

# NCBA BEE SCHOOL 2026

Varroa Mites and other  
Diseases, and Pests  
with treatment  
suggestions...



## **A Positive Note:**

**With rare exceptions, a strong queen and bee colony can fight off most diseases and pests.**

- **Queen Health & Behavior**
- **Adequate Nectar/Honey stores or Sugar Syrup**
- **Balanced Diet with Pollen for Protein**
- **Strong Mite testing and treatment regime**

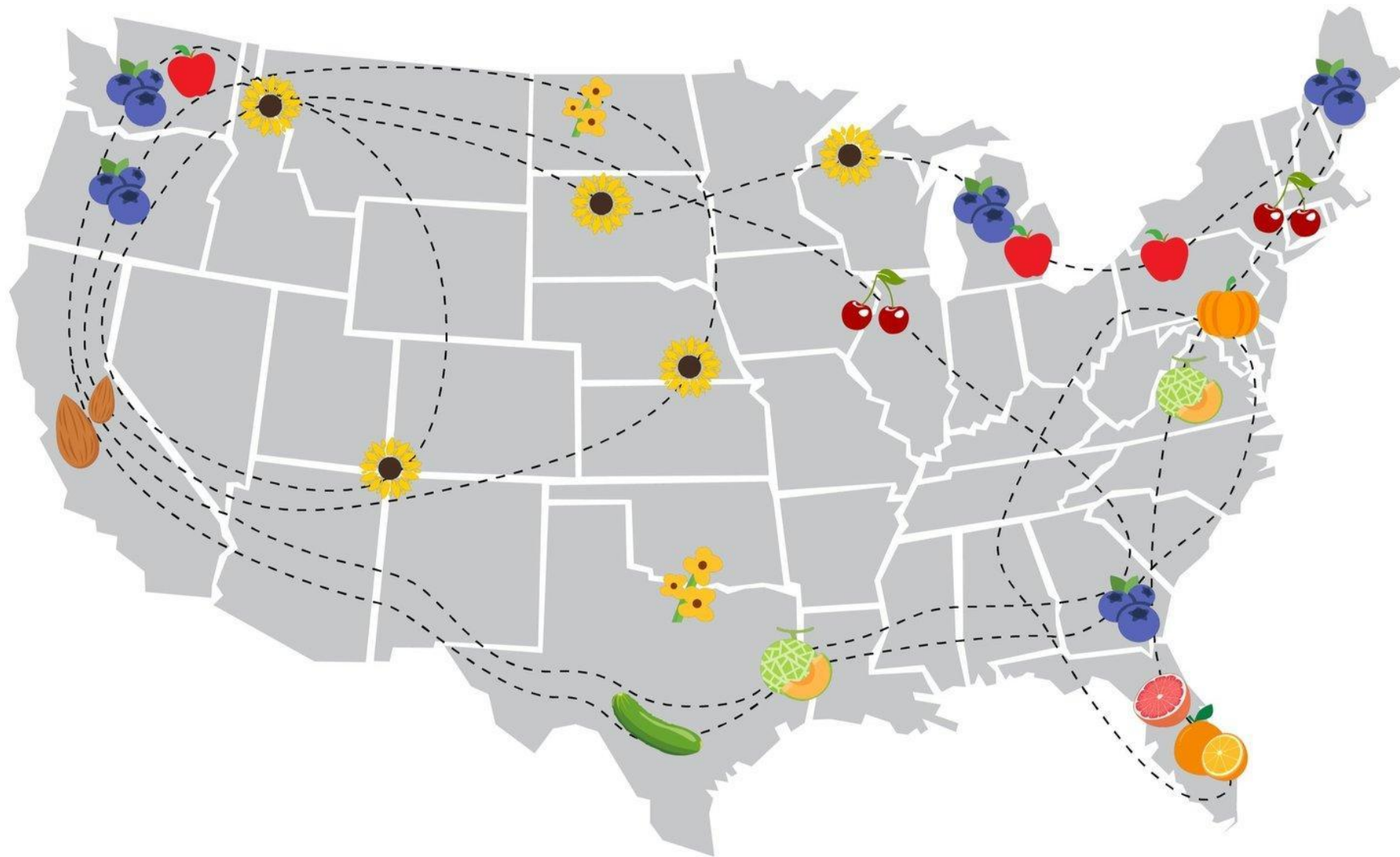


# MITES YIKES



- *Varroa* mites were originally parasites of the Asian honey bee.
- *Varroa destructor* has since (1960's) switched hosts to the Western honey bee and are now the most destructive parasite for this species.
- They are about the size and shape of a sesame seed and reddish brown.
- *Varroa* mites are ectoparasites of the honey bee — “ecto” meaning “outside”
- These parasites depend entirely on honey bees to live; they acquire all their nutrients through feeding on the bee and reproduce exclusively inside honey bee brood
- *Varroa* was first introduced into the U.S. in Florida in 1987, when hives transported to Wisconsin from Florida were found overrun with mites.
- Migratory beekeeping played a large role in the spread of *Varroa* mites from Florida and beyond.
- Not only did *Varroa* mites take a toll on the honey bee industry, but it also decimated feral colonies

**Many  
Diseases  
spread  
through the  
migration of  
commercial  
pollinators**



Map courtesy of Project Apis

# Life Cycle of Varroa

[Video of Varroa Lifecycle](#)

– 2.5 Minutes

- Mites reproduce in honey bee brood cells. They prefer to reproduce in drone cells as compared to worker cells.
- *Varroa* mites feed primarily on the fat bodies of honey bee pupae and adults. They are found most commonly on nurse bees.
- There are two stages in the life cycle of the *Varroa* mite: the reproductive stage and the phoretic stage (though the phoretic stage may be renamed in the near future).
- **Reproductive stage:** During the reproductive stage, the mite is inside the honey bee brood cell, reproducing and feeding on honey bee pupae.
- **Phoretic stage:** During the phoretic stage, the mite is found on the outside of the bee's body, feeding on the bee. Mites are most often found on the underside of the bees' abdomens, tucked between body segments.
- Mites enter honey bee colonies by hitching a ride on a forager bee that drifts into or robs an uninfested colony.
- They can also be introduced to colonies from beekeepers exchanging frames with bees or brood
- A mite crawls into an open brood cell with older larvae around 20 hours before they are capped.

# Life Cycle of Varroa

- Mites enter worker brood cells around 20 hours before they are capped
- They enter drone brood cells around 40 hours before they are capped.
- Mites are found in drone brood cells about nine times more often than they are found in worker brood cells
- The mite hides inside the brood food until the cell is capped
- Once the cell is sealed; it begins feeding on the pupa and transmitting viruses contained in its saliva through the open wounds from its bite.
- Three days after the cell is capped, the adult female mite (foundress) lays the first egg.
- This first egg is unfertilized and develops into a male (like bees, mites are haplodiploid).
- After the first (male) egg is laid, the foundress then lays subsequent eggs every 30 hours.
- Each of these subsequent eggs (usually one to six in total) are fertilized eggs that will develop into females.
- After the mites hatch, they all feed on the pupa.
- The male is white to light pink in color and smaller than a female; the females are nearly white after hatching but darken as they age.
- It takes mites six days to reach sexual maturity, at which point the females and males mate.

# Life Cycle of Varroa

- When the bee emerges, the mated females that survive exit the cell on the bee's body.
- The male mites and immature females quickly die inside the cells due to desiccation.
- Because most bees emerge 12 to 15 days after being capped (depending on whether they are workers or drones), most of the mites do not reach maturity before the bee emerges.
- Only an average of 1.3 new mites are released from each worker brood cell with a foundress mite.
- An average of 2.6 new mites are released from each drone brood cell with a foundress mite.
- Some brood cells can contain multiple foundress mites, so more sexually mature daughter mites can emerge from these cells.
- During the phoretic phase, mites remain on adult bees feeding for up to 13 days (seven on average), moving from bee to bee, before they enter cells to reproduce.
- When the colony is broodless, they can remain on adult bees for much longer, and during the winter, they can survive five to six months in the bee cluster.
- They feed on nurse bees when given the choice between nurses and foragers.
- Nurse bees are not only in close contact with larvae (making it easy for mites to crawl into brood cells), but they also provide better nutrition to mites, allowing them to produce more offspring than if they were feeding on foragers

# LIFE CYCLE OF VARROA

- *Foundress enters the colony (on forager, or via a drifting bee from an infected colony)*
- *She enters a brood cell with a larva just before it's capped*
- *She feeds off the pupa's fat bodies and lays females and one male*
- *The Females lay eggs and those mites emerge when the drone or worker emerges to populate the colony*

[Video of Varroa Lifecycle](#)

– 2.5 Minutes

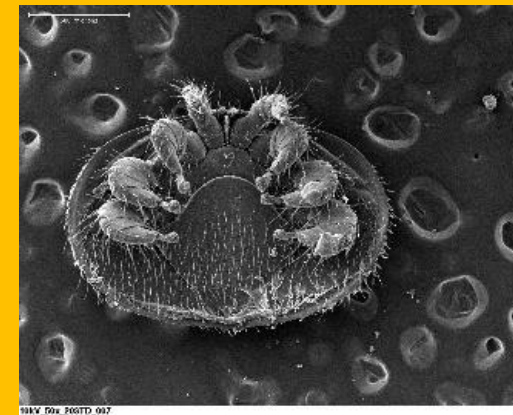


# What they Look Like and the Damage They Do.

- They are about the size and shape of a sesame seed and reddish brown.
- *Varroa* mites feed predominantly on the bees' fat bodies.
- As a result, both pupae have reduced lipid levels.
- Lipids stored in the fat body are important for the development of winter bees
- Bees parasitized by mites in autumn may not develop as winter bees
- *Varroa* mites can transmit viruses to honey bees.
- The combination of viruses and mites is more deadly either pressure is alone
- *Varroa* is a vector for at least eight different bee viruses.



- If infestation rates in a colony are high in late summer and early autumn, the colony can collapse in the following weeks or months as the population dwindles before or during winter.
- Unfortunately, *Varroa* population levels tend to peak at the same time that the colony is producing winter bees
- Many of these viruses were present in honey bee colonies before *Varroa* mites
- One large-scale study in Ontario, Canada, determined how often colonies died from *Varroa*
- Researchers monitored over 400 colonies and found that *Varroa* was the main culprit behind overwintering losses — the infestations accounted for over 85% of colony losses.
- **This outweighed the contributions of other winter stressors,**



HERE'S WHAT THEY LOOK LIKE



# Crawling on a Honeybee Pupa



# Two on a Pupa



# Mite on a Purple Eyed Pupa



**MITE INFESTATION  
WITHIN BROOD  
COMB ON PUPAE**



# Test & Treat for Mites

- Demo of Alcohol Wash
- Ratio of mites per 300 bees determines treatment urgency
- Treatment Types

**SAMPLE REGULARLY**  
(AT LEAST ONCE A MONTH)

**Alcohol wash**

The most accurate way to determine *Varroa* levels in your hives

**MATERIALS**



\*1/8 inch hardware cloth, cut to match solid lid

**10 STEPS**

- 1) Pour alcohol into jar. Set materials in easy reach
- 2) Find a frame of **open brood**  
*Check that the queen is not on frame!*
- 3) **Shake adult bees from frame into dishpan**  
**Scoop 1/2 cup (~300) bees and pour into jar**



- 4) Shake remaining bees from bin into colony
- 5) Seal solid lid on jar and **shake for 1-2 min**
- 6) Let jar sit for 1-2 minutes
- 7) Replace solid lid with mesh lid



- 8) **Shake jar contents into empty dishpan**
- 9) **Count the total # mites.**  
*If there are 4+, it is time to apply a chemical treatment (see inside of brochure)*



- 10) Discard bees and mites  
Wash all materials; can reuse alcohol

→ email [bees@mass.gov](mailto:bees@mass.gov) for a free kit while supplies last!

**KNOW YOUR PEST**

Meet the *Varroa* mite...

The Varroa Mite, *Varroa destructor*, is an external parasite that feeds on honey bee adults and brood. **They weaken bees and transmit viruses.**



**Unmonitored and unmanaged infestations of Varroa mites will result in colony death.**

**COMMON SIGNS OF MITE DAMAGE:**



- Open or damaged pupal cells
- Chewed-down pupae
- Emerging adult bees with deformed or missing wings

Version 8, May 2025. Publication produced by the Massachusetts Department of Agricultural Resources (MDAR), University of Massachusetts (UMass), and Maine Department of Agriculture, Conservation, and Forestry (MDACF), funded by the Northeastern IPM Center through grant #2014-70006-22484 from the National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program, and reprinted with permission from the Northeastern IPM Center. Drawings by Hannah Whitehead. Photos by the MDAR Apiary Team.



United States Department of Agriculture  
National Institute of Food and Agriculture



Integrated Pest Management (IPM) for *Varroa* mites



**IPM** is a decades-old farm strategy for mitigating pests while minimizing chemical use. Experts now recommend IPM for *Varroa*.

Rather than relying on a "silver bullet", good IPM incorporates multiple practices throughout the season, based on pest levels and pest biology.

**IPM PRINCIPLES:**

- **KNOW YOUR PEST**
- **PREVENT** pest build up using non-chemical practices
- **SAMPLE REGULARLY** to track pest population levels
- **INTERVENE** with pesticides when populations reach damaging thresholds (*vary products to prevent pest resistance*)



This pamphlet will help you to use IPM principles to manage *Varroa* mites.

**SEE THE MDAR MITE TREATMENT FLYER PAGE 1**

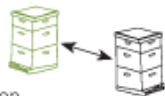


## PREVENT PEST BUILD-UP USING NON-CHEMICAL PRACTICES

### ALL YEAR

#### Hive Differentiation

Reduce mite transmission via bee drift by maximizing hive spacing and varying hive color and orientation.



#### Screened Bottom Board

Studies show mixed results on Varroa but can also be used to increase hive ventilation.



### SPRING AND SUMMER

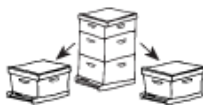
#### Re-Queen

Select mite resistant stock when available.



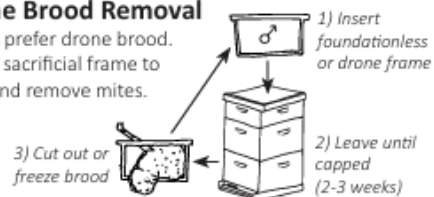
#### Brood Interruption

Split hive or allow to swarm (capture swarm!) to interrupt mite reproduction.



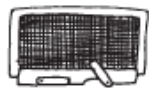
#### Drone Brood Removal

Mites prefer drone brood. Use a sacrificial frame to bait and remove mites.



#### Robber Screens

Install screens to reduce mite transmission via drift and robbing.



### \*PERSONAL PROTECTIVE EQUIPMENT (PPE):

- 1 Chemical-resistant gloves
- 2 Safety goggles
- 3 Respirator with an organic particulate filter

## INTERVENE WITH PESTICIDES IF PESTS EXCEED THRESHOLDS (4+ MITES/SAMPLE)

**MITICIDES AT-A-GLANCE** Always follow the label! The label is the law. Find full labels on the [EPA database](#):



	Product Name Active Ingredient [mode of action]	Season [temp] less effective when brood is present	Honey super safe? 	Treatment Duration 	Application Type for full video instructions, visit the <a href="#">Honey Bee Health Coalition</a>	Personal Protective Equipment 
Synthetics	<b>Apivar®</b> , <b>Apivar® 2.0</b> Amitraz [contact]	[Not Temp Dependent] Spring Fall	<b>NO</b> 	6-10 weeks do not use more than 2X per year	PLASTIC STRIP 	Miticides can harm people too!! Protect yourself with proper PPE*
	<b>Apiguard®</b> Thymol [fumigant]	[60-105°F] Spring Fall	<b>NO</b> 	4-8 weeks can add supers immediately	GEL OR GEL TRAY 	
Essential Oils	<b>Api Life Var®</b> Thymol, Menthol, Eucalyptus oil [fumigant]	[64-95°F] Spring Fall	<b>NO</b> 	26-32 days wait 4 weeks to add honey supers	FOAM WAFER 	
	<b>Formic Pro®</b> Formic acid [fumigant]	[50-85°F] Kills mites in brood! Spring Summer Fall	<b>YES</b> 	2-3 weeks 	GEL STRIP 	Recommended (not required)
Organic Acids	<b>Api-Bioxal®, Ez-Ox Tablets®</b> Oxalic acid dihydrate [contact, fumigant]	[No Temp Restriction] Spring Fall Winter	<b>YES</b> 	Immediate (but may need to repeat)	POWDER, TABLET: Spray (liquid) Dribble (liquid) Fumigation (vapor)	
	<b>Varroasan®</b> Oxalic acid dihydrate [contact]	[No Temp Restriction] Spring Summer Fall	<b>YES</b> 	6-8 weeks Pesticide must be separated by at least one chamber from any honey to be extracted	FIBER STRIP 	
	<b>HopGuard III®</b> Potassium salt of hops beta acids [contact]	[55-99°F] Spring Summer Fall	<b>YES</b> 	2-4 weeks 	CARDBOARD STRIP 	

SEE THE MDAR MITE TREATMENT FLYER—PAGE 2

THE LABEL IS THE LAW FOR TREATMENT USAGE!

AND OXALIC ACID VAPORIZATION



# VIRUSES AND OTHER DISEASES

**Here's what a healthy brood frame  
looks like**



## VIRUSES AND OTHER DISEASES

- And here is what healthy brood look like.



# DISEASES

- **Bacterial**
  - American Foulbrood (AFB)
  - European Foulbrood (EFB)
  - Nosema – Reclassified Vairimorpha (1)
- **Fungal Diseases**
  - Chalkbrood
- **Viral Diseases**
  - Deformed Wing Virus\*
  - Black Queen Cell Virus
  - Parasitic Mite Syndrome PMS
  - Chronic Bee Paralysis Virus CBPV
  - Acute Bee Paralysis Virus
  - Israeli Acute Paralysis Virus
  - Kashmir Bee Virus
  - Cloudy Wing Virus
  - Sacbrood Virus

(1) <https://www.sciencedirect.com/science/article/abs/pii/S0022201124000892>

# American Foulbrood (AFB)

---

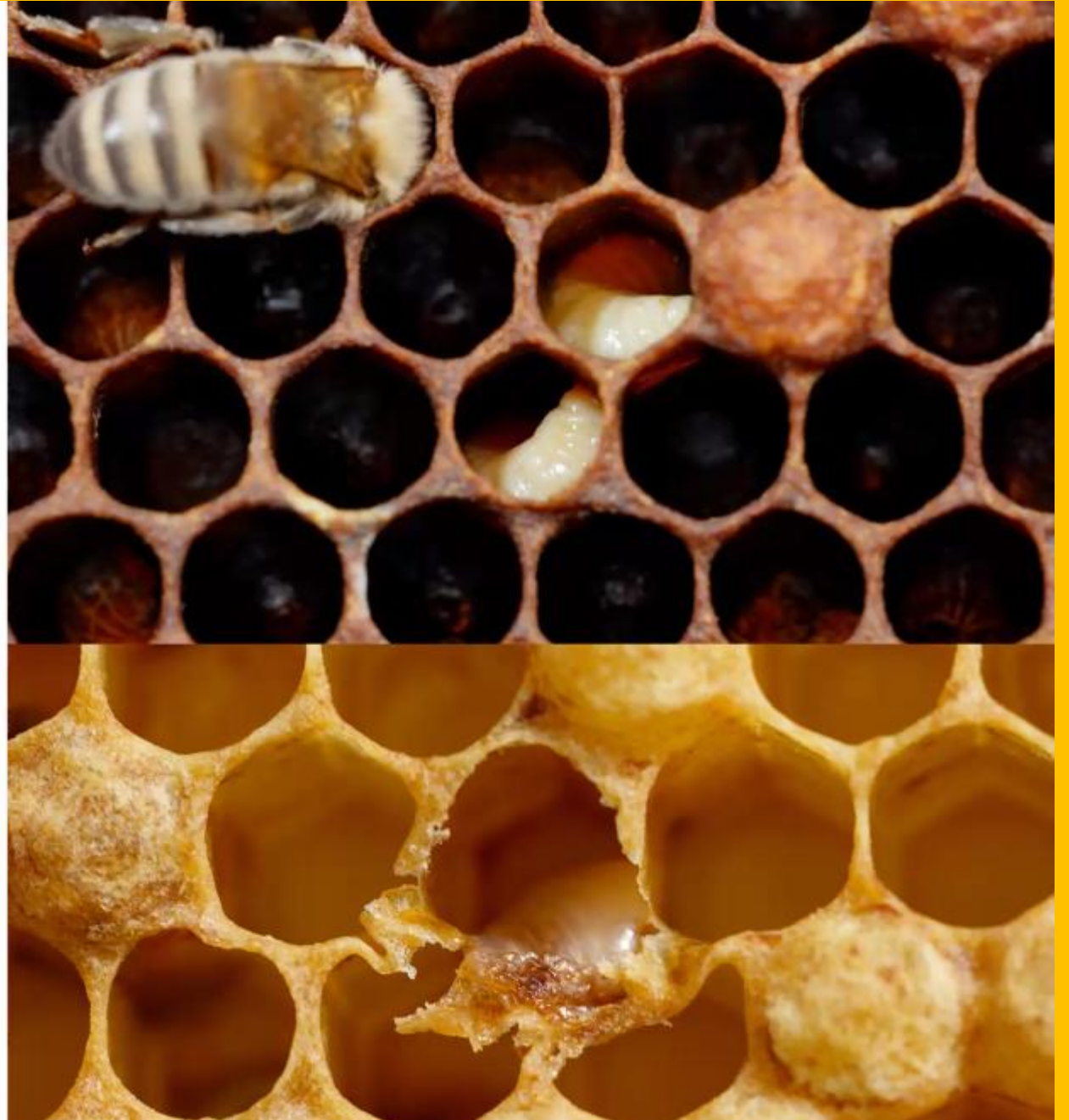
- Highly Infectious Brood Disease
- Spores remain viable in equipment for up to 70 years
- MA requires AFB colonies to be decommissioned and incinerated
- Best solution is prevention!
  - Limit robbing
  - Avoid used equipment



# European Foulbrood (EFB)

---

- Considered a stress disease and often disappears with a good nectar flow
- Many different symptoms
- Can be treated by replacing infected brood frames/equipment, or with an antibiotic called Terramycin



# NOSEMA -- Reclassified Vairimorpha

- *Nosema ceranae* is now the primary one found in North American colonies
- *Nosema apis* and *N. ceranae* have been reclassified (though MDAR staff are still using the old language) to the genus VAIRIMORPHA...so *Vairimorpha apis* and *Vairimorpha ceranae*.
- Prior to 2007 beekeepers only saw *V. apis*.
- *V. ceranae* does not diagnose with dysentery. More of a “dwindle / waste” and harder to diagnose. Reliable treatments for *V. ceranae* are unknown. Strong bee health and nutrition!
- Fumagilin was effective against *V. apis* but not *V. ceranae*



# Tracheal Mites

---

- 5 cases 2023
- 26 cases 2024
- 18 cases in 2025
- Bees crawling/dying in large numbers in front of the colony
- “K wing”

Interventions: Space in hive, direct sun, resistant honeybee stock, Menthol Crystals, Oil/grease patties, Amitraz, Formic Acid



# Virus Control Top Ten

1. **Control varroa mites**
2. Replace old frames and equipment
3. Keep populations in check
4. Limit the number of colonies per apiary
5. Clean tools and equipment
6. Keep healthy productive queens
7. Encourage propolis production
8. Work to maintain a sustainable apiary
9. Discourage robbing behavior
10. Find your support



# Deformed Wing Virus-A

---

- Direct correlation with varroa mite loads
- Strongly associated with winter losses
- Obvious field signs
- Closely related to DWV-B



# DWV-B

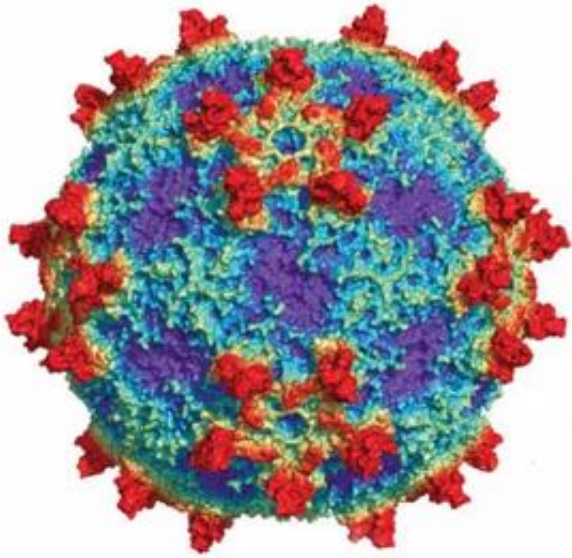
---

- Direct correlation with varroa mite loads
- Replicates within the mites
- Interventions: Monitor and treat for varroa mites



# Black Queen Cell Virus

- Mainly affects queen larvae
- Healthy colonies are usually able to control the virus
- Interventions: Sanitation between colonies, Requeening.



# Chronic Bee Paralysis Virus (CBPV)

Mimics pesticide injury

- Bees shake and tremble on landing board
- Bees fall in front of the hive and die
- Bees present as greasy and hairless

Can appear in colonies with good varroa control unlike ABPV, IABPV, and KBV.

May be caused by an infected queen and/or congestion

Interventions: Replace queen and reduce congestion



# Sacbrood Virus

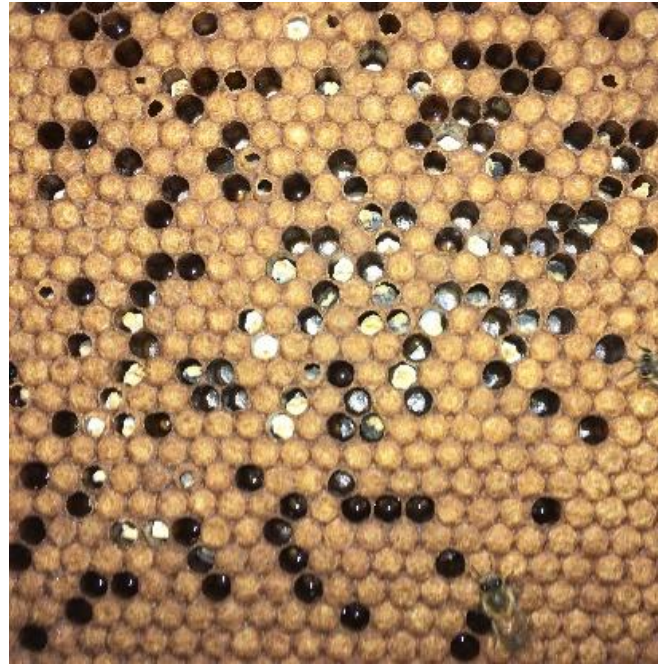
---

- Honey bees are usually able to control the virus
- Can become symptomatic with a variety of stressors such as:
  - High varroa mite load
  - Other infections
  - Poor nutrition
- Often the first virus to show signs.



# Chalkbrood

- Chalkbrood is caused by the fungus *Ascosphaera apis*. Infected brood turns hard and white, resembling a piece of chalk. Fruiting bodies make the mummies develop brown or black coloration.
- Chalkbrood mummies can be observed in the brood cells, on the bottom board, or on the ground in front of the hive.
- Chalkbrood can be managed by requeening and ensuring colonies are strong and housed in dry hives.

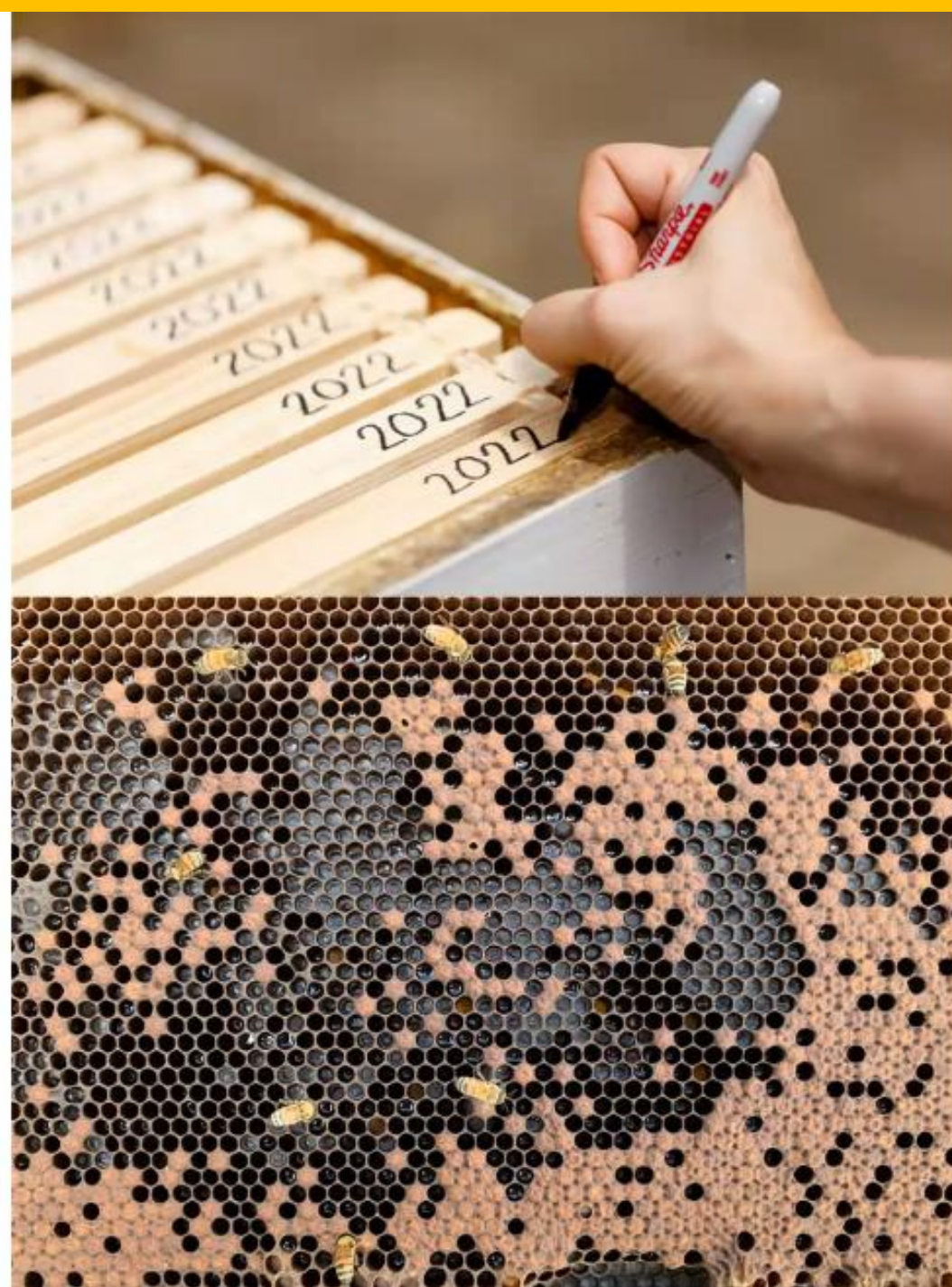


# Frame Replacement

---

Replace old frames to reduce naturally-accruing microbes, plant toxins and man-made pesticides.

- Look for entombed pollen
- Dark wax
- Frames older than 5 years
- Consider cleaning old woodenware
  - Vinegar
  - Wood bleach
  - Charring

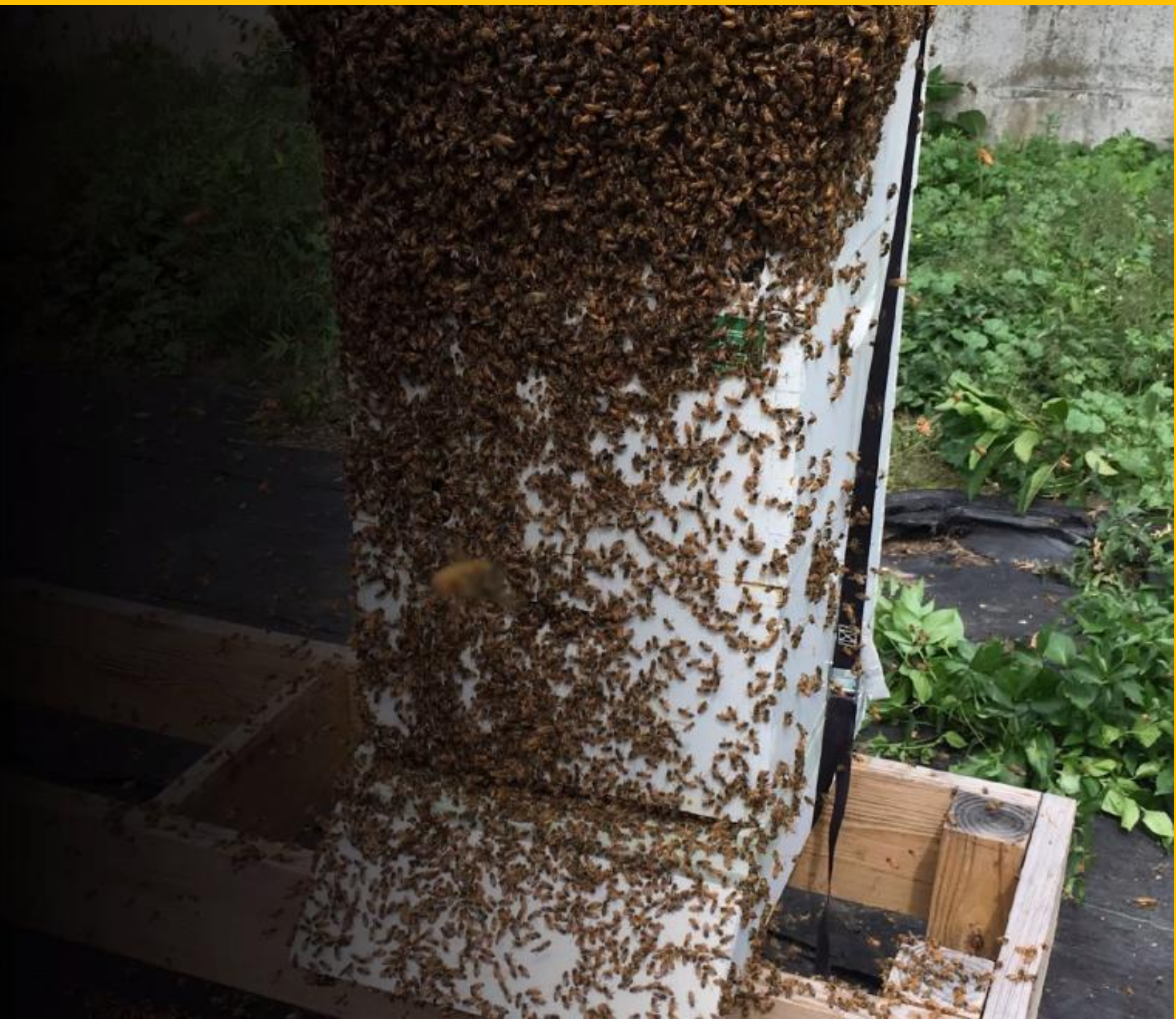


# Control Population

---

Large populations are destined for failure

- Difficult to control varroa
- Difficult to inspect properly





## Limit Number of Colonies Per Apiary

- Less competition for quality natural forage
- Reduce drift
- Less potential for robbing

# Clean tools and Equipment

---

- Consider disposable gloves
- Wash protective clothing
  - Gloves
  - Suit
  - Veil
- Scorch or bleach hive tool
- Avoid sharing equipment



# Keep Healthy Productive queens

---

- Poor queens add stress
- Queens transmit virus
  - Drone to queen
  - Queen to egg
- Consider resistant stock
- Consider local stock





## Colony Hygienic Behaviors

- Use of propolis
- Cleaning and grooming
- Removal of sick and dead bees and brood
- Guarding the colony

# Pests



- Small

- Wax Moths
- Hive Beetles
- Ants
- Tripilaelaps Mites (on the horizon - keep an eye out)

- Medium

- Opossum
- Raccoon
- Skunk
- Mice

- HUGE

- Bear

# Find your Support!



- Mentors
- Apiary Inspectors
- Viral testing Labs: USDA MD Beltsville Lab

# BEEKEEPER HYGINE

1. Good Bee Nutrition – Carbs and Protein...*Balanced Bee-Food-Pyramid*
2. Strong & Hygenic Queen – SEE #8
3. Wash your stuff & Sterilize it between Apiaries
4. NEW Comb!!! = Specifically brood comb – Rotate it and change frames every 3-5 years
  - **IF YOUR FRAMES ARE ALL BROWN AND BLACK ...**
  - **THEY SHOULD GO ON THE BURN IT STACK**
5. Consider a Single Brood Box
  - Pros and Cons - configurations seem to have lower mite populations, but are more common to swarm, may *have trouble with queen introduction*, and generally require a higher level of attentiveness vs Double Deep Brood Box Configurations.
6. Encourage Propolis Production – rough up (with rasp, rotary wire brush, or other tool) the inside of your hive boxes to “annoy” your bees – so they’ll propolize the inside of the hive, not just the seams.
7. Limit your hives within an apiary – too many and they’ll compete for resources and encourage robbing threats
8. Get northern raised, overwintered, mite-hygienic queens
9. Varroa testing and treatment throughout the year. Early and Often