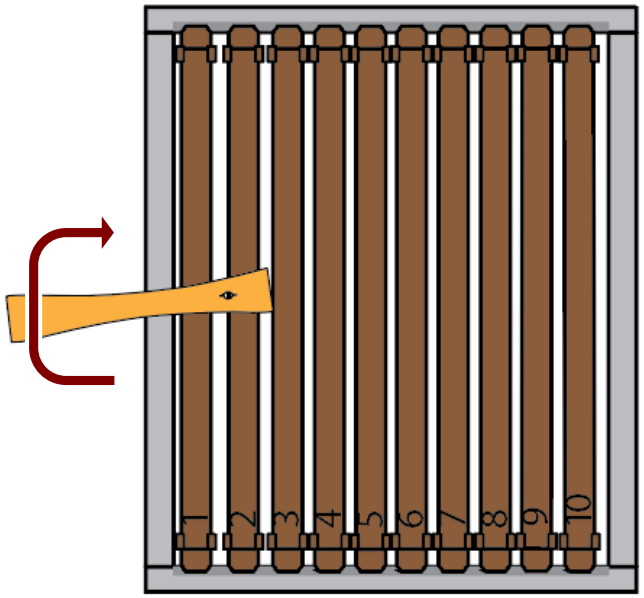


Separate #1 from #2, make space

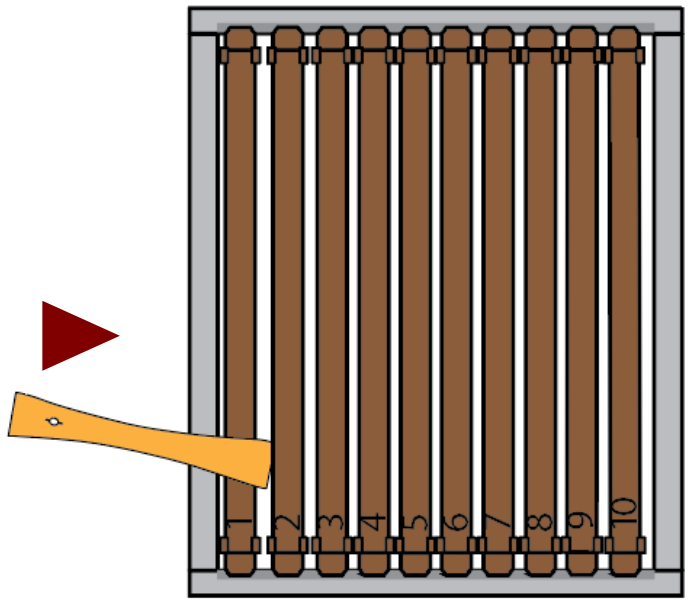


Pull #1 against the wall and away from #2

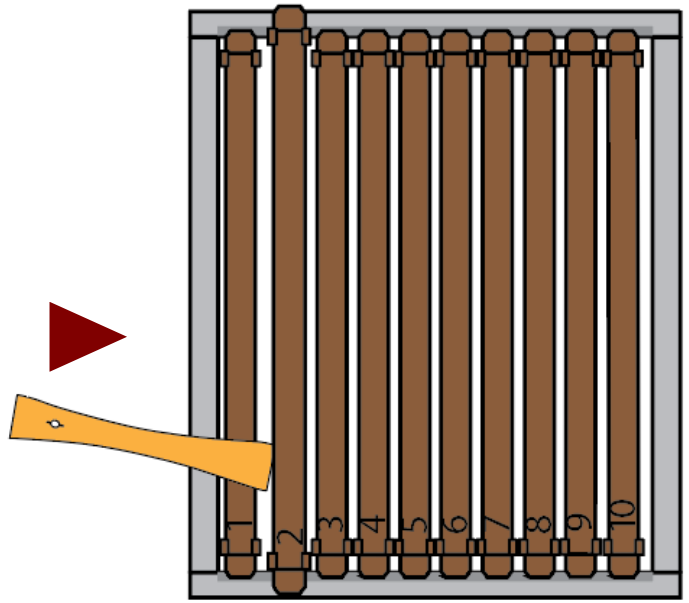
Pull #1 away from Frame #2, using a twisting hive tool motion: blade down



Rotate the hive tool and use the blade to separate the frames



Use the blade end, placed over #1 to pry the top bar up



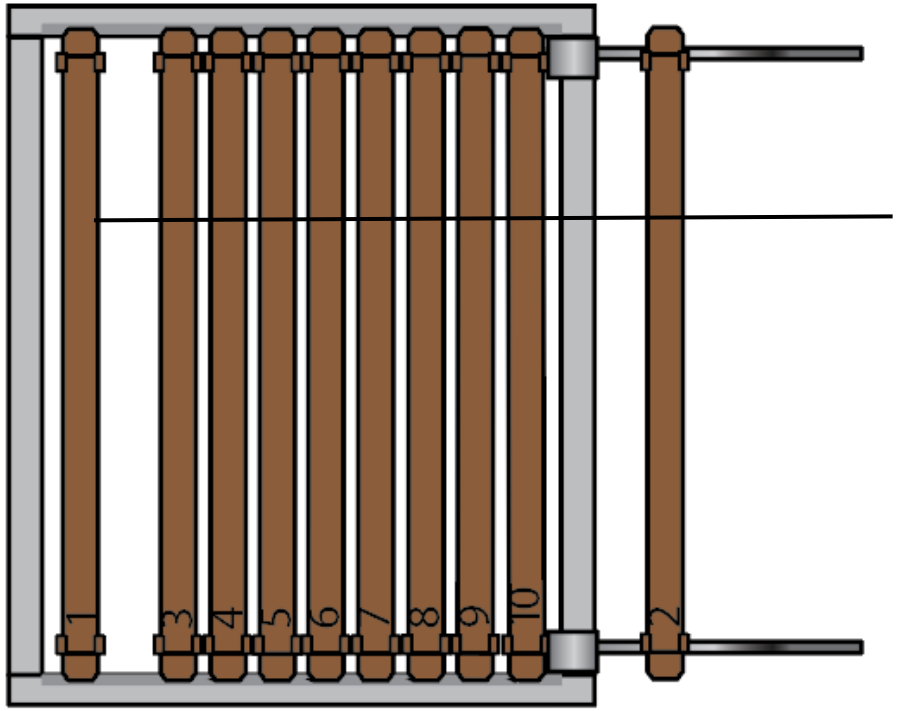
Pull #2 out of the hive

Inspect and Place #2 in the hanger
Inspect Frame #1, *or not…*

Place #2 in a frame hanger post inspection

Hang it slightly away From the side of the hive.

Avoid placing #2 right against the hive box, as the bees will walk to the side of the box



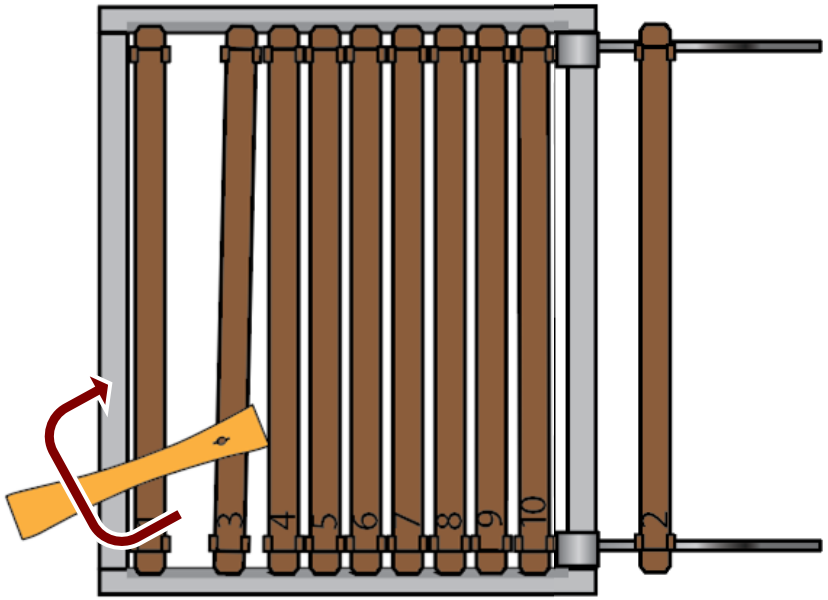
Back of the hive

If you want to inspect #1, do that now, before going to frame #3 (which is next)

When done….Place it back in the #1 spot when done

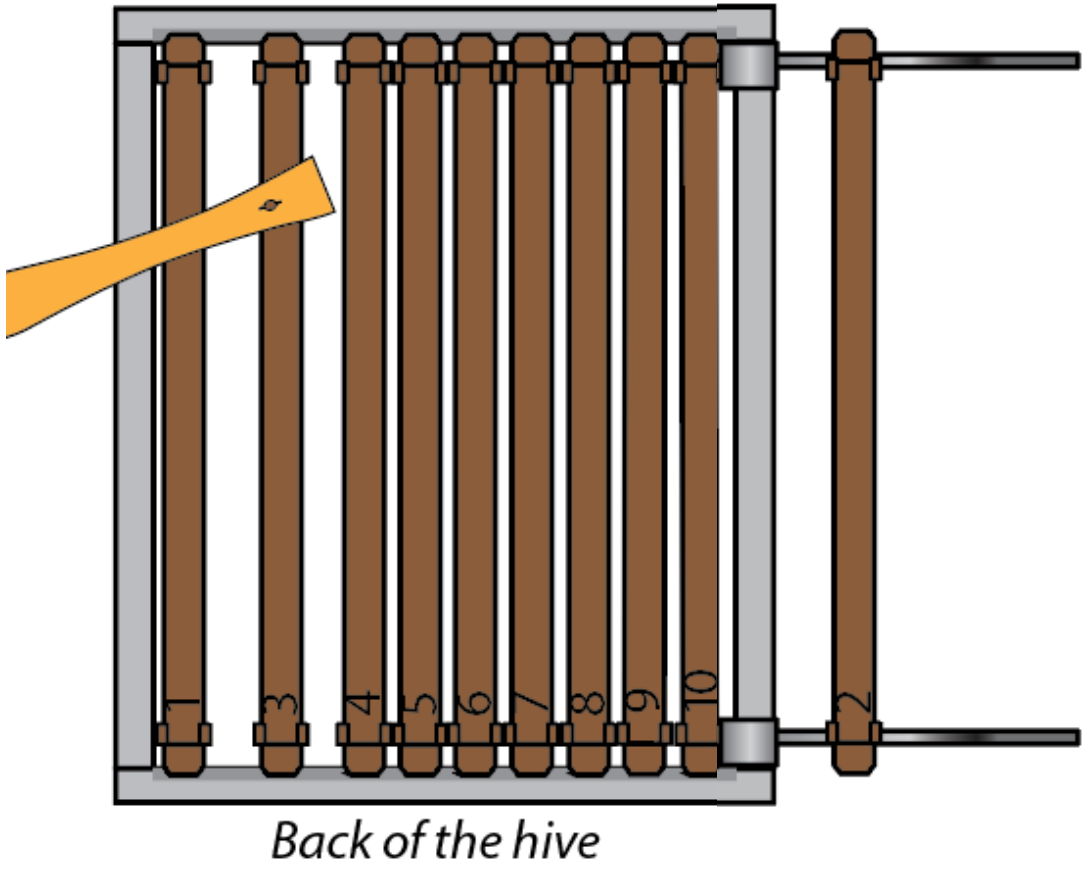
Inspect the extracted frame #2 ▶ Place #2 on your frame hanger ▶ Optionally check frame #1 if you need to see what it holds

Pull #3 into the gap so it can be extracted for inspection



Back of the hive

Twist the hive tool blade to pull #3 into the gap

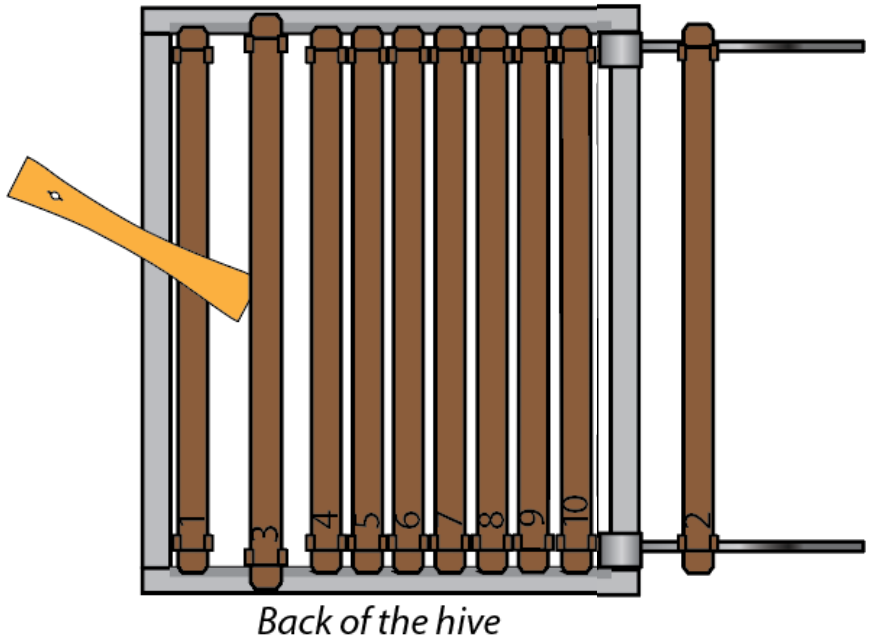


Back of the hive

Do the same for the other side

Pull #3 from the hive – inspect it…
Place it back in slot #2

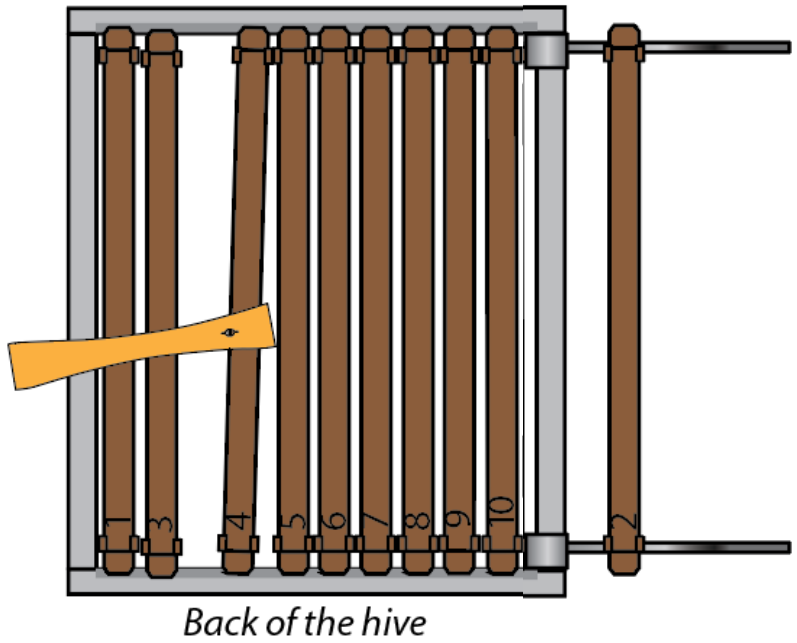
Always put frames back in the same orientation they came from the hive



Back of the hive

Use the blade end to pull #3 out and inspect.

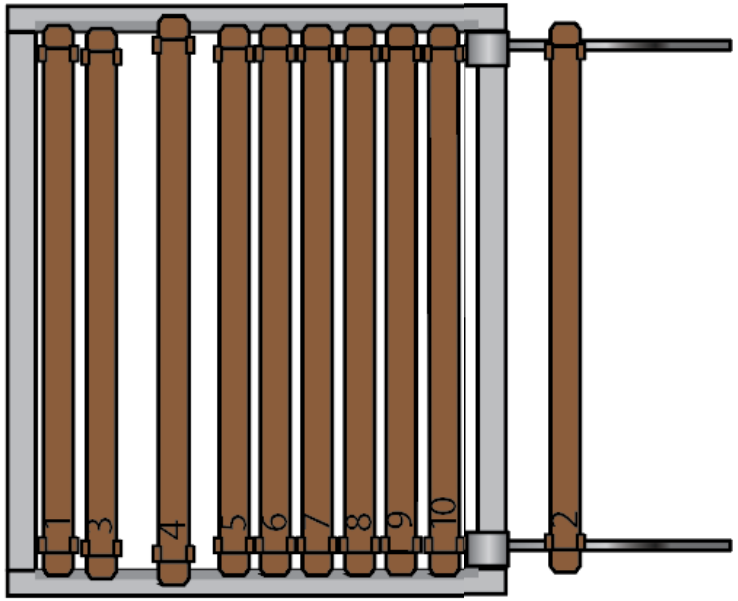
3 went back in the gap!



Back of the hive

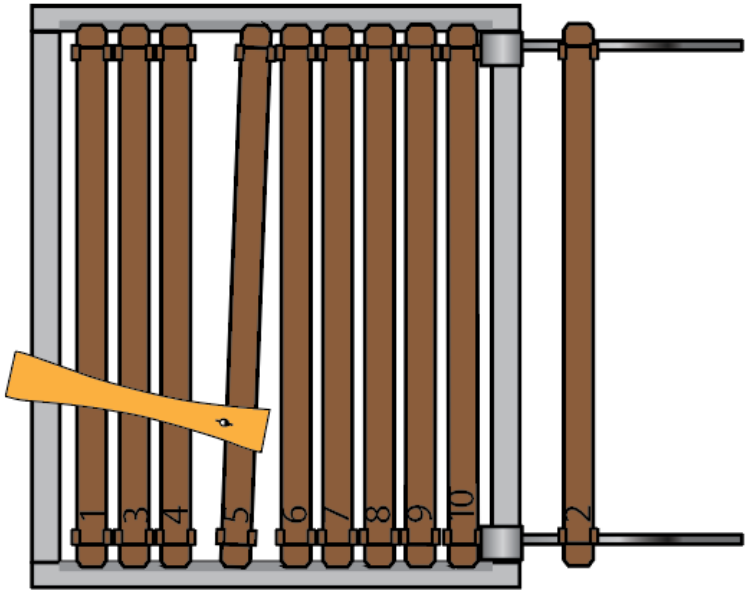
After inspection, #3 goes in the #2 slot.
…Pull #4 into the gap.

Repeat the process for #4 and #5



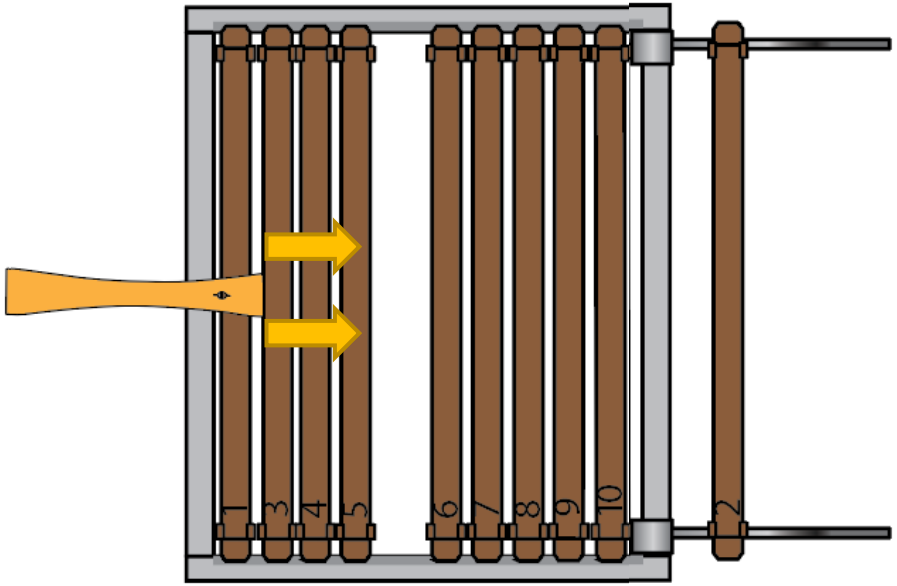
Back of the hive

Once in the gap, pull #4 and inspect

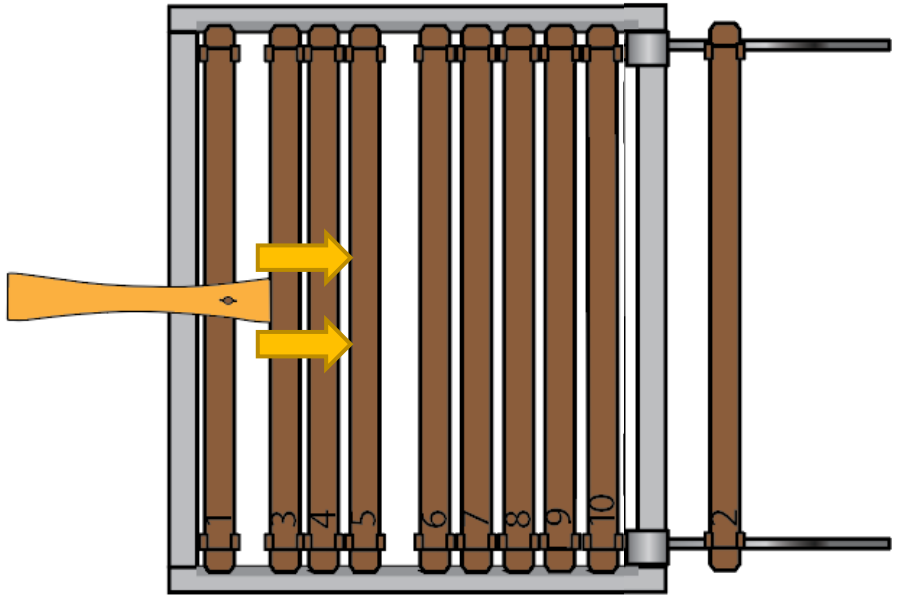


Back of the hive

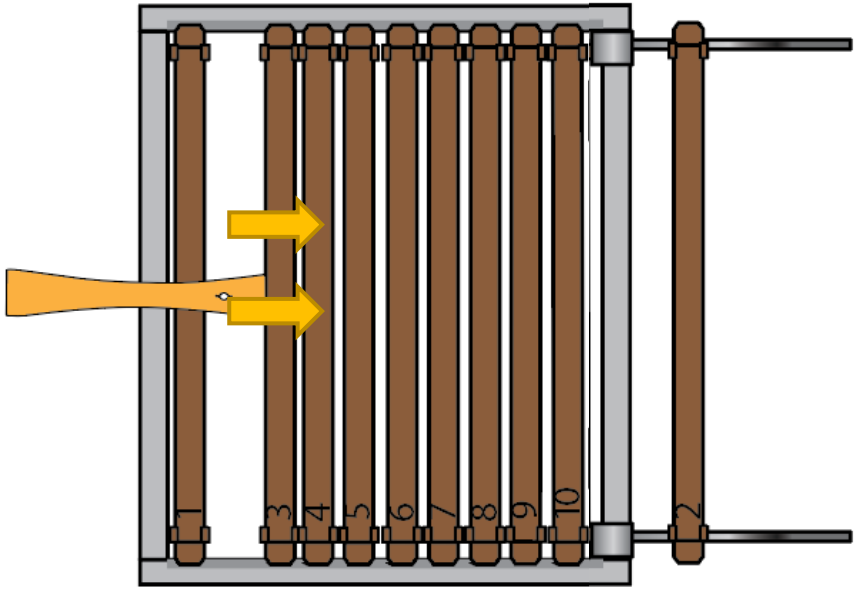
Put #4 back, Pull #5 into the gap and inspect. Continue until done.



Back of the hive

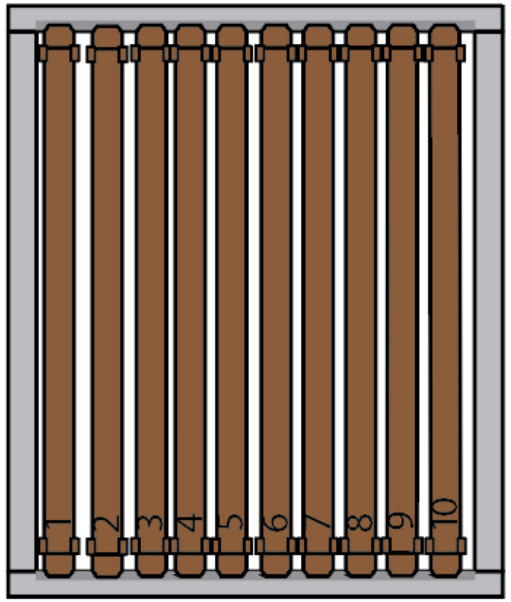


Back of the hive



Back of the hive

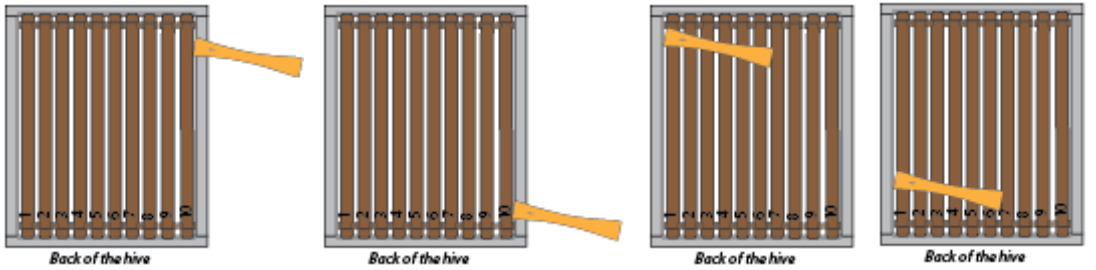
Mind the Gaps!

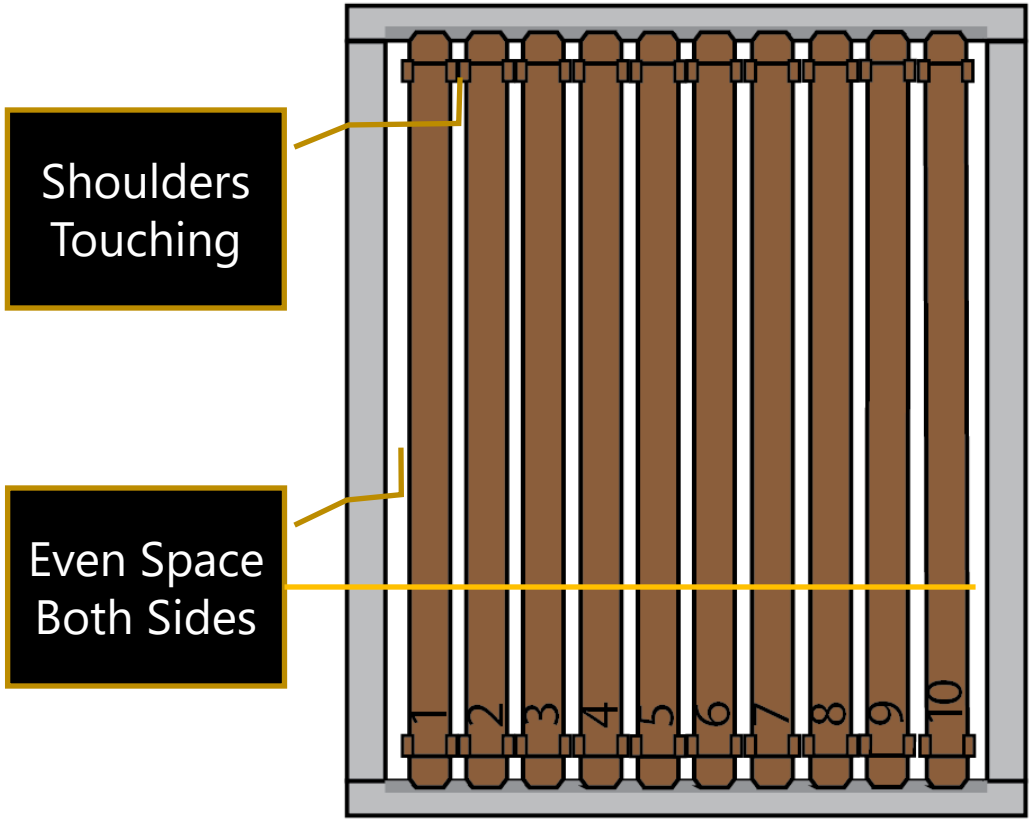


Back of the hive

All the frames are in the box. One more task to do.

Nestle the frames together and center in the box



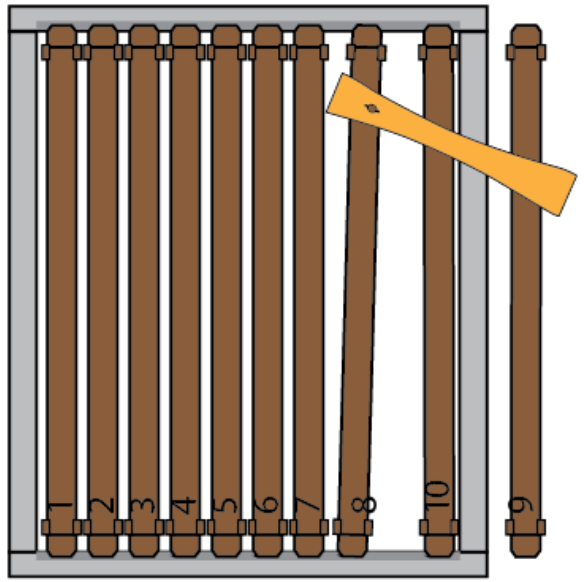


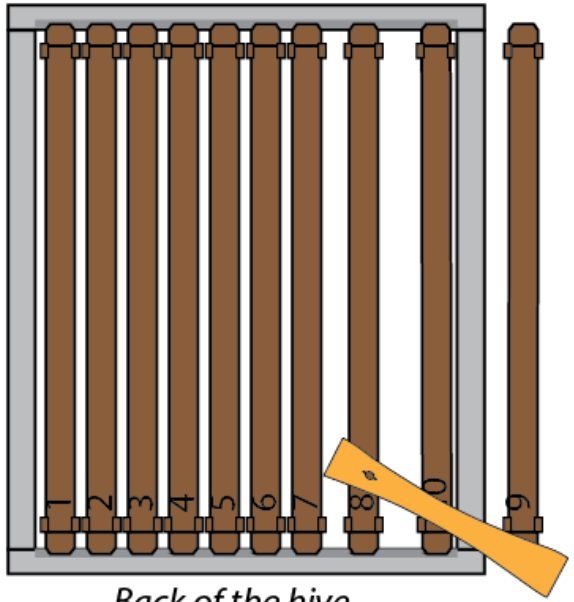
Back of the hive

If you work the hive from the other side

Simply reverse the order

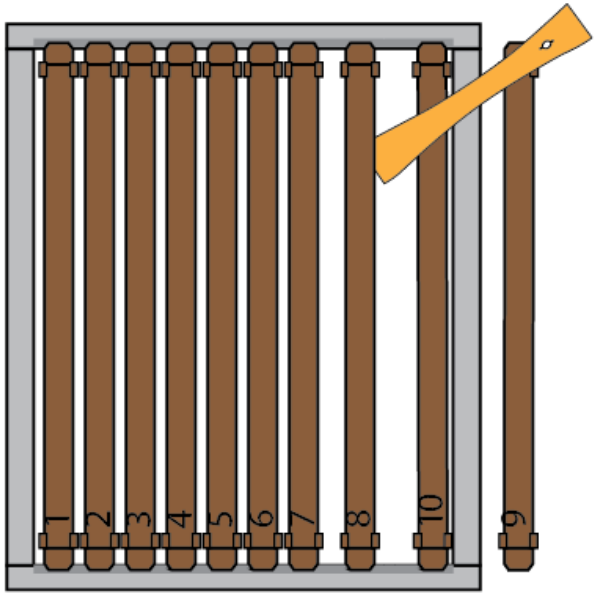
Separate 8 from 7, move into the gap



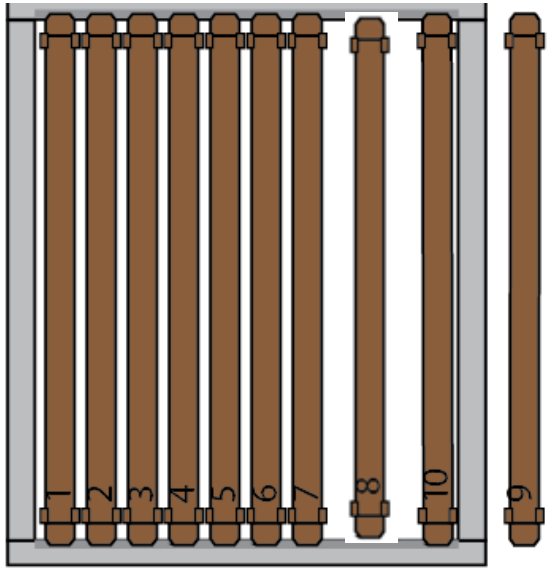


Back of the hive

Once Free, pull 8 and inspect, when done, put back in the hive



Back of the hive



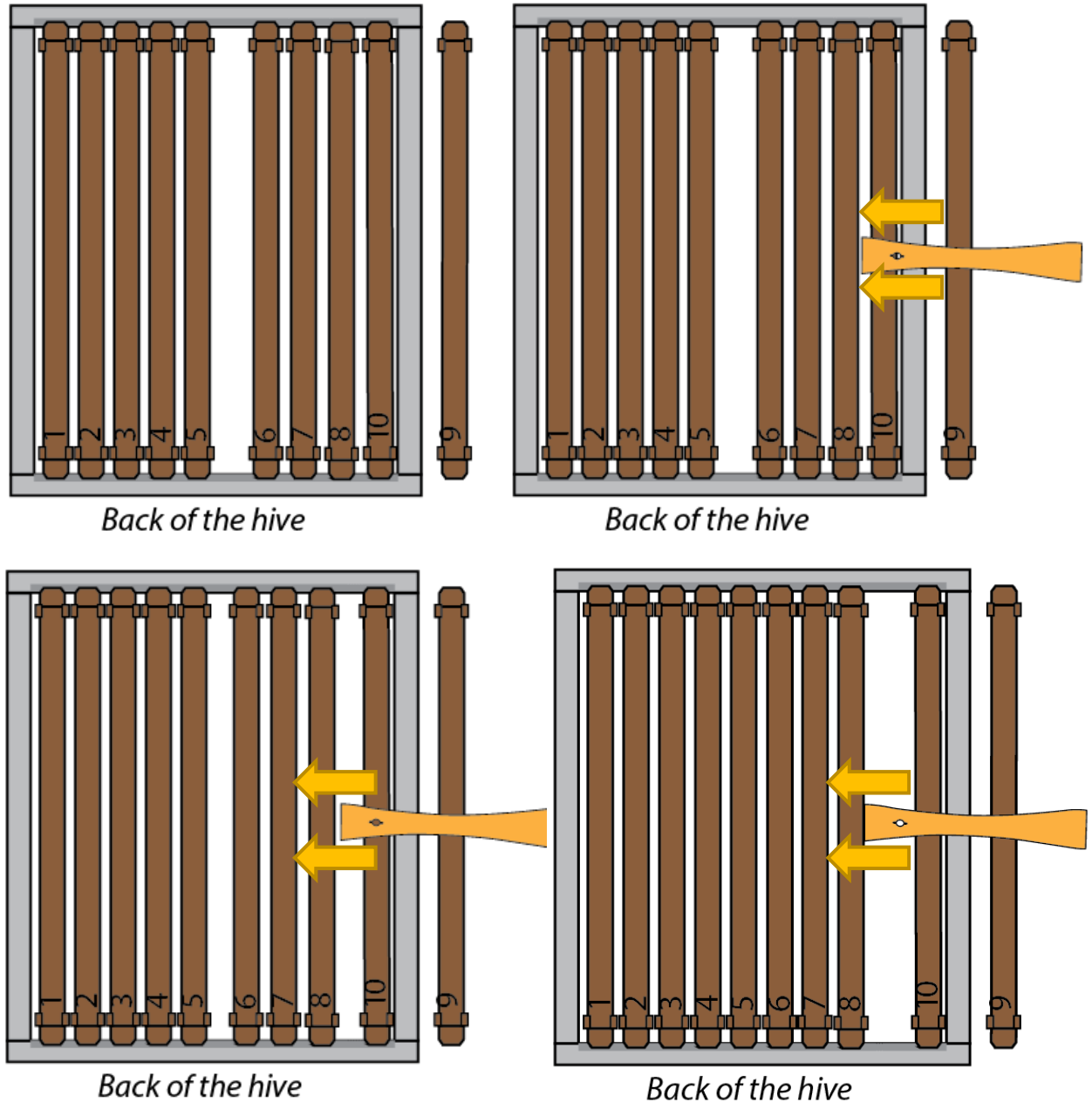
Back of the hive

Returning Frames to their original position

Put 6 and keep going until done.

When done, use your hive tool to push the frames back into position

You can save time by pushing multiple at a time as depicted.



Q&A

- Questions

BABA Beekeeping School

Week Five Setup

What is Covered in this Lesson

- Week 4 Recap
- Announcements
- Agenda

Welcome to Week 5

- **Week Five**
  - Week Four Recap
    - Regulations for Boston and Mass.
    - “Bee-ing” a Good Neighbor
    - Package Installations
    - Nuc Installations
    - Inspections
  - The focus was on knowing regs and being a good neighbor. We covered installations as well as inspections of the hive for the first time

Presentation Materials

- **Presentation Materials Available**
  - Presentations can be accessed at this link https://managedmentoring.com/baba-bee-school

This weeks Agenda

- **Varroa Mites & Small Hive Beetles**
  - This week we focus continue with hive inspections
  - Then we dig into **harm caused to colonies by varroa mites**
  - We overview **monitoring for mites**
  - An overview **mite treatment options and techniques**

Q&A

- Questions

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Varroa Mites and Beekeeping

Lesson | Varroa Mites

38

What is Covered in this Lesson

- Introduction to Varroa Mites
- Mite Population Dynamic
- Mite Population Impacts
- Supreme Colonies
- The Perfect Storm

Impact to the Population

- **Wounds and Viruses to Adults and Developing Bees**
  - Adult Bees –Mite injuring developing bees
    - The nurse or drone bee host is wounded from the physical bite of the mite
    - In the process they can be inflicted with viruses through the wound site
      - Mites will often be found on adult drone bees,
      - They will switch to workers in abundance when drones are no longer produced.
  - Larva
    - Mites also enter cells with developing bees
    - They prefer developing drones, but will also enter and injure developing workers

Managing Varroa – Mite Dynamics

- **Varroa Mites are always there**
  - They feed off the fat body and hemolymph (blood fluid)
    - Researchers indicate that the mites are converting the egg yolk pre-cursor to make their egg – they do not produce this and it is necessary for reproduction
- **5th Stage of Development**
  - Varroa mite generally enter the cell and hide in the brood food during the 5th stage of larval development (just before capping)

Larval Choice

Varroa Mites Prefer Drones

- Varroa mites will favor development in developing drone larva
  - Biologically they are attracted to developing drones
  - This is bad for us as drones have a longer gestation period and therefore varroa mites have more time to generate additional offspring
  - It is not out of the realm of possibility that they can enter developing queen cells also
- You can often see varroa in capped drone larva
  - Peel back the capping and if a colony is infested, you will see varroa


Introduction to Varroa Mites

Samuel Ramsey Work

RESEARCH ARTICLE | BIOLOGICAL SCIENCES |

Varroa destructor feeds primarily on honey bee fat body tissue and not hemolymph

Samuel D. Ramsey, Ronald Ochoa, Gary Bauchan, +8, and Dennis vanEngelsdorp Authors Info & Affiliations

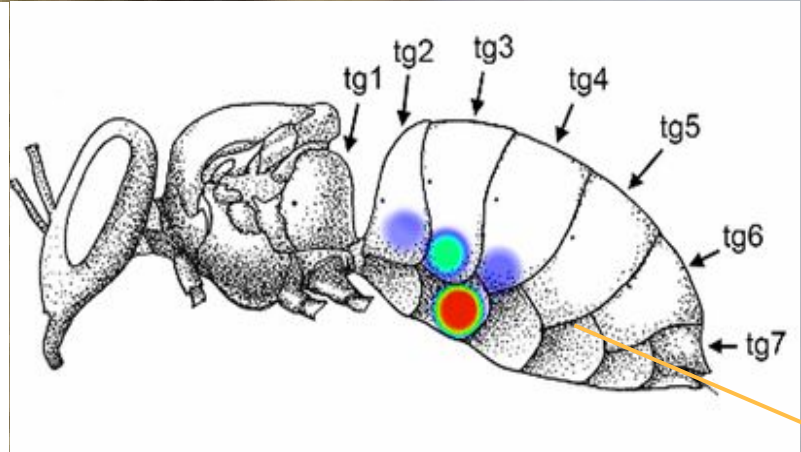
Edited by Gene E. Robinson, University of Illinois at Urbana–Champaign, Urbana, IL, and approved December 6, 2018 (received for review October 26, 2018)

January 15, 2019 | 116 (5) 1792-1801 | https://doi.org/10.1073/pnas.1818371116

- *This work debunked the myth that mites feed on hemolymph*
- *It also helps us to understand how the mites behave*

- *Varroa mites will slot under the Tergites and Sternites*
- *They are feeding on the vitellogenin fat body tissue of the abdomen*

  Mites are obtaining necessary egg-yolk pre-cursor protein/lipids need to build eggs for mite offspring



Placement makes it hard for the bees to dislodge via grooming

Image credit: Honey Dr. M. Goodwin

Exoskeleton

- The upper plates of the thorax are tergites
- The lower plates are sternites.

You will not see this.

It is atypical for mites to be visible on the bees

Mite Development

- **Females Mites Generate Offspring**
  - Female mites will lay eggs, and mate, with the eggs during the bee's larval development
    - Given drones take longer to gestate, the mites can make more offspring because the developing mite have more time to grow to a viable adult
  - The ratio of mites to bee larva is in favor of the mites
    - Stated another way, because mites create multiple mites in contrast to the honeybees, their population will over a period overwhelm the colony

Mite Population Dynamics

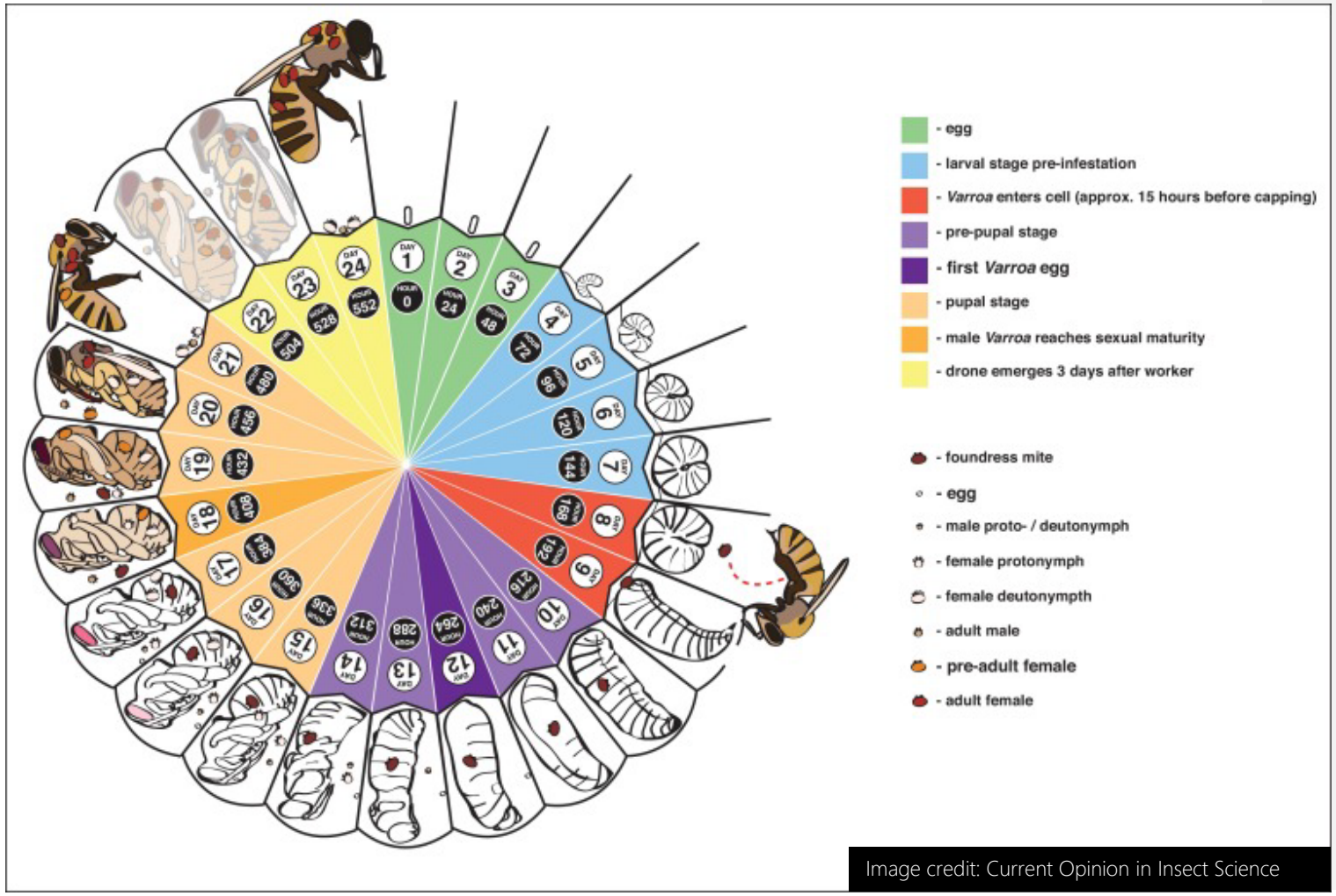


Image credit: Current Opinion in Insect Science

- The Varroa reproduction rate for mites in the cell is a ratio of **1.3 to 2.6 females per every bee that emerges.**
- In time, this population dynamic will build enough mites to out pace the population.
- Especially as the bees slow down when the nectar flow declines.

Representative Example

- **Zac Lamas Data**
  - Researcher Zac Lamas is at the forefront of this research
  - His work is showing that early in the season the varroa mites are often on the drones (male bees)

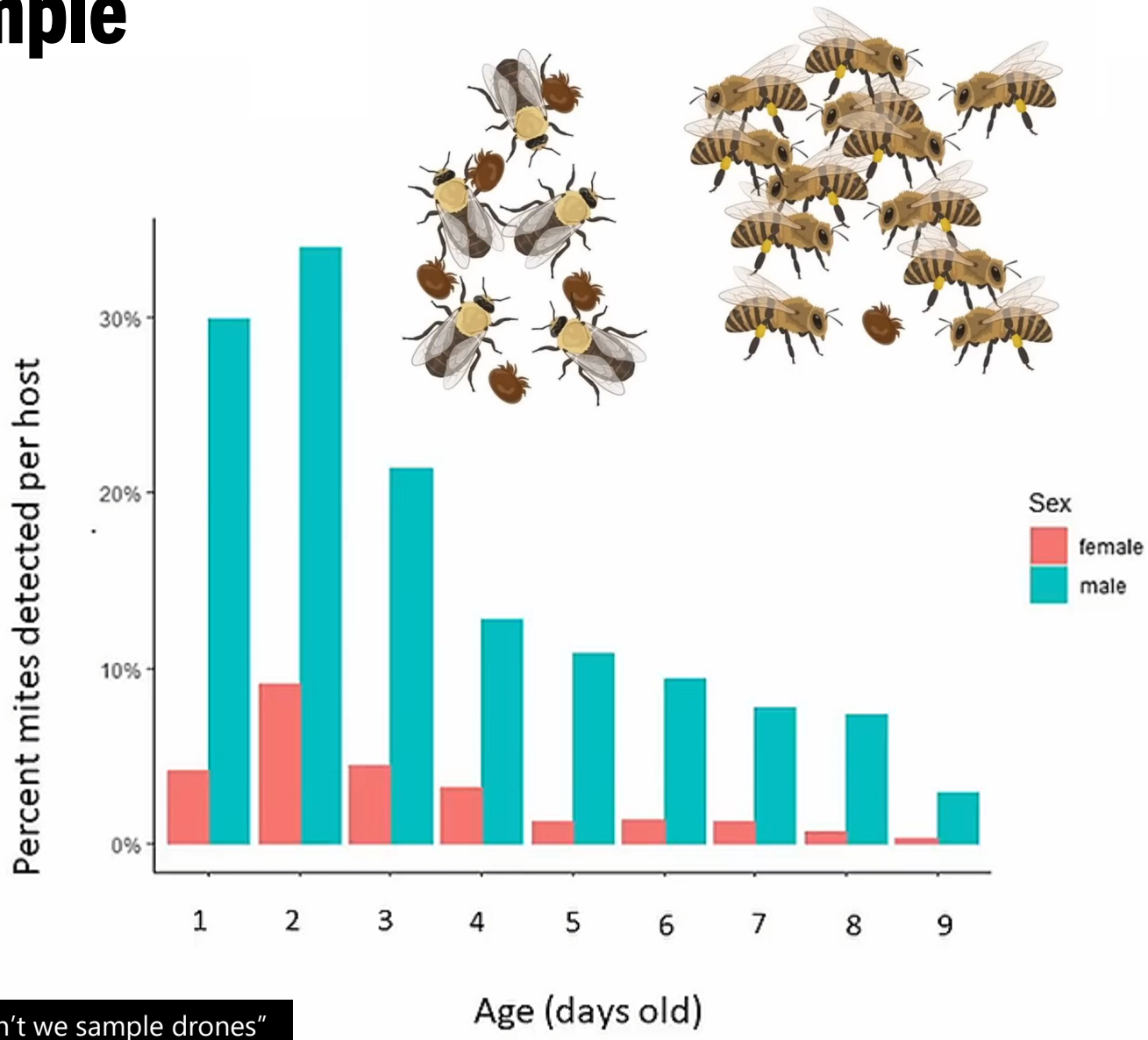
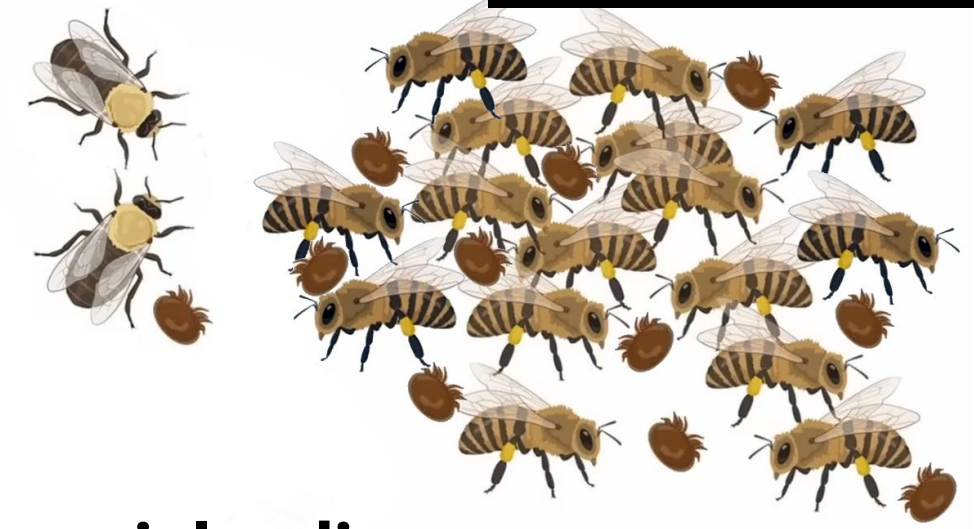


Image Credit: Dr. Zac Lamas – SGMI MEDIA "Why don't we sample drones"

When Drones Disappear



- **Early Season Mite Samples are misleading**
  - When mites are with drones, it is not going to show up in sampling
    - When you sample for varroa mites, traditionally you sample for varroa mites using worker brood frames for sampling
    - Since the mites are in developing drone brood, and on drones, mite sampling is masking the true mite population in the hive
  - When the season changes, and drones are no longer there…
    - You will see a spike in varroa mites in the sampling because they are now with the workers

For the Long Run

- **Colonies that are infested will implode**
  - If mites, not found through typical sampling, jump to workers when drones taper off, the impact to the hive population will be severe
- **Timing**
  - Cessation of Drones corresponds with the window of bees building winter bees. **So Net Net – If you treat late, your hives die.**

Virus Transmission

Definition

Trophallaxis: the transfer of food or other fluids among members of a community through mouth-to-mouth

- **Vectored by Mites**
  - When the mite wounds the bees, it transmits viruses to the bees during its feeding
- **Virus Transmission through Contact**
  - Bees will remove infected developing bees.
    - Virus transmissions can be transmitted through the contact and passed on to the workers coming into contact to clean up the detected / damaged larva
      - In certain periods of need, bees will cannibalize the larva which also plays a role in transmission throughout the colony. One pathway is via worker trophallaxis.

A word on Viruses

- **The list is long**
  - Of the 18 known honeybee viruses, six are of primary concern:
    - Deformed Wing Virus (DWV)
      - the most frequently observed of these viruses
    - Black queen cell virus (BQCV)
    - Sac brood virus (SBV)
    - Kashmir bee virus (KBV)
    - Acute bee paralysis virus (ABPV)
    - Chronic bee paralysis virus (CBPV)

[1]Varroa mite Biology and Feeding Damage Virginia Tech Department of Entomology

Without Mite Management

- **Healthy colonies implode**
  - When the ratio goes out of balance, the colony cannot cope.
    - Colonies that are thriving often hit the wall in early summer if they are carrying a mite load.
    - More than anything, these colonies especially need to be monitored
  - When monitoring indicates – colonies must be treated early to prevent an overwhelming impact from Varroa Mites
    - This is the most important dynamic to understand today if you want any chance of succeeding as a beekeeper in these times

Supreme Colonies

- **Large Colonies are Mite Factories**
  - They have all the right elements
    - Large colonies produce more brood – and given the ratio, more mites
    - Large colonies have an abundance of drones
    - Large colonies bring in abundant resources; With abundant resources colonies can produce brood longer
      - The queen will keep working as long as indicators can sustain colony growth
  - Philosophically, we do not advocate for massive colonies
    - At a later stage in the lessons, we will explore this dynamic and have recommendations

Mite Populations

Mite populations correlate with the bee population

- **4 seasonal phases**
  - Dormant
  - Population Increase
  - Population Peak
  - Population Decrease
    - Return to Dormant

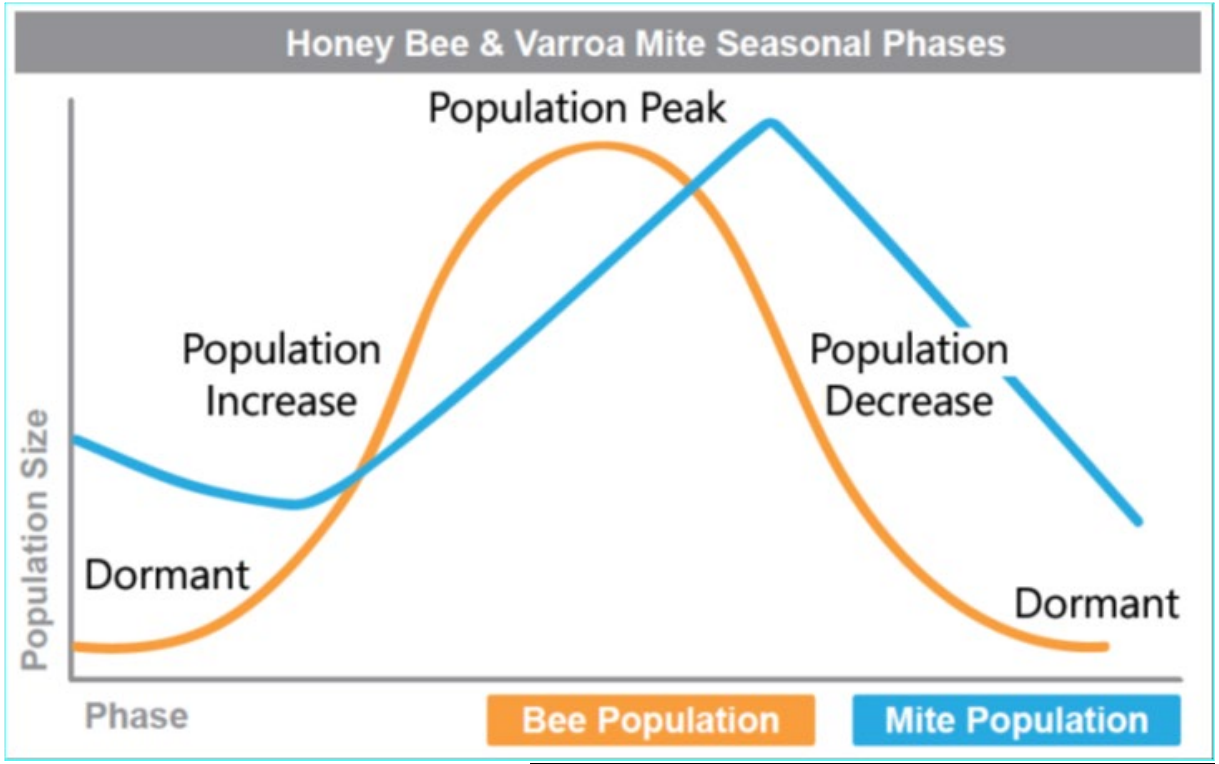


Image credit: Honey Bee Health Coalition Varroa Management Guide

Principle – Start Low

- **Starting with a low mite threshold**
  - Colonies that begin a season with a low mite threshold, can sustain health longer into the season
    - Incidentally, packages and Nucs fit this category (if sourced properly) and therefore mites have not been a concern up until this point
  - Starting with a low threshold allows you to keep mites at bay
    - One key principle is start low and keep the mites from overwhelming the colony at any point.
    - Healthier, well provisioned colonies are a path to overwintering

Treat in the Right Time Frame

- **Treat when Drones are tapering off**
  - You need to get the timing right
    - It is imperative to monitor and treat **early** to prevent impact
    - When drone production ramps down, you will see mite percentages in samples go up.
      - Some seasons do not have high mite populations – no rhyme or reason to this
      - Sometimes you sample (instructions provided in the next lesson) and percentages are low
      - Other times, you see the spike and you treat to get the mite population numbers down

Bee Population Dynamic (Refresh Cycle)

- **During Population Growth, Bees are Refreshed**
  - The lifespan of a worker is in high rotation when the colony is at peak production
    - Old bees are replaced at a fast rate and the replenishment of new healthy bees keeps thing chugging right along. It somewhat negates the impact of the mites
  - When the nectar flow slows down, the queen stops laying
    - Population of workers created tapers off and the bees in the hive are present for longer periods
    - Bees in play for longer periods have more susceptibility to varroa impacts.

Thwart the Perfect Storm

- **Late Spring, Early Summer**
  - The drones taper off, mites are at an all time high, and the queen is not refreshing the working population with as much fervor as earlier
- **Change the balance**
  - The longer this dynamic is allowed to persist, the more foothold the mites have in taking the upper hand
  - Monitor and treat early; June/ early July is customary If you wait until Aug/Sept to treat…. **The fight is all but over.**

Tropilaelaps Mites are on the Horizon

Varroa on the left, compared with Tropilaelaps on the right.

Photograph by Zachary Huang, www.beetography.com.

Q&A

- Questions

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Monitoring for Varroa Mites

Lesson | Mite Monitoring

What is Covered in this Lesson

- Presentation Overview
- Premise of Monitoring
- Mite Monitoring Methods
- Mite Sampling Process Introduction
- Mite Sampling Run Through
- Interpreting Thresholds in Context
- HBHC Varroa Mite Management Tool

Presentation Overview

- **Monitoring Background**
  - Why Monitor
    - We will start with the basics of monitoring – what are we looking to achieve
  - Monitoring Methods
    - We will cover various method and for reasons explained settle on the alcohol wash method for monitoring
  - How to perform an Alcohol Mite Wash
    - We will end with a step-by-step review of how to perform an alcohol wash
    - We will provide an invaluable resource at the end of the lesson

The Premise of Monitoring

- **Thresholds**
  - Mite monitoring is a proactive activity to forecast the percentage of mites in the colony population
    - Beekeepers monitor mites by collecting bees, and ‘washing’ them of any varroa mites that are attached to the bee.
    - Additionally, random sampling can be conducted by opening capped larva and inspecting the contents of the cell to get a sense of varroa presence
  - It is an **indicator process** and **not a foolproof way** to fully understand the quantity of mites present in the colony
    - But it is the best thing we have, and the standard of care in the industry

Exceeded Thresholds

- **Harm to the bees**
  - It is perceived that when a certain percentage of mites is realized, then harm will come to the health and longevity of the colony
    - Sampling is done based on **total mites found per 100 bees sampled**
    - The calculation represents **an estimate of the total mite population** in the hive
    - If the percentage goes above recommended threshold, then treatments are warranted
  - Sampling must be done at periodic intervals
    - The number one goal is to **never allow the percentage of varroa mites to reach a population that inflects damage on the health of the colony**

Did you Monitor?

- **This is a very important question**
  - Time after time, when beekeepers lose their colonies, the first question they are asked is **Did you Monitor?**
    …. and **what were your thresholds**?
- **Bees will most definitely perish from Varroa Mites**
  - If you are not monitoring…
    You will be quite compromised to know the health of the colony.
    - Bee sometimes starve overwinter – this is completely preventable

It might be a simplification to say, but it is quite true.

If your bees die overwintering, it is truly universal that it was from impacts of varroa mites.

Sick hives may not present as abnormal

Parasitic Mite Syndrome

How Many Mites?

- **Many methods have been devised**
  - Several mite monitoring methods have been devised
    - The evolution of mite monitoring methods have progressed over the years.
    - Sticky Boards (like on the right), and Sugar Shakes preceded alcohol washes

Image Credit: Bee-Health.Extension.org

The Wash Method

- **Sugar and Alcohol Washes were devised**
  - The ‘wash’ method of testing won out
    - Bees are sampled by volume (1/2 cup) and dumped into a container.
    - A substance (alcohol or sugar) is used to free any varroa mites that are present on the bees and dislodge them for counting.
  - How washes are conducted
    - Bees are placed in a container with the substrate (sugar or alcohol) and shaken to dislodge the mites for counting

1/2-cup is equivalent to 300 bees in a sample

Powdered Sugar vs. Alcohol

- **Powdered Sugar is inept for testing; it damages bees**
  - It is flawed and not effective
    - It results in bee mortality
      - New research shows that vigorous shaking damages bees and causes them to die post being placed back in with the colony bees
    - Sugar is not good at dislodging the mites
    - Hot weather and humidity cause inconsistent results when powdered sugar is moistened during these conditions

Alcohol Washes are the Standard

- **Alcohol Wash is Essential**
  - Alcohol Wash is superior
    - **Alcohol Wash Method** is the most effective means for dislodging the mites from the bees in the sample
  - 'Alcohol'
    - When originally conceived, the substrate used in the sample by researchers was Isopropyl Alcohol (aka Rubbing Alcohol)
    - Some other fluids serve equally well.
      - Automotive windshield washer fluid has been accepted as an alternative as well as using low sudsing soaps.

Varroa Monitoring Kit

Prep Your Kit

- A tub for collecting bees for sampling
- A measuring cup (1/2 Cup Size)
- Varroa Easy Check Device
- Rubbing Alcohol or Blue Windshield washer fluid

Choose the sampling Frame

- **Choosing the right frame to sample is important**
  - Smoke the hive
  - Work your way into the brood nest
  - Choose a frame that has developing larva, **on the cusp of being capped** (the more mature the uncapped larva, the better the sample will be)
    - Varroa mites want to enter cells just before the larva in development is capped.
    - Additionally, the varroa mites are on the nurse bees caring for the brood

Picking the right frame to sample

Picking the right frame to sample

Picking the right frame to sample

YES!; On the cusp of being capped! Mites will enter these cells

Picking the right frame to sample

Fill EasyCheck

Select a frame

Look for a queen!

Look carefully!


Cannot find the queen?
Shake off some of the bees

Move to container


Measure ½ cup

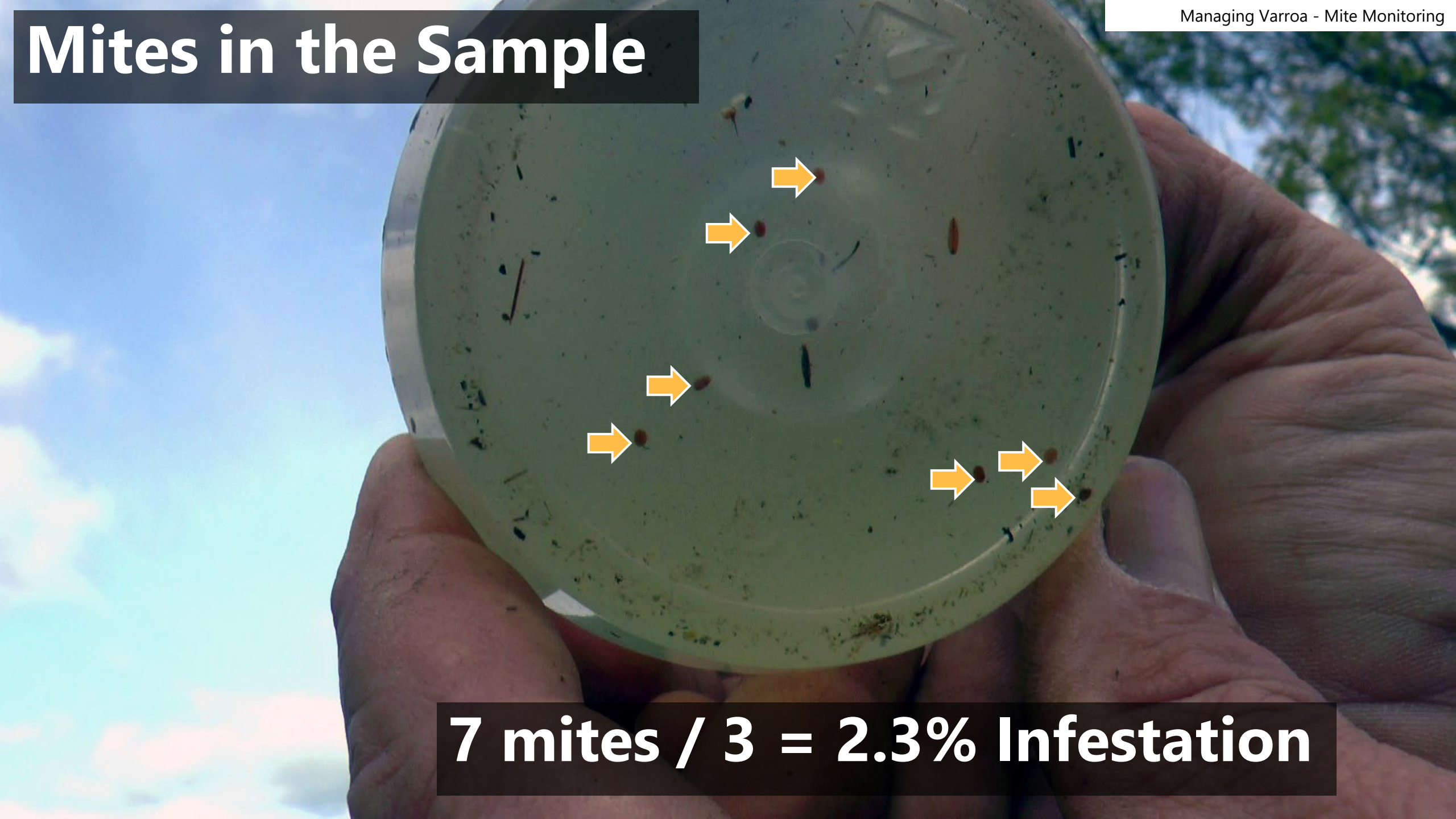
300 bees= ½ cup

Cover and Momentarily Set Aside

Return Extra Bees & Close the Hive

Shake VIGOROUSLY

Mites in the Sample



7 mites / 3 = 2.3% Infestation

Percentage Variations

- **Percentage thresholds have changed over time**
  - When the processes were coalescing, the percentage threshold for treatment were originally higher
    - Over time the percentage threshold has dropped from previous highs to currently 2% and 3%.
    - This is attributed to notions that viruses have become more impactful and that damage inflicted by varroa mites is more harmful than in the past
  - Percentage recommendations vary
    - No standard perse but the Honey Bee Health Coalition is the gold standard

State of the Colony

- **Mite Tolerance**
  - Naturally colonies grow and contract across the seasons
    - When bees are being produced at a prolific rate, mite infestations can be tolerated due to the proliferation of the bees and the attrition of bees
    - When bee populations are static, or declining, mite impacts can be more detrimental (think summer into fall, fall into winter)
  - Percentages aim to take this into account
    - Sometimes a 3% infestation is acceptable, and other times is too high
    - The Honey Bee Health Coalition has recommendations on Interpreting Sample Findings in the Varroa Management Guide

A need to Monitor…. why not simply treat?

- **This is often a conundrum**
  - Treating Proactively is Frowned Upon
    - Philosophically there has often been a stigma to monitor, and if only treat if samples indicate to do so.
    - Doing otherwise is irresponsible. It is synonymous with taking medicine proactively and risking resistance to treatment options.
  - But mite problems are real, and thresholds will be high, it is a given
    - In our experience, this is often true, but not always
    - After a decade plus of observation, it is true that for some reason mite presence is lower in some seasons and treatments would not be warranted.

Monitor before the Perfect Storm

- **Mite Population Peak during Population Decrease**
  - When the spring nectar flow declines, the mites are hitting their stride.
  - This is where mite impacts compromise colony health

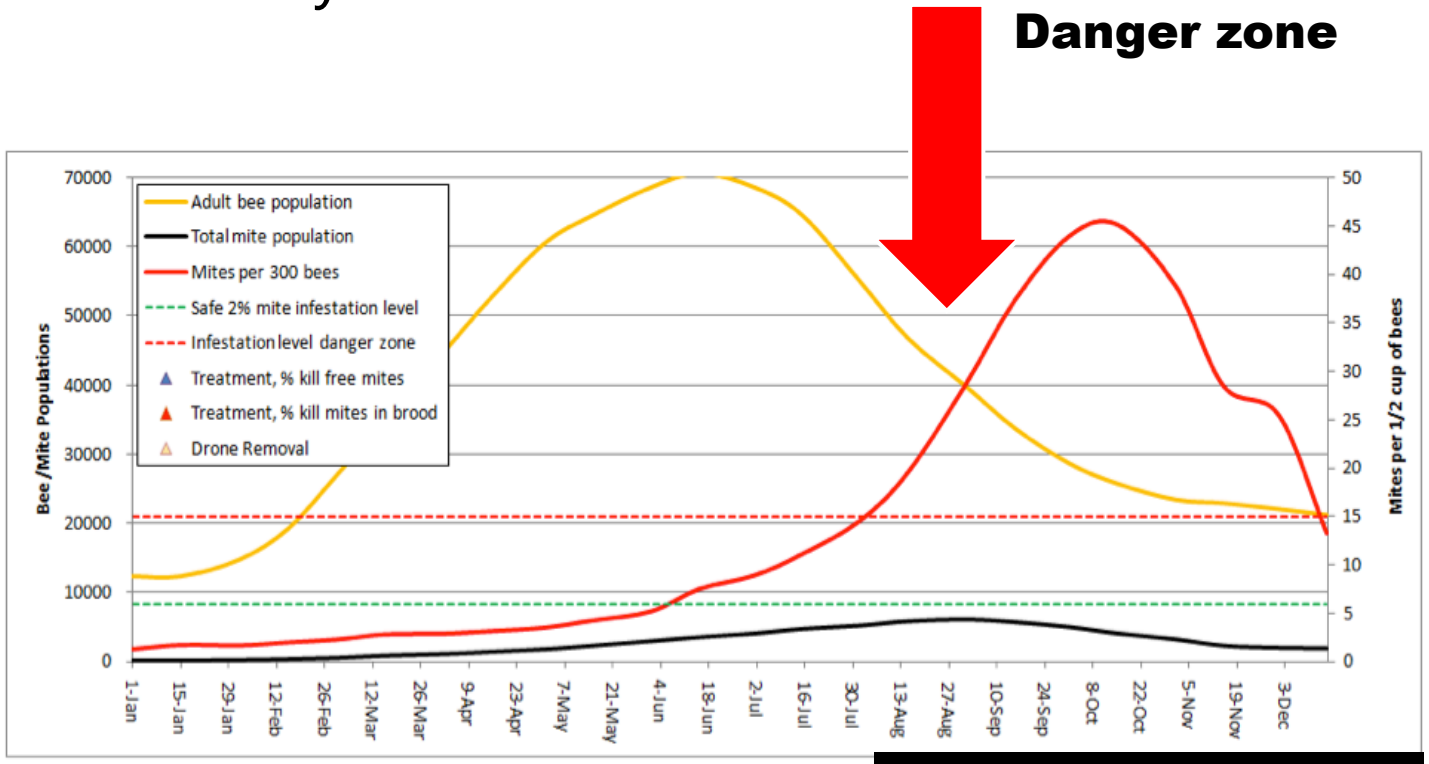


Image credit: Randy Oliver – Scientific Beekeeping

Winter Bees are Imperative

- **Population and Resources Mask Problems**
  - Many colonies can live with problems during population growth
    - New bees born every day take the place of any compromised bees
- **Winter Bees are not as fortunate**
  - During the summer and fall months, the plethora of new bees are not happening.
    - Impacts are more prevalent to the population when the replacement pool is not as abundant.

Winter Bees are made in summer and fall

Monitoring Expectations

- **You could time your monitoring**
  - Treat, Monitor for results
    - The only true way to know if a treatment was effective is to monitor post treatment.
      - Treatments are not 100% effective.
      - Different circumstances prevent treatment effectiveness (ex. How many mites were under capping, and did they find a way not to be exposed to the treatment?)
    - If you monitor, and the mites are knocked down, you might buy a window – but the mites will come back
      - Proactive monitoring during population cycle changes simply makes sense

Varroa Management Resource Website

- **Honey Bee Health Coalition**
  - A free resource with an abundance of resources for understanding and managing varroa mites in beehives
  - Instructions, pest insights, how to videos, decision guide, and more
  - A key resource for varroa management and more

https://honeybeehealthcoalition.org

Q&A

- Questions

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Varroa Treatments / Integrated Pest Mgmt.

Lesson | Mite Treatment Options

What is Covered in this Lesson

- Treatment Dynamics
- Treatment Tactics
- Guidance
- Plan Considerations
- Treatment Instructions
- Following Labels & Trusted Sources

Treatment Dynamics and Outcomes

- **Kill a Bug on a Bug**
  - Thinking of what we are trying to accomplish….
    - Treatments are designed to kill varroa mites, resident on bees
    - Additionally, we need it to penetrate the capping and kill mites in the cells of developing bees
  - All while doing minimal harm and inflicting the least disruption to honeybees
    - Treatments do harm brood in development
    - It can also impact adult bees and impact colony operations

A somewhat complex problem to manage

- **Treatment Solutions are complicated**
  - It takes time breaking down treating a colony for varroa mites
    - There are several factors to consider and it requires some know how
- **Break it down, build a plan**
  - We are going to take it step by step, in digestible chunks
  - Then come back to center and make some plan suggestions

Treat to keep Thresholds in Check

- **Treat when warranted**
  - Monitor bees to know the thresholds
  - When thresholds are exceeded, treatment is warranted
  - Monitor thresholds **post treatment** to assure treatment met objectives
- **Choose the right treatment for the situation at hand**

We treat colonies to keep the harm levels that varroa inflict upon colony bees to a manageable level.

If levels are allowed to cross thresholds, the impacts of survivability are greatly diminished

Treatment Classes

SYNTHETICS

- ☐ **Apivar/Amiflex**
  (Amitraz + ?)
- ☐ **Apistan**
  (Tau-Fluvalinate)*
- ☐ **CheckMite+**
  (Coumophous)*

ESSENTIAL OILS

- ☐ **Apiguard**
  (Thymol)
- ☐ **ApiLife Var**
  (Thymol, Eucalyptus, Menthol, and Camphor Combination)

ACID Based Products

- ☐ **Formic Pro**
  (Form Acid)
- ☐ **VarroxSan**
  (Oxalic Acid)
- ☐ **ApiBioxal RTU**
  (Oxalic Acid)
- ☐ **HopGuard3**
  (Potassium Salt of Hops Beta Acids)

dsRNA

- ☐ **Norroa**
  (Vadescana)

Oxalic Acid Powder

- ☐ **EZ-Ox/Api-Bioxal**
  (Oxalic Acid Dihydrate Powders)

***Available, *but not to be used*. Outmoded, Dangerous, Ineffective**

Non-Chemical Approaches

- **These are additional measures to employ**
  - Screened Bottom boards
    - Minimally effective – if at all…. Mites are groomed off and fall through
  - Drone Brood Culling (removal)
    - Removal of capped drone brood (with mites in the cells), lowering mite populations

Mostly these are not in play for new beekeepers.

For the sake of being thorough they are shared here.

These are mostly applicable further into your beekeeping journey

Non-Chemical Approaches

- **These are additional measures to employ**
  - Brood Interruption
    - Prevent the queen from laying, ceasing capped brood
      - Combine with treatment that kills exposed mites – also lowers mite reproduction
  - Replace Queen with Varroa Resistant Tendencies
  - Bee Gym – Modified Entrances
    - Different devices that aid in grooming and thwart varroa mites and other pests

Mostly these are not in play for new beekeepers.

For the sake of being thorough they are shared here.

These are mostly applicable further into your beekeeping journey

Approved Treatments

The Label is the Law

- **Use Only Approved Treatments**
  - The products on the previous slide are the only ones to be used in beehives
    - These are registered as safe with bees, **and any honey produced**, when applied by the label instructions
  - There are many unsanctioned methods and products promoted that are not registered, not approved, and sometimes outright dangerous
    - This includes classes of essential oils and non-label uses of approved products

Treatment Regime

- **Product Choices**
  - It is not uncommon for beekeepers to administer **several treatments** of differing products across a single beekeeping year
    - With an array of products to choose from you must decide on what to use
    - Conditions present during application influence choices (temperature, honey present, state of the bees, etc.)
  - Some beekeepers evaluate their goals and decide on a treatment regime (more on this later)

Preventing Resistance

- **Mites can become resistant to medicines**
  - Varroa mites can develop resistance to applied treatments
    - Case in Point: Beekeepers started with two products, Cumophos and Tau Fluvalinate, two medicines that were initially very effective
      - In time, and with repeated usage, both products became completely ineffective and are no longer recommended or useful
  - **Rotation is imperative**
    - To stem resistance, subsequent treatments should be altered so no one product is used in succession.
      - The premise is a second, competing product will kill off mites that survived the first

Designing a Regime

- **Product Selection**
  - Product Characteristics and Conditions driving decisions
    - When you become informed about product choices, you will understand that there are factors to consider prior to application
    - Certain products require specific **Temperature** and **Weather** conditions as a condition of use
      - For example, products may rely on a specific temperature range to activate and if it is too cold or too hot, they may not work, or they work so fast that the harm the bees
    - Use with Honey on board
      - Some products cannot be applied when there is honey that will be harvested present on the hive. The product will penetrate and taint the honey.

Colony Factors

- **Colony State as an input to selection**
  - What product you choose to administer is also driven by the state of the colony at any given point during the season
    - Factors that influence choice include:
      - Size of the colony at time of treatment
      - How many boxes, and what shape, do the bees occupy
      - **Are the bees building brood** – what states of brood are present? (large contingent of larva, large swaths of capped brood, etc.
      - Are drones present?

Colony Makeup

- **Why it Matters, an example**
  - Part of the effectiveness of some products depend upon colony makeup
    - Illustrative Example: **Capped Brood**
      - Varroa Mites develop their offspring in capped brood cells
    - Some treatments, Formic Pro for example, will not only kill varroa mites on resident bees, **it will also penetrate the cappings** and kill varroa mites in development
    - This means that in those periods where capped brood is prevalent, you might select Formic Pro over another product to gain that benefit

Temperature and Honey

- **Temperature Considerations**
  - To Hot: Will the product bomb the bees with chemicals?
  - To Cold: Will the product get hot enough to chemically release?
- **Honey Considerations**
  - Is it safe to use with consumable honey on the hive?
  - If it is not safe, how can it be used so it does not impact honey to be harvested?

Product Impacts & Risks

- **You should know the potential impacts**
  - Both to the bees and to yourself during handling and application
    - Injury to self (acid burns, skin irritation, eye injuries, and other poison effects)
    - Injury and impacts to bees and the colony
      - Injury or Mortality to developing brood
      - Injury or Mortality to adult bees, including potentially the queen
      - Irritable bees – bees absconding
      - Tainted brood food and food stores – tainted wax
      - Injury to queen and drone reproductive health

Cannot use with Honey

- Apivar
- Apiguard
- ApiLifeVar

- Require Buffers
  - These products require time to work
    - An Apivar treatment window is 42 to 56 days
  - Some require moratoriums after removal
    - ApiLifeVar labeling requires a 30 day wait period before honey supers can be added
    - ApiVar requires a 14-day wait period

Safe to Use with Honey Supers

- ☐ **Formic Pro**
- ☐ **Oxalic Acid**
  ApiBioxal RTU
  VarroxSan*
  Norroa*
  Oxalic Acid Dihydrate (vapor or dribble)
- ☐ **HopGuard3**

- These product can be used when collecting harvestable honey
  - The residuals will not impact consumable honey.
  - You can treat the bees during nectar flows and it will not adversely impact the honey stored by the bees for their consumption – ***notes to follow***

* Varroxsan and Norroa labels indicate the product is safe to use with honey, but it is preferable to remove supers before treating in the USA

VarroxSan – honey on board… more

Just because you can, Doesn't mean you should

- **Q: Should I use VarroxSan when supers are on the hive / during a honey production period?**
- **A: It is preferable to remove supers before treating with VarroxSan.**
  - It is approved to be used with supers on, and it is totally safe.
  - Studies have shown that even at 1.5 times the dose, the level of oxalic acid in honey does not increase.
    - At the recommended dose oxalic acid levels in honey are below the detection limit.
    - Honey collected during VarroxSan treatment can be sold for human composition.

Norroa – Honey On Board…more

- **Norroa works on contact**
  - Mites come into contact with bee food laced with the active ingredient
  - It is not advisable to use Norroa *during a nectar flow or with honey supers in place*
    - The active ingredient can become diluted
    - The active ingredient can be moved into honey supers
      - Varro Mites would not come into contact with the active ingredient if it is stored in a cell for holding honey

Treatment Instructions

- **Follow them Scrupulously**
  - Must follow the process
    - Product supplies, and the government agencies that oversee them, will stand by their products if you use them in the manner directed (the label is the law)
      - They simply will not support you, or answer questions, if you use them in any other manner other than how they are instructed to be used.
        - Common sense says that if they did not test for the practice you are using, then legally they cannot make any claims. It is not unlike the drug industry for humans – off label application is not permitted
    - Instructions are explicit
      - To get the desired outcome you need to know and follow directions
        - If you use a vapor product and the bottom board is not closed, it will not work. Instructions matter

Effectiveness Considerations

- **Will it Work?**
  - No product has a 100% effectiveness kill rate
    - Product success is often highly dependent upon conditions and makeup of the colony
      - Colony size, application methods, temperatures, makeup of the interior of the hive, and other factors play a large role in how effective treatments play out
  - Percentages reported are a guide
    - There is debate as to how factual these numbers are…
    - The numbers reported are often considered inflated

* It is being reported that mites are becoming resistant to ApiVar

Treatment Tactics

- **Forecasting a Treatment Plan**
  - Many beekeepers look to some treatment regime over the course of the beekeeping season (spring, summer, fall – late winter)
  - Take into consideration the annual plan for local conditions
    - Consider the honey harvest windows – local temperatures, colony state, and other inputs
      - Don't forget…. Vacation plans and life events must be factored in
  - Based on evaluation, and conditions they may start with a treatment plan design (and know the rationale to why it is structured that way)

Example Timeline (with rationale examples)

▢ **Jan/Feb**	**VarroxSan:**	Low population, open brood, early season mite control
▢ **Jul/Aug**	**Formic Pro:**	Large Mite Knockdown – penetrates cells
▢ **Sep/Oct**	**ApiGuard:**	Cleanup for any potential mite resurgence
▢ **Nov/Dec**	**OA Vapor:**	Rid colony of residual mites during no brood period

- ▢ **All options predicated on testing and mite thresholds**

Treatment Plan Design

- **So many things to consider…. Where to start?**
  - Treatment possibilities are confusing
  - There is help in the HBHC Varroa Management Decision Tool
    - Until you get some experience and learn to manage this in your own way, know that there is a guide that simplifies choices – while taking into consideration all of the conditional inputs
    - Follow the online wizard, answer the questions as to the situation, and it will provide choices with you **and don't forget to watch the instructional videos**
  - Once you have your selection, follow the label

The Label Is the Law

- **This is the best way to end**
  - We do not make it a habit to tell you how to use the treatments
    - We, as beekeepers, do not try to remember the rules and instructions
    - This forces us to read the label every time and that helps us to:
      - Learn any changes since last use
      - Refresh our direct knowledge of how to use the product – no guesses
      - Remind us of the detailed instructions to follow and help us to plan; not forgetting the important points – like putting the slide back into the screened bottom board and such
      - Ensures that we remain safe and do the best not to harm our bees

Labels and SDS

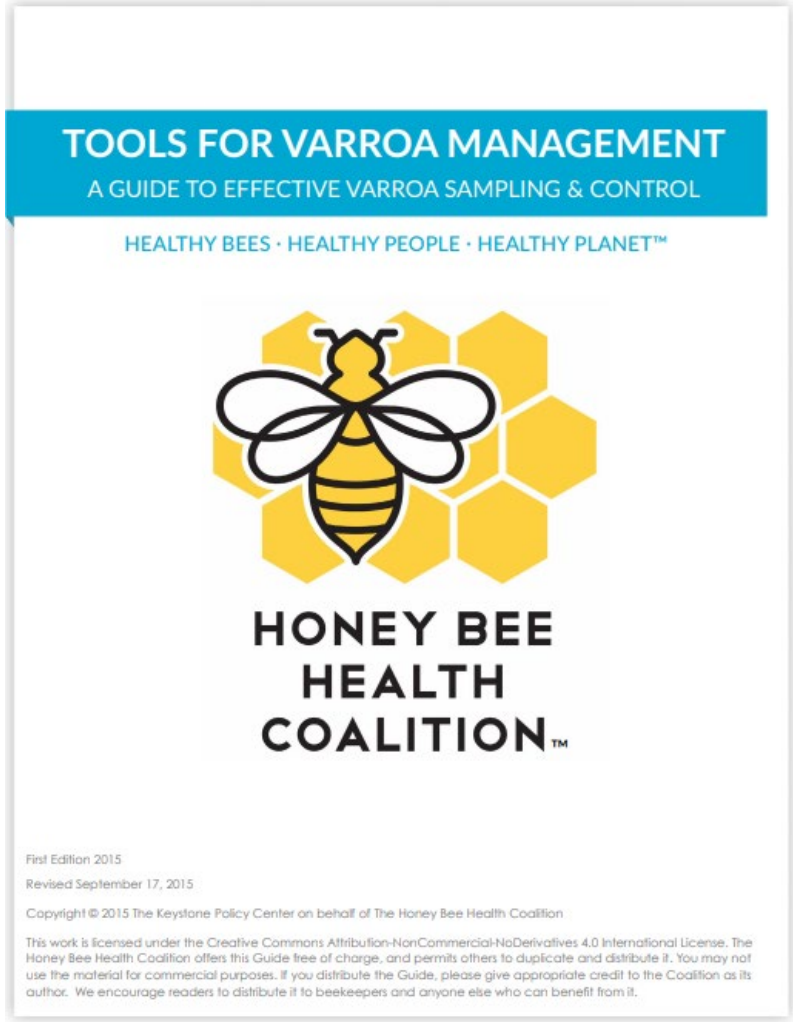
Being ***directly*** well informed will provide you with the confidence and know how to effectively manage varroa mites

- **The Fine Print is enlightening**
  - The best way to be informed is invest in the research required
    - How long is a product good for? How should it be stored? What should you to if you come into contact with it (will it harm you?) Does it have to be removed after use? What is the proper disposal method? Can I use less of the dose? How do I treat a Nuc? Can I treat a package? And a 100 more questions…..
  - Labels and Safety Data Sheets (SDS)
    - These two resources, along with website information from product manufactures, should address all questions you may have or information you need or on any problems you might encounter.
    - Invest the time to do your research, it is amazing what you can learn

Varroa Management Resource Website

- **Honey Bee Health Coalition**
  - A free resource
    - Resources for understanding and managing varroa mites in beehives
    - Instructions, pest insights, how to videos, decision guide, and more
  - A key resource for varroa management

https://honeybeehealthcoalition.org >



Wait – No DIRECTIONS how to use things?

- **No product application instructions, *and it is on purpose***
  - You may or may not have noticed, we did not tell you how to apply treatments – no directions were given in this presentation
    - We know how of course, but opted not to include it on purpose
      - For example: Norroa – Pull the plastic sticker off, give the bag a gentle squeeze, place two pouches per brood box. Use a shim. And so on and so on….
        - There are more instructions, and they are important to follow – and the truth is you will not remember later this year even if we told you
  - You **must read the instructions** EACH TIME, *during each use*
    - Read it as you are buying it, so you understand it before spending money
    - Read it before you are planning to use it, to get reacquainted
    - And then read it just before applying it

Q&A

- **Questions**
  - Next week…
    - Summer Queen Assessments
    - The Calendar of Summer
    - Equipment Prep for Future Endevours
    - Things you will see