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Cover designed by Artist Kayla O'Neal. See page 7 for author biography.



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By John Martin



# Bee Culture®

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## Letter to the Editor

Dear Editor,  
*Discovering Stingless Bees in Cuba*

Before COVID hit I had sent a deposit for a Beekeepers' tour of Cuba. It was canceled and then I hadn't really thought about it.

But here it is six years later and I decided to take a "cultural" trip to Cuba.

I had been attracted to the Island for many reasons: culture of the area, food, agriculture, pirates and historic mob activities.

Arriving on a Friday morning at Jose Marti International Airport, I was met by my guide Ivan and our blue 1952 Chevy taxi.

We made a couple cultural stops on our way to my apartment and I casually mentioned to Ivan that I was interested in honey bees.

Ivan related that a friend had just introduced him to a beekeeper and he had visited his place. He said he would see what he could do to set something up.

My hopes were realized on Sunday morning when we set off for the "Las Terrazas" biosphere. Here our local guide showed us around the abandoned coffee plantation. Then we visited the local beekeeper, who lives with his mother who started with the stingless bees years ago. These bees are about a third the size of "our" bees and are kept in frameless hives about the size of a five frame medium nuc. They both were very informative and let us taste the honey and pollen of their bees through hollow plant stems. The taste was infused with the taste of many tropical plants.

After we left the beekeepers we visited the local "farm to table"

restaurant on the same property. We had a great lunch and here the waiter also had stingless bees and several customers were sampling their honey!

In conclusion, I would like to let others know what an interesting and informative trip this was. I never dreamed I would have the opportunity to investigate stingless bees or Cuba in this lifetime.

For further information contact [info@culturalislandtravel.com](mailto:info@culturalislandtravel.com)

Neil Brunner

## Compliments to Nina

Hi Ms. Bagley,

I hope you are well. I have been following you for a few years now. I'm a beekeeper in NE Ohio, east of Cleveland. I've absolutely loved your articles on women in beekeeping. They're always fascinating to me. I just wanted to reach out, tell you I'm a fan.

Regards,  
Greg

**"Hive with comb and ping pong ball shaped spirals that bees fill with nectar or pollen." Photo by: Ivan Leon**



**"Close up of hive interior with bees in various states of development." Photo by: Ivan Leon**



# Book Reviews

Dewey M. Caron

## Beekeeping: A Practical Guide for Considerate Beekeepers



*Beekeeping: A Practical Guide for Considerate Beekeepers* (Crowood Press) is an informative book by two well-known, respected English beekeepers Martin Hann and Clare Densley. It is written “for beekeepers with a few years of experience in basic seasonal management who want to work with their bees using a more flexible, realistic and responsive style of management.” As such it does not cover all aspects of beekeeping – it concentrates on swarming (Chapter 4, Normal Swarming and Chapter 5, Atypical Swarming) and queens (Chapter 3, Making sense of Queen Cells and Chapter 6, Simple Queen Rearing and Queen Introduction). It covers them very thoroughly.

Chapter 1 is an UK centric introduction to beekeeping history with a wider sense of how we have evolved as beekeepers. Illustrations are well done with several illustrations of how we used to keep bees. Chapter 2, although sparse, has two sections of interest – Engaging with your Bees and Hive Inspections. Good information therein. Subheadings throughout the seven chapters make navigation very easy and facilitate return to sections of interest. Call-out boxes provide additional explanations. Each chapter has a helpful concluding summary.

Queens and swarming are thoroughly covered. Inexperienced beekeepers, as well as those with more

experience, in the dual topics of swarming and queens will find much material of interest. The authors say their “approach in the seven chapters is that beekeepers should emphasize working with bees natural instincts rather than imposing rigid management systems.” They introduce many aspects of what bees do naturally and how our management might be adopted. I like their one sentence description in introducing swarming, “Honey bees have evolved to swarm and it’s part of their success as a species, but for many beekeepers it appears to be an activity sent by the devil to annoy and torment them all season long.”

There are sparse references to additional literature; the index is adequate. There are two curious appendix chapters, What is Epigenetics and What are Pheromones. The author’s approach in the seven chapters is that beekeepers should emphasize working with bees natural instincts rather than imposing rigid management systems. Beekeepers will generally find this book a valuable addition to your library.

## Bottom-Up Beekeeping: Learning from the Debris on the Hive Floor



The second book is by Scottish beekeeper Ray Baxter. If you use a sticky board, have you look at hive debris and wonder what you are looking at? Ray Baxter is such a

beekeeper. He wondered if hive debris could tell him hive status and reduce his hive intervention, minimizing stress and disturbance to the bees and beekeeper.

In the second paragraph of the Introductory Chapter of **Bottom-Up Beekeeping Learning from the Debris on the Hive Floor** (2025, Northern Bee Books) author Baxter states “...before opening a hive, and certainly before moving any colony to my home apiary, the first thing I now do is look at the debris. It gives me the clues that I need to make judgments about the location of the colony, its size, the shape of the cluster, the history of the colony, colony activity, pests and parasites, and helps me to make informed hive intervention.”

The book is an interesting discussion of the potential if careful hive debris examination might reliability reveal hive conditions. The author, a hobby metal detector, feels his metal discoveries “tell of the past, revealing how humans lived and solved problems.” Bee hive waste, he believes, can tell “the story of bee behavior and the wider environment.”

The book describes hive debris collection monthly from the author’s AZ hive. The absolute delight of Bottom-up Beekeeping is the final Chapter 4. It is the story of hive debris of one colony for the entire year. But it is more – it is a prompt for further reading and best of all, a story of discovery. The author asks questions (not all answerable), about what he observed on the hive bottom board (using photos blown up and high school students to help sort) and what it might reveal about the colony.

He both weighed and used heat mapping to determine how much debris accumulated over the month and compared differences in monthly debris amounts. He describes the meaning of seeing bee eggs in debris, how bee body hairs (and structure of the bee foot) describes colony increase and with pollen analysis use of bee bread versus freshly collected pollen. And much more. A bee club could benefit from **Bottom-up Beekeeping**. Interested members might collect debris boards, bring them in monthly, and have the same type of discussion as author Baxter presents. All of us should consider using a hive debris board – it might reduce hive intervention and lower stress to our bees.





Photo By: Thomas Babcock

# Image Gallery

Hive Insulation,  
Covers, Protection



Top insulation is the most important thing. I now wrap and follow the condensing hive method. Photo By: Thomas Crawford

Too much heat and moisture is lost with upper entrances. Photo By: Thomas Crawford





# COVER ARTIST

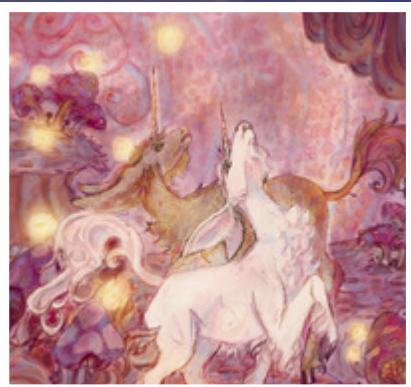
*Kayla O'Neal*



Kayla O'Neal is an artist who specializes in the art of storytelling. She has experience in multiple mediums including extensive experience in writing, layout design, illustration, digital painting, photography, and photo editing. Her art has been featured in international galleries, and she is a member of the Guild of Natural Science Illustrators and the Society of Children's Writers and Illustrators. She loves drawing all things nature based and taking on exciting new client work.

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Scan here to see more of Kayla's art!







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# NEXT MONTH

FEBRUARY

## Region 1

- Keep hive food stores (weight) consistent
- Check electric bear fence
- Start getting excited for Spring
- Assemble new frames and foundation
- Render old dark comb
- Put on insulation boards if you haven't already

## Region 2

- Check food stores and feed on warm days
- Assemble, paint, assemble, paint
- Mite wash
- Early inspection of queen as weather permits
- Order supplies for Spring
- Keep mite loads down with labeled products

## Region 3

- Spring is here in Louisiana! Make splits
- Equalize colonies, check for swarm cells
- Feed
- Mite checks and treatments
- Check colony weight (back hive lift)
- Combine queenless colonies

## Region 4

- Make sure they don't starve
- Make sure hives are wrapped
- Assemble frames
- Treat for mites with approved treatments
- Move snow away from entrances
- Feed anyway

## Region 5

- Make sure they have enough food stores
- Check hive wraps
- Don't use OA on a cold day
- Keep hives closed up and insulated...pray
- Don't let entrance get clogged up with snow
- Feed and feed some more

## Region 6

- Check for deadouts
- Feed hives that are light in weight
- Keep bears, teenagers and thieves away from hives
- Begin monitoring for swarming
- Feed to build up colonies
- Start assembling supers

## Region 7

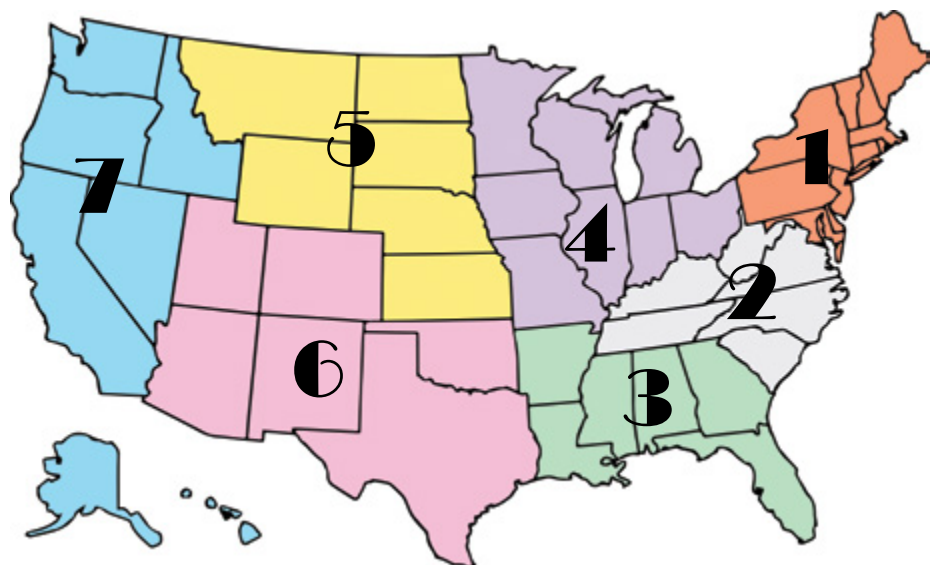
- Check food stores
- Check for moisture condensation
- Rodent watch...they chew
- Clear entrance of dead bees
- Clean up any Winter deadouts
- Feed to build up brood production

## Honey Reporters Wanted

We are expanding our Honey Reporter population in EVERY region. We ask that you fill in most of the sections, most months, and our short survey at the bottom. We give you a FREE subscription for your service. So if you are interested fill out the form <https://forms.gle/EnZW531NHM7sbMUz8> OR send an email to [Stephanie@BeeCulture.com](mailto:Stephanie@BeeCulture.com) and put REPORTER in the subject line. Include name, email, phone number and mailing address and we'll get you the next Honey Report form. Sign up today and be a part of the BEST Monthly Honey Price and Beekeeping Management Report in the industry.



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# JANUARY – REGIONAL HONEY PRICE REPORT

| REPORTING REGIONS                                                   |        |        |        |        |        |        |        |               |             |              | History           |                  |
|---------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|---------------|-------------|--------------|-------------------|------------------|
|                                                                     | 1      | 2      | 3      | 4      | 5      | 6      | 7      |               |             |              |                   |                  |
| <b>EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS</b>    |        |        |        |        |        |        |        | <b>Range</b>  | <b>Avg.</b> | <b>\$/lb</b> | <b>Last Month</b> | <b>Last Year</b> |
| 55 Gal. Drum, Light                                                 | 3.00   | 3.00   | 2.83   | 2.93   | 2.59   | 2.48   | 2.80   | 1.95-3.60     | 2.78        | 2.78         | 2.85              | 2.72             |
| 55 Gal. Drum, Ambr                                                  | -      | 3.03   | 2.76   | 3.13   | 2.50   | 2.50   | 2.65   | 2.00-3.60     | 2.84        | 2.84         | 2.87              | 2.76             |
| 60# Light (retail)                                                  | 240.00 | 338.33 | 250.80 | 252.17 | 251.67 | 218.87 | 350.00 | 150.00-480.00 | 264.96      | 4.42         | 263.24            | 257.10           |
| 60# Amber (retail)                                                  | 229.29 | 320.67 | 245.80 | 262.33 | 250.00 | 213.53 | 237.50 | 151.58-480.00 | 256.59      | 4.28         | 272.58            | 238.74           |
| <b>WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS</b> |        |        |        |        |        |        |        |               |             |              |                   |                  |
| 1/2# 24/case                                                        | 116.82 | 151.00 | 102.75 | 109.73 | -      | 108.00 | 240.00 | 84.00-240.00  | 123.17      | 10.26        | 117.03            | 109.17           |
| 1# 24/case                                                          | 183.04 | 240.40 | 170.17 | 154.95 | 181.42 | 143.92 | 444.00 | 96.00-480.00  | 190.23      | 7.93         | 199.46            | 168.87           |
| 2# 12/case                                                          | 173.30 | 213.25 | 161.50 | 156.55 | 173.76 | 216.00 | 324.00 | 90.00-350.00  | 179.25      | 7.47         | 165.43            | 140.83           |
| 12.oz. Plas. 24/cs                                                  | 145.87 | 195.33 | 128.67 | 120.40 | 121.32 | 138.48 | 120.00 | 94.80-250.00  | 140.14      | 7.79         | 150.86            | 131.33           |
| 5# 6/case                                                           | 178.62 | 284.00 | 178.00 | 145.11 | 153.24 | 270.00 | -      | 108.00-400.00 | 179.39      | 5.98         | 172.52            | 160.80           |
| Quarts 12/case                                                      | 142.50 | 225.00 | 210.50 | 189.73 | 195.30 | 233.50 | 384.00 | 110.00-600.00 | 219.49      | 6.10         | 212.92            | 223.99           |
| Pints 12/case                                                       | 210.00 | 173.50 | 144.00 | 145.97 | 162.00 | 162.00 | 191.00 | 84.00-288.00  | 166.49      | 9.25         | 133.37            | 140.45           |
| <b>RETAIL SHELF PRICES</b>                                          |        |        |        |        |        |        |        |               |             |              |                   |                  |
| 1/2#                                                                | 7.23   | 8.38   | 6.97   | 7.70   | 5.45   | 6.75   | 10.00  | 3.50-24.00    | 7.63        | 15.25        | 7.21              | 8.02             |
| 12 oz. Plastic                                                      | 9.54   | 11.86  | 9.01   | 8.24   | 7.08   | 7.50   | 11.00  | 4.59-19.00    | 9.51        | 12.68        | 9.33              | 8.70             |
| 1# Glass/Plastic                                                    | 13.15  | 13.92  | 12.84  | 10.60  | 11.69  | 12.14  | 17.60  | 6.00-32.00    | 12.85       | 12.85        | 12.03             | 11.70            |
| 2# Glass/Plastic                                                    | 21.50  | 22.83  | 21.69  | 18.41  | 20.27  | 20.00  | 28.00  | 10.89-40.00   | 21.37       | 10.69        | 20.76             | 19.89            |
| Pint                                                                | 14.39  | 18.56  | 13.72  | 13.47  | 17.75  | 18.33  | 17.00  | 8.00-38.00    | 15.85       | 10.56        | 15.63             | 14.62            |
| Quart                                                               | 23.53  | 29.18  | 26.23  | 25.10  | 21.72  | 30.75  | 31.75  | 11.20-55.00   | 26.56       | 8.85         | 27.16             | 24.70            |
| 5# Glass/Plastic                                                    | 42.50  | 41.00  | 38.82  | 33.24  | 30.93  | 32.50  | -      | 17.97-80.00   | 37.65       | 7.53         | 39.77             | 34.69            |
| 1# Cream                                                            | 14.89  | 17.14  | 16.10  | 14.00  | 9.99   | 20.00  | 14.00  | 8.00-25.00    | 15.42       | 15.42        | 14.67             | 14.19            |
| 1# Cut Comb                                                         | 16.46  | 18.20  | 18.80  | 18.17  | 11.99  | 15.00  | -      | 8.00-25.00    | 17.26       | 17.26        | 16.55             | 16.02            |
| Ross Round                                                          | 14.25  | 15.00  | -      | 15.00  | 18.00  | -      | 16.00  | 10.00-20.00   | 15.31       | 20.41        | 14.67             | 13.89            |
| Wholesale Wax (Lt)                                                  | 8.78   | 7.21   | 8.65   | 8.00   | 6.33   | 4.50   | 4.50   | 4.50-10.00    | 7.77        | -            | 7.70              | 7.45             |
| Wholesale Wax (Dk)                                                  | 7.75   | 6.60   | 7.75   | 8.00   | 6.00   | 4.00   | -      | 4.00-10.00    | 7.25        | -            | 6.79              | 6.21             |
| Pollination Fee/Col.                                                | 65.00  | 78.00  | 93.80  | 162.50 | 200.00 | -      | 52.50  | 50.00-200.00  | 101.06      | -            | 104.99            | 104.69           |
| Price of Nucs                                                       | 177.21 | 210.00 | 199.00 | 165.83 | 197.50 | 225.00 | 225.00 | 125.00-243.00 | 190.55      | -            | 192.37            | 185.33           |
| Price of Packages                                                   | 177.50 | 137.50 | 137.50 | 148.33 | 165.00 | -      | -      | 100.00-200.00 | 157.50      | -            | 146.84            | 144.75           |

Please note: anywhere within each region that there is a ‘-’ it is because no information was sent to us for that specific item in that region.

**How do you compare to our honey reporters? All data collected is from October/November 2025.**

## Average Honey Flow Time and Amount per Region

Region 1:

Timing of Flow: Normal

Amount of Flow: Equally light, average, and none

Region 2:

Timing of Flow: Normal

Amount of Flow: Average

Region 3:

Timing of Flow: Normal

Amount of Flow: Average

Region 4:

Timing of Flow: Normal

Amount of Flow: Light

Region 5:

Timing of Flow: Equally normal, late and none

Amount of Flow: Light

Region 6:

Timing of Flow: Normal

Amount of Flow: Average

Region 7:

Timing of Flow: Equally normal and none

Amount of Flow: Equally average and none

## Mite Treatment per Region

Region 1: Most used either an

Unspecified Oxalic Acid product or a Formic product.

Region 2: Most used no mite treatment.

Region 3: Most used no mite treatment.

Region 4: Most used either an

Unspecified Oxalic Acid product or no mite treatment.

Region 5: Most used another type of mite treatment.

Region 6: Most used an Unspecified Oxalic Acid product.

Region 7: Most used either an

Unspecified Oxalic Vapor product or no mite treatment.

## Top Blossoming Plants per Region

Region 1: Aster, Goldenrod

Region 2: Goldenrod, Aster

Region 3: Goldenrod, Aster, Spanish Needle

Region 4: Aster

Region 5: Not enough data was provided to conclusively decide what the top blossoming plants were in this region.

Region 6: Not enough data was provided to conclusively decide what the top blossoming plants were in this region.

Region 7: Not enough data was provided to conclusively decide what the top blossoming plants were in this region.

## Overall Top Blossoming Plants

Aster, Goldenrod, Sunflower, Sedum, Clover, Spanish Needle, Ragweed



# FOUND IN TRANSLATION



## *Bee Genes: Stayin' Alive* Jay Evans, USDA Beltsville Bee Lab



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<https://beeculture.com/found-in-translation-73/>

Like master gardeners scouring seed catalogues, many beekeepers spend their Winters pondering honey bee genetics. Practically, this involves comparing tried-and-true versus new places to send their cash for queens used in Spring packages and splits. With a four-fold range in queen prices, and an even greater economic difference between a flourishing or dead colony, these decisions are not trivial. Fortunately, the options for queen stock are diverse and expanding, thanks to established juggernauts as well as innovative local breeders in almost every state. This essay will not compare and contrast those queen producers (I can't do that) but it will describe some of the tires you might kick as well as the basis behind developing selected breeding stock. I will also highlight some new resources for those among you engaged in selecting and producing queens.

I love many of the longtime queen-breeding families (again, can't

name names) and you really can't go wrong buying stock from any of those, especially if they advertise sustainable queen production and a honey bee lineage you favor. At the same time, it is heartening to see new and old coalitions of queen breeders intent on helping each other and the industry, despite being in competition for you, the queen-buying public.

One fantastic coalition for sharing insights and practices is the Adaptive Bee Breeders Alliance (<https://adaptivebeebreedersalliance.org/>), funded by donations and USDA's Sustainable Agriculture Research and Education program. There is a nice ABBA overview in the July 2025, issue of *Bee Culture* (pp. 68-71), written by queen-bee queen Melanie Kirby, and they have informative updates and outputs on social media as well. However, if you are interested in knowing all of the steps needed to develop and maintain selected bee stock, you will not waste a day

by watching and reading the ABBA annual reports and presentations at <https://projects.sare.org/project-reports/wrgr22-006/>. I know a lot of these folks, but was still blown away by the quality of these collaborations: the depth they are getting into for identifying resistance genes, the use of tools such as instrumental insemination and stock sharing, and the effort they are making to educate current and future queen breeders on what is working and what's to come. Truly fun to see this collaboration. ABBA is not unique, and you will see other creative souls working together to set guidelines for pushing queen breeding in the U.S.

**Queen cells. Photo Credit: Zachary Lamas**







**Queen cells.** Photo Credit: Zachary Lamas

So, what do these breeders focus on and what should you ask for from your own queen source? The two trending targets for stock selection are 1) individual and collective traits that adapt bees to specific climates and 2) traits that help bees resist or tolerate mites. After decades of public research and refinement from breeders, the tools used to identify and maintain these traits are now commonplace. Many breeders test their stock with one or multiple measures of disease resistance, with some going all the way to raise bees that have little or no management help in combating mites and other diseases. Breeding 'local' bees adapted to specific climates is a younger effort but one that has gained purchase worldwide, often via partnerships among competing local breeders keen on floating all boats a little higher. There are many groups and clubs focused on combining mite resistance traits with regional genetics, but I have truly enjoyed recent conversations with the Sustainable Beekeepers Guild of Michigan (<https://sbgmi.org/>) and learning about their Northern Queen Initiative. Like ABBA, their efforts reflect a mix of individual tried and true production efforts alongside serious efforts to corner tricky honey bee genetics via instrumental insemination and relentless book-

keeping. Most importantly for the queen-curious, they offer two free online expert classes in breeding and biology at the above website, as an entry for more in-depth study.

If you have joined the queen breeding game, or simply want to increase your knowledge of what it takes, there are three recent resources that are pretty essential. First on your reading list should be *Honey Bee Genetics and Breeding* (Wicwas Press; [www.wicwas.com](http://www.wicwas.com)) by Robert L. Page, Jr. This book nicely modernizes and simplifies a lifetime (or many!) of work focused on the hows and whys of collecting, maintaining, and sharing genetic traits that make quality queens. Pioneer queen breeder Susan Cobey crafted a great review of this book and its implications for breeders in *Bee Culture* (<https://beeculture.com/honey-bee-genetics-and-bee-breeding/>) that describes all that you will find.

A second huge resource, just published by a collection of scientists from the international Colony Loss Network COLOSS ([www.coloss.org](http://www.coloss.org)), gives some of the best new techniques for isolating genes and producing quality mated queens (Costa, C., Meixner, M., Carreck, N., Uzunov, A. and Büchler, R., 2025. Sustainable Honey Bee Breeding: A Scientific Guide for Future Beekeeping. <https://link.springer.com/book/10.1007/978-3-031-94204-4>). This 250-page book is heavy on field-relevant techniques for starting and running a queen-producing enterprise, arguing for better ways to assess traits, mate queens on the wing or inside, and score the resulting progeny. There is also an informative chapter weighing the relative costs of selection programs, disease treatments, and colony losses. The book ends with 20 pages of interviews with established queen breeders and researchers from around the world, itself a great read.

The last recent bee breeding resource might be a little niche, but if you are using instrumental insemination to push your breeding and production stock, Manuel Du and colleagues in Germany presented a nice modelling effort aimed at determining how best to plan bee parenthood (Du M, Bernstein R, Hoppe A. 2024. Comparison of pooled semen insemination and single colony insemination as sustainable honeybee breeding strategies. *R. Soc. Open Sci.* 11: 231556; <https://doi.org/10.1098/rsos.231556>). Their focus was on the sperm side and they relied on holistic measurements of queen breeding values. As a technical point, you can select either *individual* drones from 'high-value' colonies to collect sperm for individual matings with unrelated queens, or you can *pool* sperm from massive numbers

keeping. Most importantly for the queen-curious, they offer two free online expert classes in breeding and biology at the above website, as an entry for more in-depth study.





**Queen breeding luminaries.**  
Photo Credit: Jay Evans

of drones (100's) across multiple colonies into a desired source pool and then mate all of the queens in your operation with a drop from that pool. Their efforts suggest that mating queens with known small drone pools, then testing offspring of those matings for breeding traits, gave a significantly higher rate of genetic improvement. Since in the next generation the 'winners' of these one-source matings came from a smaller slice of genetics they warn against inbreeding, but your careful breeding books can minimize this. In the end, this method was viable with little inbreeding for 70 generations. On the sobering side, even the most efficient methods are predicted to take years or decades, even, to shift the population; bee selection is for patient souls.

Happy queen-shopping and good luck with them once they join your apiary next Spring! **BC**

**Tim Lawrence, Susan Cobey and Jay Evans**







# A Closer LOOK

## Drifting Of Bees

Clarence Collison

“When hives are arranged in repetitive patterns, bees drift to hives occupying similar positions in the pattern to their own. When hives are arranged in rows, bees from the center colonies drift more than those at the end, resulting in the latter colonies gaining numerically. In some circumstances, more bees drift to hives in one direction than in the opposite direction. Facing hives in different directions and painting them different colors considerably reduces drifting, the facing of hives in different directions being of the greater significance. Drifting varies considerably in different circumstances and may be extensive. Most of the bees which drift do so during their orientation flights and before they become regular foragers. An individual bee is more likely to drift from a small to a large colony than vice versa, but the greater number of bees flying from the large colonies may result in a net gain in bees by the smaller ones. Drones drift two to three times as frequently as workers. Bees emerging in August and September drift less than those emerging earlier in the year (Free, 1958).”

“Drifting of honey bees depends on the arrangement, the coloring of the hives and on various environmental factors. Bees are able to distinguish between related and non-related individuals, so one aim of this study was to determine whether drifting also depends on relatedness.

In addition, we wanted to examine whether there are differences in survival of drifted bees and non-drifted bees and to model the component of alien worker bees in a colony's population. We used two non-related strains of bees. The colonies stood in rows. Each of the colonies had two non-related neighbor colonies, except for the colonies on the ends of the rows. From each colony, 200 newly emerged bees were marked individually and 100 of them were reintroduced into their original colony (native bees) and 100 into a non-related neighboring colony (foreign bees). The marked bees were examined for presence on their 2<sup>nd</sup>, 6<sup>th</sup>, 9<sup>th</sup>, 16<sup>th</sup>, 25<sup>th</sup> and 34<sup>th</sup> day of life. Experiments were done in Summer and Fall. There was no difference in survival and the amount of drifting of native and foreign bees. We also found no differences in the number of drifting bees for the two non-related strains. The bees never preferred related colonies when drifting. Bees of strain 1 did not show any preferences. In two experiments significantly more bees of strain 2 drifted into colonies of strain 1. Most bees drifted into the neighboring colony next to the colony they left. In Summer significantly more bees that had drifted until their 9<sup>th</sup> day of life, survived until the 25<sup>th</sup> day than bees that did not drift until that day. In Fall we did not find this difference. This was true for bees of both strains. Our data support the results of Jay (1965), who found that more bees drift from a center colony to the end colonies of a row than vice versa. With a model we calculated the component of alien worker bees living in a colony's population. On average,  $22 \pm 3\%$  alien worker bees were calculated for edge and  $42 \pm 6\%$  for inner hives in a row in our first experiment (Summer). In a second experiment (fall) the components were  $13 \pm 1\%$  for the edge colonies and  $39 \pm 4\%$  for the inner colonies in the row. Drifting seems not to be influenced by relatedness and did not shorten the lifetime of the bees. This indicates a great tolerance against drifted bees and a high intermix of an apiary's population when no precautions to reduce drifting are taken (Peiffer and Crailsheim, 1998).”

“Wind direction and speed, and the distance of hives from wind-breaks, greatly affect the drifting of bees. Little drifting was found to occur when hives were within or near a windbreak, but much when they were 15 meters or more away. Entrance size had little or no effect on drifting. Bees drifted less between hives placed on a steep slope than between hives on level ground. There was no difference between the proportions of bees that drifted in May, June, July and August. More bees drifted from the center hive of a row to the end than vice versa (Jay, 1965).”

“There was no significant difference between honey yields from hives (in rows) which faced in the same direction and hives (in rows) which faced in different directions. The end colonies in rows of hives which faced in the same direction gained more bees and produced more honey than the center colonies, but they required frequent attention during the active season. Drifting was significantly greater along than between rows. Drifting also occurred from the back row to the front when two rows were placed near windbreaks, but there was no significant difference between the honey yields of the two rows. Drifting can be decreased in apiaries consisting of rows of hives by (1) spacing hives at least 9 meters apart, (2) spacing rows at least 18 meters apart, (3) facing hives in different directions, (4) placing colored boards above entrances, and by a combination of (3) and (4) (Jay, 1966).”





**Honey Bee.** Photo Credit: Public Domain, Kadri Puna, May 7, 2007. <https://en.wikipedia.org/w/index.php?curid=11108000>

"Five layouts of 4 colonies each, were arranged on pallets to determine the amount of drifting that occurs between the colonies of each layout and to determine the relative honey production of the colonies of these layouts. There was no significant difference in the number of marked bees that drifted within 4 of the layouts but there was a significant difference in the number of marked bees that drifted within each of these four layouts and a fifth layout, where the hive entrances faced inwards. However, there was no significant difference in total honey production between the five layouts. Further, there were no significant differences in total honey production of colonies according to their position (which includes the direction they faced) both within and between layouts (Jay and Dixon, 1988)."

"The behavioral patterns of nurse bees that had drifted into a neighboring colony differed from those of non-drifted sister bees of the same age living in the same colony. Drifted bees spent significantly more time inactive and performed brood care tasks less frequently. Our results show that drifted bees contribute less to the benefit of a colony but have no lower individual benefit and partly explain a prolonged longevity of drifted bees (Peiffer and Crailsheim, 1999)."

"Drifting, the phenomenon whereby workers from one colony find their way into a foreign colony, is widespread in social insects. In apiaries of the honey bee, orientation errors lead to high rates of worker drift. Given that *A. mellifera* workers in apiaries enter foreign colonies accidentally, do they continue to refrain from laying eggs in the foreign colony, or do they behave in their evolutionary interests and attempt to lay eggs? We propose two hypotheses: the "lost losers" hypothesis, where lost workers do not invest in personal reproduction, and the "lost social parasites" hypothesis, where lost workers detect that they are in a foreign colony and do invest in personal reproduction. Previous work has used complete ovary activation as an assay for testing whether workers invest in personal reproduction, but this may not detect subtle reproductive investments in queenright colonies. We instead look at the full range of ovary activation in natal and non-natal workers, because partial activation may signal preparation for future reproduction. We show that in queenright colonies, non-natal workers have the

same low degree of ovary activation as their natal counterparts, which supports the hypothesis that drifted bees are "lost losers" caught in an evolutionary trap (Smith and Loope, 2016)."

"Experiments were done in 1964 and 1968 in which honey yields were compared between groups of hives arranged in rows with entrances facing one direction (A) and groups arranged in rows with entrances facing different directions (B), or U formations (C). Due to severe drifting in the first group (A), honey yields in 15 test apiaries were greater when one or other of the latter two combinations were used; in 1964 the average production per hive was

12.1 kg greater in (B) and in 1968 it was 9.8 kg greater in (C), where drifting was reduced (Jay, 1969)."

"Worker bees learnt the color of their hive in the close vicinity to their hive entrance and took little or no notice of colors above the lower brood chamber. They orientated to a color below the entrance more than to a color above. They did not learn combinations of colors. They distinguished between certain symbols placed immediately above the hive entrance. They learnt the height of their hive and the height of its entrance above ground. More worker bees and drones from queenright colonies drifted to queenless than to queenright colonies. Drones expelled from queenright colonies did not drift to queenless colonies (Free and Spencer-Booth, 1961)."

"Marked drone honey bees of known age were introduced to queenright colonies of equal strength, in five different apiaries arranged in different patterns, in Manitoba, Canada. The extent of drone drifting was measured by counting marked drones in each colony. Most drones began drifting when 6–7 days old. The proportion of drones that drifted increased with age to a level of 50% at 15 days old. The proportion of drones older than 15 days that had drifted from the parent colony remained fairly constant (50–60%). Twenty one percent of the drones drifted more than once. Drones continued drifting after they had left their parent colonies, with the level of drift being fairly constant in all age groups of drones. At distances greater than 50 meters, drone drift decreased with increased spacing between colonies. No drones drifted between colonies that were spaced more than 150 meters apart unless other colonies were present at intermediate distances. Drone drift between hives with colored entrances, offset entrances or laid out in horseshoe formations did not differ significantly from colonies arranged in straight rows. Drift between hives in a pair was significantly lower than that within rows of five hives, when drones were 7–10 and 14–16 days old. Drift from colonies at the ends of rows was not significantly different from drift from colonies in the middle of rows. There was no apparent tendency for drifting drones to collect in the colonies at both ends of a row. There was, however, a significant directional effect in which more drones drifted towards the south than towards the north, in west-facing rows. None of the apiary designs tested



can be recommended for reducing drifting of drones in commercial apiaries (Currie and Jay, 1991a)."

"During mating flights, some honey bee queens are lost due to predation or because of mistakes they make when trying to find their way back to their nests. The purpose of this study was to investigate the factors affecting the drifting of queen bees. Italian and Carniolan queens spaced in different hive, long hive, and mating nucleus layouts, were examined. There were significantly more queens drifting during flights in colonies spaced in rows without landmarks, than in those colonies arranged in rows near trees or bushes. The smallest percent of lost queens was found in colonies in which the hives were irregularly placed facing different directions and near landmarks in the vicinity. Losses of queens from parent colonies with high worker activity at the entrances and very weak nuclei with a low activity of bees did not differ significantly. Parent and nucleus colonies were located in the same long hives with entrances in the same direction. In this study, the effect of colony strength (more than 30,000 or about 1000 bees) on loss of queens during mating flights was not shown. No significant differences were found between the drifting of Italian and Carniolan queen bees. I found that queens returning from flights can be accepted and start oviposition in foreign colonies; probably, the acceptance happens when the foreign colony had lost its own queen (Gabka, 2018)."

"Drones were marked individually with numbered tags and introduced into pairs of hives that were spaced 1 meter apart facing south. The queen state of one colony in each pair was altered (ie with a caged-virgin queen, caged-mated queen, mated-laying queen, queenless or pheromone trans-9-oxodecenoic acid) and the other member of the pair remained queenright. Drifting of 4 independent age groups of drones (5-10, 10-15, 15-20 and 20-25-days old) was studied. A higher proportion of drones drifted to colonies with caged-virgin queens or to colonies with lures containing a component of the virgin queen's pheromone, trans-9-oxodec-2-enoic acid, than to either queenless colonies, queenright colonies or colonies with caged-mated queens. The proportion of drones that drifted to colonies containing virgin queens increased with the age of the drone. There was a tendency for drones from queenright colonies to drift westward. This appears to have masked the attraction of drones to pairs of hives that had the pheromone or virgin queen-treated colonies in the westerly position. Drift of drones away from colonies with virgin queens was not significantly lower than drift from either queenright or queenless colonies (Currie and Jay 1991b)."

"Nest drifting is often observed in honey bees and can be detrimental to neighboring colonies because it has the potential to increase disease transmission. However, the characteristics of drifting behavior over a honey bee's lifetime and the influence of parasitism on this phenomenon have been insufficiently investigated. Using optical bee counters, we tracked the drifting behavior of workers that were either infected with the parasite *Nosema ceranae* or uninfected. Approximately 10% of the tracked bees drifted into a foreign colony. The drifting prevalence was influenced by the colony's location in space but not by *N. ceranae* parasitism. However, the number and duration of drifts changed over the lifetime of the bees and the season, and parasitism had an effect on drifters, with

*Nosema*-infected bees performing more but shorter drifts. This phenomenon was more pronounced in old bees (+62 and -15% for the number and duration of drifts, respectively) and could potentially be explained by the energetic stress induced by the parasite. In conclusion, combining a detailed analysis of drifting behavior with the actual risk of newly established disease in colonies will benefit our knowledge of bee epidemiology (Bordier et al., 2017)." **BC**

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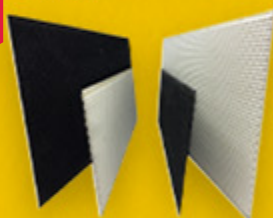
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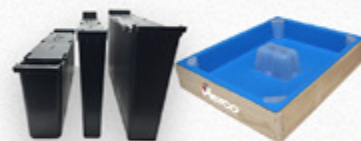
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# MORE AND MORE ABOUT LESS AND LESS

John Miller

KIM FLOTTUM, 2020



Photo Courtesy of John Miller

When Kim Flottum was *Bee Culture* editor (and good friend) he often said the above words. The decade from 2010 to 2019 was a good time to be in beekeeping. The supply of good bees for almond pollination was chasing the demand for good colonies of bees. Honey crops were not what they were in the 1990s, (and never will be), but beekeepers could sell their production. Variable costs like vehicle replacement, feed costs, and labor costs were within reason – now a distant memory.

We are in a doom loop it seems. Domestic honey prices are pressured by unrestrained imports, the transshippers and adulterants two steps ahead of the cops; every time, throughout time.

Production agriculture in general has been walloped by increasing costs as previously discussed. The heavy boot of regulation, imposing costs without providing benefits sets across our throat. In short, it is tough in Ag Country in the 2020's.

We can do better, even if we don't feel like doing better. As Kim

Flottum stated, it seems we know more and more about less and less. Our few remaining scientists drill into previously undiscovered realms of microbiology, gene editing, artificial insemination (the other A.I.).

I'm surprised when I hear dedicated scientists who went over a month without a paycheck: 'This isn't my first furlough rodeo.' We, all of us, have to keep pressing, improving. It is in the DNA of a Capitalist society.

Recently, among colleagues, we were puzzling over Winter losses; which have been mind-numbing lately. We know about 1/3 of U.S. colonies now winter indoors, maybe more.

Anecdotally, in November 2024, Indoor Storage Building (ISB) operators I called were getting cancellation calls from beekeepers who had **previously** reserved space, but no longer needed the space because colonies were already dead – prior to shipping to the ISB.

This was a **leading** indicator of the upcoming 2025 wreck – 60 days before the intensity of the die off was

known. In beekeeping, 60 days is a lot of time, and not a lot of time. In Spring, colony replacement takes about 60 days from date of nuc or package – to a functioning colony. That can be a long time. In Summer, a harvest flow may commence, peak, wane and conclude in 60 days; very often in less than 60 days. In the 60 days from January 15 to March 15 a big outfit can go from 20,000 colonies to 1,800 colonies; a calamity. There is no evidence an outfit can recover from 1,800 to 20,000 colonies in 60 days. We don't have enough data on how well **outdoor** wintered colonies compare to **indoor** wintered colonies.

Again, the leading indicator is % of reserved, rented IDS building space vs. the % of actual occupied ISB space. But, by when? Some ISB's are refrigerated with enormous chilling capacity. Some ISB's are not refrigerated, postponing loading dates until weather cools.

Refrigerated ISB's can start loading as early as October 15, storing colonies for up to 90 days, within the physiological tolerance an individual



honey bee can remain dormant.

ISBs that merely move un-refrigerated air through the air-handlers must wait, sometimes until December 1 to load.

Consider the cold Winters in Northern Europe, the sturdy tree wherein the colony overwinters, a single auger-hole sized opening below the cluster. Carbon dioxide levels within tolerances because bees have selected for appropriate 'indoor storage' trees for much longer than man has kept bees.

How do we tap into the ISB data? First, we need willing participants. The baseline premise is: Bees wintered indoors are better than bees wintered outdoors. We don't know – because no one is measuring – no one is asking – no one is participating. Are indoor stored bees empirically, statistically, demonstrably superior to outdoor bees? Some operators of ISB are well-known, but we don't know everyone operating an ISB.

Ashursts

Ron Talbot

Shawn Steele

Tim Kearns

Tenney Lemaroux

Dale Reisinger

Tony Noyes

Brownings

Jay Miller

Jason Miller

Chip Vannoy

Ryan Thomas

Ron Spears

Buzz Landon

Matt Doely

Scott Hamilton

James Masucci

Consider: if the combined square footage of ISB in America is 2,000,000'; and the average concentration of colonies in those buildings is 1.5 square feet per colony (made possible by stacking pallets 7 or 8 high) – the indoor storage capacity is 1,333,000 colonies. Sounds about right.

Building sizes vary from enormous to artisanal; the largest weighing in at a whopping 240,000' – smaller buildings run around 5,000 square feet. If the industry had early on adopted a standard model with standard refrigeration capacity – things would be a lot simpler; but we didn't and won't so each project is unique. But if we adopted a 20,000' building with 22' side walls, and 25' building crown, with drive-through design (safer) – those cookie cutter sized buildings housing 20,000 colonies or about 50 semi-loads of bees – construction cost savings would accrue by not re-inventing the building each time. Another story for another day.

But! Wait! We also know many ISB operators rent space to other beekeepers. Do beekeepers use the same practices prior to entering the ISB? No. Same inbound weights? Nope. Same 0-2 mites per hundred in the mite wash? Nope. Some colonies arrive with high mite counts; they are dead – they just don't know it yet. Others starve because feed is not expensive until withheld. The Best Management Practices to keep a hive alive are well known. Still, the renters variables (the bees) make

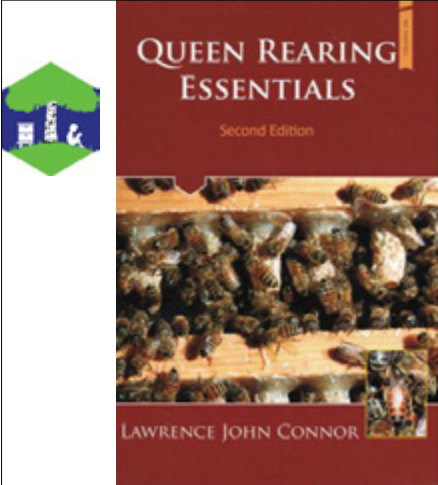
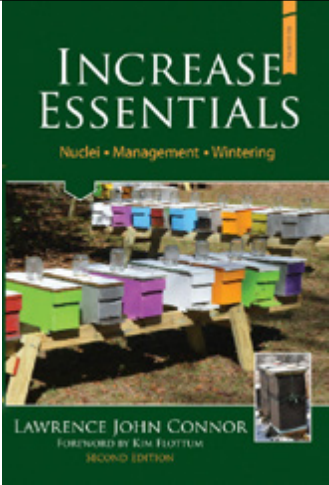
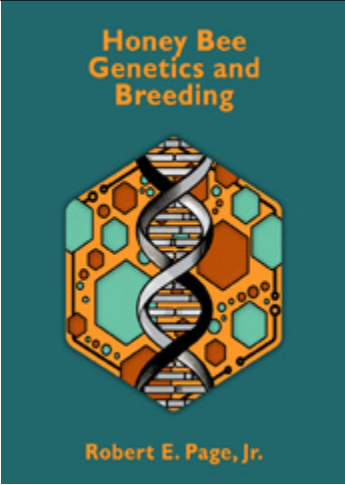
broad claims about ISB's superiority subject to further review. In addition, though the occupancy rate may be known – we have scant data on how those ISB colonies performed **after** departing the ISB. Another lift. Another inquiry. Oh, NO! Another survey!

Back to the above-named outfits. Many of those outfits attended the AHPA Annual meeting in Tampa, Florida recently. Prior to the meeting, emails went out to many of the outfits.

The ask is: How to improve ISB performance? How do we enhance the survival rate of bees wintering in ISBs? How can standards be adopted that will enhance colony survival and strength in the first, and second most important colony test in 2026 – the measured strength almond contract most big outfits now prefer. The most important test in 2026 will be the September 15 mite wash test.

The bigger question is – how do we emerge from this doom loop and re-orient to improving overwintering? How do we improve colony performance? We have good company, good examples of industry's pressing on in the face of poor prices (almonds) trade barriers (or lack of trade barriers) honey, global overproduction (blueberries). Yet these growers keep looking for better stock, better growing conditions, better bees, better margins.

Commercial Beekeeping is not exempt from these pressures. We need more, better data. **BC**

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# Humorous History: The Life and Times of Triple LLL

Stephen Bishop

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Lorenzo Lorraine Langstroth was the “Father of American Beekeeping.” He was born to his mother and father, “the Grandmother and Grandfather of American Beekeeping,” in 1810 in Philadelphia. He was the second of eight children, which just goes to show that being second inline isn’t always a bad spot to be in — his older brother quickly abdicated his responsibilities and duties to be the “Father of American Beekeeping,” so it fell on Lorenzo. Lorenzo was said to have had a “keen interest” in insects as a child. His parents took a tried-and-true method of trying to discourage his passion, to get him to play football or whatever sports they had back then, but strangely this only reinforced “his curious interest in the habit of ants.”

You never forget your first love, and for Lorenzo it was bugs. Sure, at the age of twenty-five, he married Miss A.M. Tucker of New Haven and eventually fathered three children, but as is usually the case, the wife and children are merely a sidenote to history, for the man had more important fathering to do, that of American Beekeeping. It should be noted, however, that his wife “helped” him in his experiments with hive designs, which says a lot for her — most wives (or at least mine) forbid their husbands from experimenting with hive designs in their presence. In that regard, Miss A.M. Tucker of New Haven certainly deserves to be called the “Mother of American Beekeeping,” but you rarely hear her credited as such.

Before getting married, Lorenzo attended Yale and majored in theological studies, which sounds pretty highfalutin, but you have to remember that back then Yale pretty much took anybody (at least any white protestant man) who could pay tuition. Lorenzo used his education

in theology to become a minister. But it also came in handy in beekeeping, especially when he got stung in the hand, as he was a lot better at resisting the temptation to say bad words. Back then people got stung a lot more because to inspect a colony, you more or less had to destroy a colony and the bees didn’t like that. It was a catch-22 to be sure.

Lorenzo experimented with many different ways to solve the problem of destroying the hive and tinkered with many different hive designs. For instance, in his journal, Lorenzo theorized about brick hives, which never really caught on. Lorenzo eventually settled on a wooden design and received a patent for the L.L. Langstroth Bee Hive on October 5th, 1852. It was a little over-engineered, with a hinged top and little legs like a coffee table, but the hive innards, ten moveable frames, were a breakthrough — that part of his design remains the basis for most modern hives.

Throughout his life Lorenzo struggled with “head troubles,” or what many people now suspect were depressive bouts of bipolar disorder. At times, he could be superhumanly productive — in 1853, he wrote his 400-page tome, *On the Hive and Honey-Bee*, in six months. At other times, his head troubles were so crippling that he had to resign his ministerial duties. For much of his life, bees were not only his passion, but his refuge. He was a voracious reader of bee books, most of which, at the time, were written in a foreign language. Back then there was no such thing as Google Translate, so he had to figure out the language and translate it himself.

Like many brilliant minds, Lorenzo reaped very little in terms of monetary rewards from his ideas — he spent much time and money fighting off patent infringement. Thankfully, he was a minister and knew that storing up treasures on earth was a fool’s errand. He lived to 85 and died in the pulpit, which is only fitting for a man whose book was considered the bible of modern beekeeping. Such high praise is no small compliment (though maybe a little treasure stored in a sock drawer would have been nice). **BC**

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## Building Canada's Honey Bee Self-Sufficiency: The ULaval-CRSAD Research Partnership

Andrée Rousseau<sup>1</sup> and Pierre Giovenazzo<sup>2</sup>

<sup>1</sup>Centre de recherche en sciences animales de Deschambault – CRSAD, <sup>2</sup>Université Laval

### Article Overview

This article presents the collaborative research program between Laval University (UL) and the Centre de recherche en sciences animales de Deschambault (CRSAD), highlighting how ongoing scientific projects contribute to increasing honey bee self-sufficiency in Canada. The article will describe the program's structure, its main research themes, and the practical outcomes for beekeepers and breeders.

### 1. Authors and Institutional Collaboration

- Pierre Giovenazzo – Full professor, Laval University

Over the past six years, our research has advanced honey bee breeding, health, and pollination management in Canada through a coordinated program of complementary projects in collaboration with the CRSAD, Canadian beekeepers and queen breeders, Québec low-bush blueberry farmers and many Canadian and international honey bee experts. These efforts address critical challenges facing the Canadian beekeeping industry, including queen failure, colony losses, disease pressures, and environmental stressors, while providing a foundation for sustainable, locally adapted honey bee populations essential for pollination services.

We have developed a northern-adapted breeding program implementing instrumental insemination, BLUP-based breeding values, and novel phenotypic assays for *varroa* resistance. These efforts have improved Winter survival, disease resistance, honey production, and queen longevity. Large-scale Winter queen banking has been optimized, maintaining the



Part of the ULaval-CRSAD team conducting hygienic testing in colonies  
(Photo Credit: S. Maucourt)

fertility and fecundity queens, supporting year-round availability of high-quality of Canadian raised honey bee stock. Network analyses of environmental and biological stressors have revealed the complex determinants of colony resilience, while precision beekeeping approaches integrating audio and environmental sensors allow accurate prediction of colony survival, population dynamics, and *Varroa* infestation.



Research on pollination services showed that honey bees providing blueberry pollination receive a limited and less nutritious diet. We identified optimal colony densities and worker-to-brood ratios that enhance wild blueberry crop productivity. Probiotic strategies based on endogenous and commercial strains increased Winter colony survival, mitigated *Nosema* ssp. infection and degraded pesticide residues, highlighting new avenues for improving colony health in agricultural environments. Throughout these projects, we have actively fostered equity, diversity, and inclusion in research and training. We have supervised and co-supervised more than 25 young researchers, including women, international students, and visible minorities.

- Andrée Rousseau – Researcher at CRSAD

The Deschambault Animal Science Research Centre (CRSAD) is a non-profit organization dedicated to research, development, and technology transfer in applied animal sciences. Through its specialized facilities, multidisciplinary team, and strong partnerships, CRSAD actively contributes to advancing innovation and sustainability in animal production systems. In close collaboration with Université Laval, CRSAD has led long-term research programs focused on honey bee genetics, queen breeding, and colony health. This partnership has generated significant advances in selective breeding and bee health management, supporting the resilience, productivity, and self-sufficiency of Québec's beekeeping sector.

Our research team includes myself as honey bee research scientist, three project managers — Georges Martin, Marilène Paillard, and Laurence Plamondon — and three beekeeping technicians — Michael Benoit, Jose Chach, and Emma Juarez. The team brings together many years of experience in honey bee research and manages 400 to 500 research colonies across the Portneuf region. Together, we operate a queen-rearing centre and conduct applied research in genetic selection, honey bee health, colony management, nutrition, and pollination to advance sustainable beekeeping practices and strengthen Québec's apiculture sector.

In addition, CRSAD benefits from a dedicated Tech Transfer Team



Sampling in colonies for ApiOmic genomic analyses (Photo Credit: A. Rousseau)

Drone traps to sample at the drone congregation area (Photo Credit: O. Baudet)





composed of Martine Bernier, Sara Bouaziz, and Marilène Paillard, whose mission is to ensure that research results are effectively communicated and applied within the beekeeping industry. The team also supports beekeepers directly through start-up assistance, pathogen monitoring, and tailored technical guidance. In her role as Development Officer for Québec's Beekeeping Industry Table (Table filière apicole), Marilène Paillard acts as a liaison between sector stakeholders to identify and address emerging needs. Their work plays a vital role in connecting science and practice to foster innovation across Québec's beekeeping community.

## **2. Research Activities:**

### **Focus on Increasing Honey Bee Self-Sufficiency in Canada**

#### **2.1. CRSAD/UL Breeding Program**

Each year our Canadian beekeeping industry produces nearly 75 million pounds of honey worth \$253 million and offers pollination

services that make an annual contribution to agricultural crops, such as canola and blueberries, worth an estimated \$4.5–6.1 billion. Unfortunately, since the last 15 years, beekeepers suffer an average Winter colony loss of 26%. The highest ever recorded loss occurred during Winter 2022, when beekeepers across Canada lost 46% of their 800,000 colonies and imported 360,000 queens and 60,000 packages of bees from various countries to rebuild their honey bee livestock. Supporting the Canadian honey bee queen rearing and breeding is therefore a sustainable solution to achieve Canadian honey bee stock self-sufficiency. CRSAD/Université Laval has been conducting a honey bee breeding program since 2010, achieving significant genetic progress on several traits of interest to beekeepers (Maucourt et al., 2021, <https://doi.org/10.3390/agriculture11060535>).

Our most recent project, ApiOmic (Genome Canada, 2024–2028) establishes a genomic honey bee breeding program to produce honey bee stock that is Winter hardy, productive and disease resistant. This ensures efficient pollination services, superior honey production and increased sustainability for the Canadian beekeeping industry. By combining optimized DNA sampling with cutting-edge genomic tools (the Illumina 100K SNP honey bee array, PacBio and Nanopore), we improve phenotypic evaluations, account for environmental variability, accelerate selection, and support the production of resilient, high-performing locally bred queens. This makes our team the first in North America to deploy genomics at this scale in honey bee breeding.

ApiOmic is structured around three related activities. Activity 1 is the main honey bee breeding activity that will drive activities 2 and 3. The goal of Activity 1 (post doc fellow, Dr. Ségolène Maucourt) is to implement genomic selection in our honey bee breeding program. Each year we will select breeder colonies using genomic breeding values calculated with the genotyping results

*A modified frame with 40 queens individually caged (20 queens per side; Photo Credit: A Rousseau)*





of the Illumina honey bee array and follow the genetic progress. Activity 2 will contribute knowledge that will optimize honey bee colony DNA sampling (Master student Émilie Dallaire and doctoral student Laurence Plamondon). Activity 3 will focus on the impact of male genetic diversity and the study of paternal control efficiency within the breeding program (doctoral student Andrée Rousseau).

## 2.2 Queen Production and Quality

At CRSAD, queen production is conducted in a dedicated queen-rearing centre that supports both research and applied development. Each year, between 600 and 800 queens are produced, the majority of which are used within the selection breeding program. As part of this program, 180 queens are evaluated annually at CRSAD and another 180 queens are assessed by six collaborating queen breeders across Québec. These evaluations contribute to the improvement of locally adapted genetic lines, focusing on productivity, gentleness, overwintering success, and disease resistance.

Since 2018, the team has been developing an innovative indoor queen-banking overwintering technique that maintains 70–85% queen survival from October to April, providing a large supply of locally produced queens in early spring when demand is high. The development of this method has allowed CRSAD to identify the key factors required for successful overwintering, including optimal temperature control, queen density per bank, bank size, feeding strategies, *varroa* mite treatments, and the precautions to be taken when using queens in Spring (Rousseau and Giovenazzo, 2021, <https://doi.org/10.3390/agriculture11050402>; Levesque et al., 2022, <https://doi.org/10.1080/00218839.2022.2126613>). This technique represents a major step forward in improving early-season queen availability in Canada, reducing dependence on imports, and strengthening the autonomy and resilience of the Canadian beekeeping sector.

As part of this research, Camila Perera Perez is studying the impact of nutritional supplementation on worker immunity and physiology during overwintering in honey bee queen banks, helping to better understand

the physiological mechanisms that influence queen survival under controlled Winter conditions. In parallel, Marie-Lou Morin's Ph.D. project examines the influence of nutrition and genetics on honey bee queen production and quality, with the goal of improving queen rearing outcomes.

Together, these research efforts contribute to advancing scientific knowledge on honey bee nutrition, queen physiology, and colony management, while supporting the long-term goal of producing high-quality, locally adapted queens suited to Canadian beekeeping conditions.

## 2.3 Pollination Research

Our most recent project, ApiBleuMax (2022-2025), used an integrated scientific approach to evaluate the contribution of commercial pollinators bees (*Apis mellifera*), bumblebees (*Bombus impatiens*) and leaf cutter bees (*Megachile rotundata*) to lowbush blueberry production in the Saguenay-Lac-Saint-Jean region. A historical analysis (2015–2021) confirmed that blueberry yield increases with both pollinator density and diversity, suggesting current pollination recommendations should be revised upward (Levesque et al., 2025, <https://doi.org/10.1093/jee/toaf242>). Field studies on *Bombus impatiens* and honey bees revealed that early colony deployment, sunlight protection, and optimal brood-worker ratios significantly enhance foraging efficiency and fruit yield (Robert MSc thesis, 2025; Ménard MSc thesis, 2024; Ménard et al., submitted ECONENT-2025-0372). However, high colony densities can negatively affect honey bee health by increasing *Varroa* infestations and DWV-B virus prevalence, though no pesticide-related effects were detected (Quiroga-Arcila PhD thesis, 2025; Quiroga-Arcila et al., 2025, <https://doi.org/10.1080/15538362.2025.2534352>; Quiroga-Arcila et al., 2025, accepted TCE-2025-0048).



Honey bee colonies in blueberry field in Lac St-Jean (Photo Credit: A. Quiroga Arcila)

## 2.4 Varroa research

The “Brood Break and Organic Acid Application” project is part of a broader research effort aimed at developing strategies to control *Varroa* destructor earlier in the season in order to minimize its negative impacts on colony health (Laurence et al., 2024, <https://doi.org/10.1093/jisesa/ieae042>). This specific project focuses on developing an effective Summer control strategy by studying the combined effects of brood breaks and organic acid treatments. During the Summer months, controlling *Varroa* populations is particularly challenging because the mites reproduce inside capped brood cells, where they are protected from most treatments.

This study explores two complementary brood break methods: queen caging and the use of a queen ring that temporarily prevents the queen from laying eggs in brood cells. By inducing a brood break for a defined period, the reproductive cycle of the *Varroa* mite can be disrupted, thereby increasing the efficacy of organic acid treatments such as formic or oxalic acid. Conducted as part of the MSc project of Victoria Ferland, this research seeks to identify the optimal combination of brood break duration and treatment protocol that maximizes mite reduction while maintaining colony health and productivity.





A queen with a ring that prevents egg laying (Photo Credit: O. Beaudet)

Results from this study will provide beekeepers with a sustainable alternative for managing *varroa* populations during the Summer, reducing dependence on synthetic miticides and promoting healthier, more resilient colonies as part of an integrated pest management (IPM) strategy.

### 3. Conclusion

Our research activities strengthen collaboration between Laval University, the Centre de recherche en sciences animales de Deschambault (CRSAD) and the Canadian beekeeping industry. Importantly, they provide young researchers exceptional training opportunities in cutting-edge research, genomics, and applied apiculture, equipping a diverse and inclusive next generation of scientists to support the long-term sustainability of the Canadian beekeeping industry.

Don't miss our next article of **The U-Laval / CRSAD Series that will outline the workings of our Extension program.** [BC](#)



**Andrée Rousseau** is a honey bee research scientist at CRSAD since 2019 and a member of the apiculture research team since 2013. Her research focuses on factors affecting the production and quality of honey bee queens, and her Ph.D. project investigates the genetic diversity of drones under Professor Pierre Giovenazzo at Université Laval (Credit Photo: Marie-Lou Morin)



**Pierre Giovenazzo** received his Ph.D. in Veterinary Sciences from the University of Montréal, where he specialized in integrated pest management (IPM) strategies for *Varroa* mites. He is a Full Professor in the Department of Biology at Université Laval and held the Chair in Educational Leadership in Apicultural Science from 2016 to 2021. His research focuses on honey bee breeding, queen reproduction, pollination services, honey bee nutrition, and *Varroa* IPM strategies.



# I NEED TO FEED MORE THAN I THINK

James Masucci

I finally broke down and bought a hive scale. I wanted one to help me monitor the nectar flows. My hives are spread out in four counties, so I am not in constant monitoring mode. Cost and applicability has kept me from buying one. Most hive scales require a wifi connection, and those that don't are very pricey. But this year, after the black locust flow came 3 weeks early, I finally found one ([www.wifihivescale.com](http://www.wifihivescale.com)). It uses cellular connections but in a way that the monthly data costs are only \$2.00 per month. So I bought one to give it a test drive. It arrived too late to help me with the nectar flow, but recently, I gleaned some interesting information from it.

We all know that colonies require a certain amount of stored honey to get through the Winter. How much depends on where you are. But each Fall, we mix our sugar syrup and feed our hives until the top box is full, or whatever your criteria are. Those with experience, have feel for how much feed is needed. I, on the other hand, always wonder where all that sugar syrup goes. I usually plan on 3-4 feedings for my light hives (in 2 gallon feeders). But in the end, they always end up lighter than I want. That always brings me back to a beekeeper I worked with in Alberta several years

ago. After he pulls the honey, he feeds each colony 2- five gallon buckets of syrup, back-to-back. That's 100 pounds of syrup. Any hive that didn't take it all, he removed and destroyed. "Hives are like teenage boys. The only reason they don't eat food put in front of them is if they are sick."

So, this year, I have a hive scale and I recently fed that hive using my 2-gallon feeder. What I saw wasn't unexpected, really, but the magnitude was eye opening to see (for me). If you take a look at the data, you can see that for the week leading up to the feeding, the hive weight remained constant. A few days after the feeding, the hive weight also remained constant. What happened in between is what happened to the syrup I gave them.

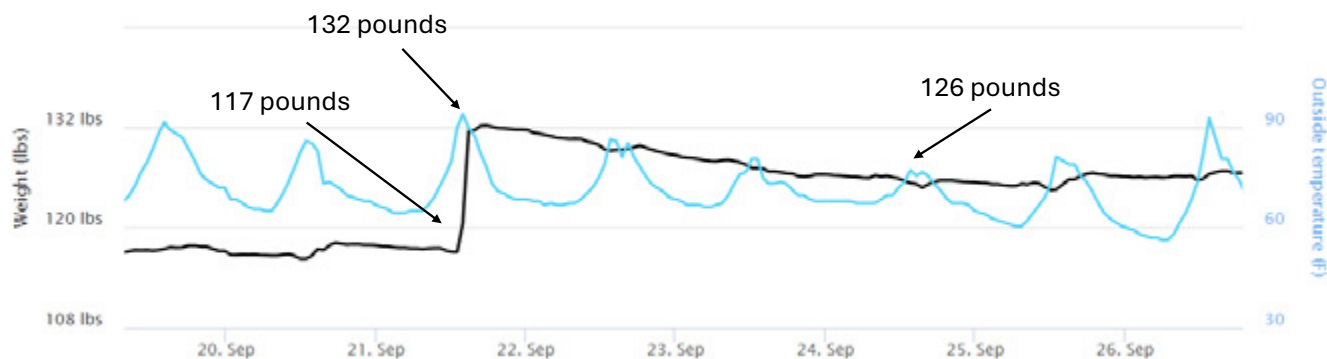
I ended up feeding about 15 pounds of syrup. Surprise #1, it was supposed to be a 2 gallon feeder, which should be 20 pounds. So, I am feeding 25% less than I thought. Surprise #2, I lost 6 pounds of the syrup in two days. That's 40% of the syrup gone, presumably from the bees drying it down. Processing the syrup and drying it down is expected, I just didn't realize how much. The bees are basically storing 60% of the weight that I am giving them and I am giving them less than I thought.

No wonder I have a hard time filling them up!

I can use this information to give me some feeding "guidelines". Going back to the Alberta beekeeper, when he feeds 100 pounds of syrup, he is basically giving them 60 pounds of Winter stores. For me, with my feeders, I know I am adding about 9 pounds of Winter stores per feeding. I also have some idea how heavy I want them to be. That means I can estimate how many feedings I need and it tells me that three feedings are not enough for my light hives. I probably need 4-5.

It wonder, instead of talking about gallons of syrup fed, maybe we should talk in terms of pounds of sugar fed? I am feeding 1:1 syrup. 15 pounds of a 1:1 syrup is about 7.5 pounds of sugar. That much sugar in 9 pounds of processed syrup means the bees are drying it down to 16.7% moisture (what a surprise...just like nectar!). If I was feeding 2:1 syrup, I would have fed them 10 pounds of sugar in 15 pound of syrup. Assuming they dried that down to 16.7% moisture, then I would have added 11.8 pound of Winter stores per feeding. Maybe I need a calculator in my apiaries, or...maybe it's just easier to feed them until they are full. **BC**

**The fate of 1:1 syrup in the hive. On September 21, 15 pounds of sugar syrup was fed to the hive. After 2 days, the syrup lost 60% of its weight as it was dried down to approximately 16.7% moisture (calculated). Knowing how much moisture is lost can help us plan for the number of feedings we need to prepare our hives for Winter.**





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# New(ish) Beekeeper Column

## Off the Wahl Beekeeping UNDERSTANDING RESEARCH

Richard Wahl



<https://beeculture.com/off-the-wahl-beekeeping-48/> Listen along here!

### Intro

Quite often when new beekeepers go looking for information, they come across research papers filled with unfamiliar terms like *abstract*, *control*, *hypothesis*, *methods and materials*. It can feel like trying to read a foreign language. Understandably, many folks close the tab and turn instead to a forum or a YouTube video for advice. But, learning to read and understand research, even just at a basic level, can be one of the most useful skills a beekeeper can develop. My aim in this article is to clarify what some of the terms mean and to explain the research process as I came to understand it while teaching high school students. During the last six years of my teaching career, I was fortunate to teach at a magnet school. The school invited gifted students from surrounding rural districts to our accelerated science, technology, engineering, and mathematics (STEM) program for a half day of their studies while completing their other half day humanities course work at their home schools. Because we were able to cover all the STEM material in four days each week, all Wednesdays were devoted entirely to research projects.

I watched 16-year-olds wrestle with terms like *variables* and *literature review*, and other words that can make a beekeeper set aside a research paper. What the students learned, and what I learned teaching them, was that research is really just organized curiosity. It's the same instinct that makes us wonder why one hive swarms earlier than another, or whether that fancy new feeder is worth the money. The research process involves defining a topic and developing questions, reviewing existing literature, designing a study, collecting data, analyzing it for patterns, interpreting the results, and finally reporting and citing the findings. These steps are often iterative, meaning researchers may revisit earlier stages as their understanding evolves. What follows is a brief synopsis, the explanation and implementation, of the research process offered to help new and experienced beekeepers better understand the terms and steps they will encounter when reading a research document.

### Advantaged Beekeepers Understand Research

You might say, "Look, I only have two hives in the backyard and I'm not a scientist." Fair enough; but bees do not care if you have two colonies or two hundred. They are still responding to pests, weather, forage, and genetics in the same complex way that we are all trying to understand. Experienced beekeepers know they must keep adapting to new situations as advice changes constantly. Twenty years ago, powdered sugar dusting for *Varroa* mites was all the rage. Today, through experience and research, it has been found to be mostly ineffective. Understanding how research works helps you cut

through the clutter of opinions and fads and to find advice grounded in real evidence to support that advice. For example, a common recommendation is to add essential oils to your syrup. Some beekeepers swear their bees thrive on it, while others dismiss it as an unnecessary expense. Without research, it is just one person's word against another's. With research, you can see whether there are any previous trials (*literature reviews*) to see if measurable benefits exist, or whether the results found in that research simply do not hold up. That is the power of research as it provides credible evidence.

### The Abstract is the Road Map

One of the first intimidating words new readers encounter in a research paper is *abstract*. It sounds far more complicated than it really is. Think of it like the back-cover synopsis of a book, or a condensed preview that tells you what you're about to read in greater detail. The abstract is a short summary of what question the researchers asked, sometimes also known as the *hypothesis*, what was done, what was found, and what those findings might mean. For example, suppose a researcher wants to know whether screened bottom boards reduce mites. The abstract will spell out the basics which would include, how many colonies were tested (say fifty total), how they were divided (half with standard and half with screened bottom boards), and what was used as a *control*. In this case, the solid bottom boards act as the baseline, or control, while the screened boards are the *variable* being tested.



Hives with a mix of nucs as well as standard and screened bottom boards. Photo credit: Richard Wahl

The abstract also states how long the study ran and then presents the results. Perhaps the researcher observed about 15% fewer mites in colonies with screened bottom boards over an entire Summer season. That is the *data* collected over the period of the observation. From there, the researcher draws a *conclusion*, which is likewise summarized in the abstract. In this case the



researcher would conclude that screened bottom boards can help, but that they will not solve mite problems in and of themselves. The beauty of an abstract is that you get the main point of the research without wading through pages of technical language and charts. You do not need to be fluent in all the academic jargon, merely able to understand a few basic terms, to gain useful value out of what the study found. In other words, did the study support or refute the *hypothesis* that screened bottom boards help reduce mites?

### A Control Sets the Baseline

One of the most powerful but often overlooked ideas in science, and one many new beekeepers miss, is the *control*. A control is simply the facet in an experiment that does not get the new treatment or change. Think of it as your baseline, the steady yardstick against which everything else is measured. Without it, you cannot know whether the results you see are due to what you did or to something else entirely. Let's say you feed your bees a fancy protein patty in the Fall and they survive Winter as a strong colony. Was it the patties that made the difference, or would they have survived just as well without it? To know for sure, you would need a control group, colonies that did not get the patty. Then you could compare survival rates between the two groups. Without controls, you are left with guesswork, because bees can be influenced by weather, forage, mite levels, or just plain good luck. Controls strip away some of the external chaos and provide a clearer picture of whether the change you made, the *variable*, really matters.



Pollen patty in cellophane wrap used when pollen is scarce or needed. Photo credit: Dave Meyer 2022-01-15 09:46:03.

### The Moving Parts are Called Variables

If controls are the baseline, then *variables* are the moving parts of the research. Beekeeping is messy because so many variables can influence a hive, like weather, forage, genetics, pests and the list goes on. In research, those factors get sorted into categories. The *independent variable* is the one thing you purposely change, like deciding to add pollen patties. The *dependent variable* is what you measure in response, for example, how strong the colony is come Spring. Then there are controlled variables, which are all the other details you try to keep the same, like starting colony size, hive equipment, or location, so those other factors do not muddy the waters. Think of it like cooking chili; if you swap three spices and change the beans all at once, you won't know which change made it

taste better. The fewer uncontrolled variables you have in the mix, the clearer a picture the research results will provide.

### It Starts with a Hypothesis

A *hypothesis* is the question or supposition that research seeks to support or refute. It is a tentative, specific and testable prediction about the relationship between two or more variables, serving as a preliminary assumed answer to a research question that guides the entire study. Think of it as an educated guess such as, if I change element A, will result B happen? For instance, maybe you have noticed that one of your colonies builds up much faster every Spring than the others. You might wonder, "Is it because that hive gets more morning sun?" That thought, "I wonder if more sun makes a difference?" would form the basis of a hypothesis. However, to be useful in research, it has to be stated in a testable way. A proper form would be a statement or question such as, "Colonies that receive more morning sunlight will build up faster in Spring than colonies kept in shade." A hypothesis is not just a random idea but a prediction that can be measured. In beekeeping, nearly every management debate can be framed as a hypothesis. Some examples include, "Does insulation help?" or "Should I re-queen every year?" Choosing to insulate a hive or deciding not to re-queen one year become the variable to be tested. The changed condition, or the variable, that allows results to be measured.

### Methodology States the Methods and Materials Used

Once you have a hypothesis, you need a plan. That's where *methods* and *materials* come into play. If the hypothesis is the big idea, then the methods and materials are the nuts and bolts of the study, in other words, the "how" and the "with what". I like to think of them as the orchestration of the research. The materials are simply the stuff you used such as hives, bees, syrup, mite counters, or whatever tools were part of the works. Methods are the step-by-step directions; when you fed, how often you checked and how many colonies you worked with. Just like sharing notes from a hive inspection, the details matter. If you leave out whether you saw eggs or how many frames of brood were present, another beekeeper will not get the same picture or the same results that you did.

A solid methods section is detailed enough that another beekeeper could repeat the experiment and reasonably expect to see similar results. For example, let's say a study is testing Fall feeding. The methods might spell it out in this fashion. Twenty colonies were split into two equal groups; Group A received 2:1 sugar syrup weekly from September through October, while Group B received no supplemental feeding. Colony weight and brood area were measured twice a month. The more precise the instructions, the more confidence we can place in the results because we know exactly how the study was carried out. Sometimes a broader term, *methodology*, is used. This refers not only to the steps and materials, but also to the reasoning behind their use. Methodology explains why the experiment was designed in that way, and how the parts fit together. It is the framework that explains both the "what" and the "why" of the research process.

### Collecting Data is Gathering the Evidence

Once your inquiry is underway, you need *data*. Data

is just a structured word for *evidence*. It can be numerical; like mite counts, hive weights, brood area in square inches or simply observational, like whether the bees seem calm or hot-tempered. The trick is consistency. If you measure brood on one hive using “square inches” and in another using “frames covered,” the data will not compare. Likewise, if your measurements were taken once in April and again in July you have missed the story in between. Honest, consistent, repeated measurements are what make the data useful. I once had students tracking seed germination. The ones who measured every two days could chart accurate growth patterns. The ones who forgot and then guessed produced graphs full of gaps. The same applies to us beekeepers. Guessing at mite levels is not the same as actually counting them. Reliable data comes only from steady, repeatable observation.

### Facts That Happen Are the Results

The *results* section of a research paper simply lays out what happened. This is where all the planning, measuring and note-taking finally come together into a picture that others can see. Importantly, the results section should not tell you what to think. It simply reports the findings from the collected data. This information may appear as charts, graphs, percentages, or just tables of numbers. For beekeepers, results might show something like, “Colonies fed syrup weighed 20% more going into Winter than colonies that were not fed”, or “Screened bottom boards reduced mite levels by an average of 15%.” Notice that in the results, the researcher is not adding opinion. They are only reporting what was observed. It is like returning from a hive inspection and writing down exactly what you saw without speculating about why the bees behaved that way. Later, in the *discussion* and *conclusion*, the meaning of those results will be explored. But here, the focus is on putting the evidence on the table so everyone can see it clearly.

### The Discussion and Conclusion Make Sense of It All

The *discussion* and *conclusion* are where the researcher finally steps back to make sense of all those numbers, charts, and observations. If the results section is like writing down what you saw during a hive inspection, the discussion is the part where you ask, “So what does that mean for the health of my bees?” In this section, the researcher interprets the findings, compares them with other studies (*literature reviews*), and points out any limitations. For example, if colonies given pollen patties built up faster in the Spring, the discussion might explain that patties can provide a boost, but may only be effective when natural forage is scarce. The conclusion then ties everything together; summarizing the big picture and sometimes suggesting what beekeepers or future researchers could try next. In practical terms, this is the section that helps you decide whether the research offers something useful for your own beekeeping or if more testing is needed before changing your management practices.

### Replication is the Key to Reliable Research

Reliable research requires *replication* because one trial alone is never enough to be certain of the results. Bees and their environment are influenced by countless factors. Here come those variables again such as weather shifts, forage availability, or even queen temperament,

all of which can skew a single test. By repeating the same evaluation multiple times, or by having different researchers replicate studies under comparable conditions, confidence grows that the outcome is real and not just a fluke. For example, if several studies in different regions all show that Fall feeding improves colony survival, you can be far more confident in the practice than if only one beekeeper happened to get lucky. Replication is what turns an interesting observation into dependable knowledge and reliable evidence.

### Statistics or the Math Behind It All

*Statistics* may sound intimidating, but in research it is simply the math that helps separate real patterns from random chance. Bees are living creatures, and their behavior is naturally variable. One hive may thrive while another struggles for reasons we don’t fully understand or control. Statistics take all those numbers, like mite counts or colony weights; and help determine whether the differences between groups are meaningful or just coincidence. For example, if colonies fed syrup weighed more going into Winter, statistics can show whether that weight gain was likely caused by the feeding or if it could have happened by random variation. You do not need to do the math yourself, but knowing that a study used solid statistical methods should give you greater confidence that the results are reliable. As an aside, this was also where much of my high school students’ statistical mathematics education came into play. They learned to analyze their collected data using valid statistical methods.



Two hives belonging to a beginning beekeeper.  
Photo credit: Richard Wahl

### Bringing It Back to Your Bee Yard

The steps of research aren’t so different from what you’re already doing. It begins with defining a topic and asking questions, reviewing what’s known, designing a plan, collecting data, analyzing patterns, interpreting results, and sharing findings. These steps are often iterative as you circle back looking at new insights as they emerge. It is much like returning to the hive for subsequent inspections as the season unfolds. Even if you never publish a research paper, you can apply these principles in your own apiary. Every time you try something new, you are running a small experiment or conducting research. For example, if you wonder whether pollen patties help in late Winter, treat half your hives, leave half untreated, keep everything else the same, and see what happens.



Measure honestly, and you'll have your own mini-study to guide colony management. It won't be as airtight as a university trial with two hundred colonies, but it will be far better than relying on gut feeling alone.

As beekeepers, we are constantly balancing old traditions, club advice, internet debates, and new discoveries. Learning the language of research, those words like abstracts, hypotheses, methods, controls, and variables to name a few, gives you the tools to sort fact from opinion. You don't need a PhD to read a paper with confidence or to apply the same principles in your own bee yard. At its core, research is simply organized curiosity. It is the same process you use when you crack open a hive. You look, wonder, and test ideas against what you see. So next time you come across a research paper, do not be intimidated by the new vernacular. Behind all that formal structure is the same thing you do every time you do a hive inspection. You observe, you ask questions, and continue to try to

understand these remarkable honey bee creatures a little better. **BC**

Richard Wahl began learning beekeeping the hard way starting in 2010 with no mentor or club association and a swarm catch. He is now a self-sustainable hobby beekeeper since 2018, writing articles, giving lectures and teaching beginning honey bee husbandry and hive management.



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# *Tropilaelaps Mercedesae:* Europe, The United States, and Canada's Next Beekeeping Threat

Dr. Robert Owen

Initially detected in southern Russia in 2021, by 2024 *Tropilaelaps mercedesae* had also been discovered in Ukraine and Georgia (Figure 1) — bordering Turkey, Iran, and eastern Europe — has put European beekeepers on alert. This small parasitic mite, already infamous across Asia, is steadily advancing westward. With its proximity to Turkey and Europe, *Tropilaelaps* could reach Romania or Bulgaria within just a few years, threatening European beekeeping.

Researchers who have studied the mite describe it as even more destructive than *Varroa destructor*. Its biology and behavior differ in key ways, meaning that familiar *Varroa* control methods won't necessarily work. Two of the most promising approaches so far are extended queen isolation and formic acid treatments.

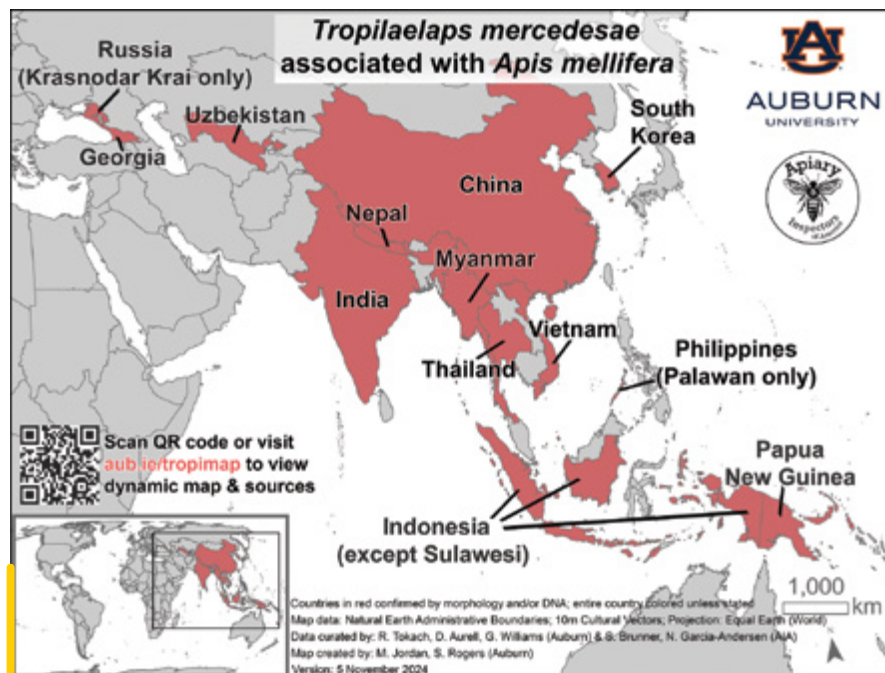
## Creating a Brood Break

Caging the queen for five to six weeks deprives *Tropilaelaps* of capped brood, which it needs to survive and reproduce. Unlike *Varroa*, which can live and feed on adult bees, *Tropilaelaps* cannot survive long outside brood cells — usually no more than five days. Once brood rearing stops, the existing capped cells emerge within about 24 days. Allowing another 10 to 12 days eliminates any remaining mites on comb surfaces. After roughly five weeks, most of the *Tropilaelaps* population has collapsed.

In Georgia, a country bordering southern Russia, Turkey, and Iran, this approach is practical because most commercial beekeepers manage fewer than 50 colonies. One enterprising beekeeper even offers a service to cage and release queens for a small fee per hive. For large commercial operations in Europe or North America, however, this technique would be far too labor-intensive, time consuming, and expensive.

## Why Formic Acid Works

Formic acid has proven to be one



**Figure 1:** *Tropilaelaps mercedesae* has migrated westwards from its natural home in South East Asia and has been detected in Georgia (far left of map). It is anticipated that the mite will reach eastern Europe in a few years, causing widespread colony deaths and economic losses. Diagram: Auburn University.

of the few effective chemical tools against *Tropilaelaps*. Its vapors can penetrate sealed brood cells, killing mites where they reproduce. By contrast, most miticides developed for *Varroa* target mites living on adult bees and rely on bee-to-bee contact to spread the active compound. Because *Tropilaelaps* spend nearly their entire life cycle under capped brood and rarely attach to adult bees, those traditional treatments have little impact.

The mite's thinner outer shell may also make it more sensitive to formic acid than *Varroa*. While formic acid requires careful handling, it offers one of the few currently practical ways to disrupt the *Tropilaelaps* life cycle.

## A Different Kind of Parasite

Although *Tropilaelaps* and *Varroa* mites look similar and share some behaviors, they are not close relatives. *Tropilaelaps* are true **phoretic** organisms — they use adult bees solely for transport and do not feed from them. *Varroa*, on the other

hand, are **ectoparasites**, living on adult bees and feeding from their tissues. *Tropilaelaps* can easily be separated from the *Varroa* mite using a ×10 magnifying glass. The body of the *Varroa* mite is wider than it is long and it moves slowly, whereas the body of *Tropilaelaps* is elongated, and it is a fast-moving mite (Figure 2).

This distinction matters for management. *Varroa*'s ability to survive on adult bees gives it a wider range of treatment vulnerabilities. Miticides inserted into a hive are carried on the body of adult bees where *Varroa* mites attached to the bees come into contact and, hopefully, are killed. Adult *Tropilaelaps*' outside capped cells rarely attach themselves to bees, instead moving independently on the comb surface. This makes attacking *Tropilaelaps* mites with miticides carried on the body of bees is largely ineffective.

Both species evolved separately but developed similar strategies to exploit honey bee colonies, a striking example of convergent evolution driv-





Figure 2: Size comparison of *Varroa* (L) and *Tropilaelaps* (R). FERA, UK.

en by the same ecological pressures.

Since *Tropilaelaps* has not reached Europe or North America, little research has been conducted on the mite and there is still a lot that we need to know, such as how it spreads between colonies, and the effectiveness of different management methods. We know that *Tropi*, as it is called, spreads attached to drifting bees, swarming, robbing, and absconding, but other transfer methods are still to be determined. *Tropi* spreads the same viruses as *Varroa*, particularly deformed wing and black queen cell viruses, as well as sack brood virus and the paralysis viruses.

### Double Trouble Ahead

The westward movement of *Tropilaelaps* is troubling news for European beekeepers. Colonies infested with the mite often collapse faster than those affected by *Varroa*. To make matters worse, *Tropilaelaps* populations in some Asian regions already show resistance to amitraz — one of the few synthetic miticides that still works against *Varroa*.

If the mite reaches Europe or North America, beekeepers could soon face the challenge of managing **two parasitic mites requiring different treatment schedules and**

**strategies.** This would increase labor demands, chemical use, and overall costs. For large-scale operations, the need to manage both pests simultaneously could raise production costs significantly and, in turn, drive up prices for honey and pollination services.

### Staying One Step Ahead

While *Tropilaelaps mercedesae* hasn't yet been found in Europe, its arrival seems likely. Early detection and preparation are crucial. Beekeepers should stay informed about research developments, monitor for unusual brood damage or emerging mite types, and remain cautious about imported bees, queens, and used beekeeping equipment.

For countries not yet facing the mite, preventive planning will pay off. That means educating inspectors and extension officers, training beekeepers to recognize early infestations, and testing control methods under local conditions before *Tropilaelaps* arrives.

The history of *Varroa destructor* offers a clear warning: once an invasive mite becomes established, eradication is virtually impossible. Effective management depends on awareness, rapid response, and coordination between researchers, regula-

tors, and the beekeeping community.

### The Takeaway

*Tropilaelaps mercedesae* poses one of the most serious emerging threats to global beekeeping. Its rapid reproductive cycle, limited vulnerability to many common miticides, and capacity for resistance development make it a formidable pest. If it continues spreading westward, beekeepers may soon find themselves fighting two major mites at once — each demanding a different strategy.

The best defence is vigilance. Know what to look for, stay updated on new management practices, and support cooperative research efforts across borders. The sooner the industry prepares, the better chance it has of keeping this destructive parasite under control. **BC**

Robert Owen is a beekeeper and author who writes on honey bee health, invasive species, and sustainable management practices. He has a PhD in *Varroa* management, and contributes regularly to international beekeeping publications. Dr. Owen is the author of *The Australian Beekeeping Manual*, *Honey Bee Pests and Diseases*, and *Beekeeping Success – Start Right, Grow Strong Colonies, Harvest More Honey* – to be published in March 2026.



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# BEE VET

## Going Down the Road

Dr. Tracy Farone



Listen along here!  
<https://beeculture.com/bee-vet-33/>

Proper transport of agricultural livestock is a familiar topic amongst veterinarians and largely regulated by the USDA. Animals move for a variety of reasons, herd restocking, breeding, shows, and fairs, but “going down the road” in my profession, often refers to animals being loaded up and transported for slaughter. Even at this point in an animal’s “career,” there are volumes of guidelines and regulations in place to assure proper treatment, safety, and the reduction of stress of the transported animals. Veterinarians study the “medicine” of transport for animals to address the stress, injury, and exacerbation of disease that improper transport may cause. In contrast, honey bee colony movement within the U.S. is largely controlled by States’ apiary programs/inspections and “going down the road” in this case is purposed to further propagate life through pollination.

While the majority of our honey bee colonies in the United States are designed to be migratory hives, most beekeepers in the U.S. are small scale operations that are not typically designed for movement. Migratory



Figure 1. Bee yard at sunset.

beekeepers may have hundreds to thousands of small to mid-sized hives bolted down to pallets. Pallets which can be moved with fork trucks, a trained crew, and then hauled on big rigs. Movement is a typical day’s work for these folks. Most backyard beekeepers may have several large honey-producing hives, a pick-up truck, and a dolly. Most small-scale beekeepers never have had to consider the movement of their hive/s. Until you do...

Due to new construction coming into the area, I recently had to move all hives from one of my apiary sites to another. While I had helped migratory beekeepers before, I now had to plan the movement of my own (15 big fat honey hives) yard. So, life experience has provided me with yet another topic I thought I could share with small-scale beekeepers just in case one may find themselves in a comparable situation. Not unsurprisingly, I discovered that many of the things that should be considered in the movement of any agricultural animal also applies to honey bee colonies.

Here are **seven important steps** to consider when planning and executing a small-scale move within a single operation.

### 1. Pre-planning

Before the move be sure you have researched any laws or regulations you may need to follow to move your bees. If you are crossing state lines, you will likely need a state health inspection before movement of bees or equipment. Some municipalities may also have ordinances on honey

bees or the number of colonies you may have.

Also, before the move, evaluate and prepare the new site so that the new hives can be placed into the apiary area as easily as possible, i.e., have ground leveled, weed barrier down, fencing and hive stands in place.

Consider any biosecurity issues, what are the possible risks? Bears? Are there any other hives in the new area? Do not move any diseased hives. Keep *Varroa* in check. Consider any other bee-related equipment that may need packed. Be sure to properly close down the previous site, leaving no debris behind.

Consider the new environment. Is the forage in the area adequate for the new hives?

Understand that this evaluation and preparation will take an investment of time and work, but reducing stress to your bees, you and any team members will be well worth the effort.

### 2. Timing

**Time of day:** Movement of colonies must occur at night. Waiting until after sunset assures us that all the bees are in the hive and they will be less active during the move. (Figure 1) It also means you will be doing this in the dark- bring flashlights! Redlights may be best, so as to not attract any stray honey bees to artificial lighting.

**Season:** If extra honey supers are on the hives you may want to consider extracting the honey before the move to reduce hive size and weight. For the move try to pick a fair, mild





Figure 2. Close up the entrances.



Figure 3. Ratchet straps for hive security.

Figure 4. Author at the lift gate.







**Figure 5. Hives on the truck.**

day without precipitation or high winds, and temperatures between 55-85°F degrees. In seasonal areas, if possible, move colonies in the early Spring when colonies are still smaller and have not established a foraging pattern for the season yet. Moving in Winter or in the middle of a nectar flow would not be advisable.

**Time on the road:** Consider the amount of time bees will be in transport. Minutes? Hours? Longer times can cause the bees to overheat or become chilled if air exposure is too much or too little. Plan a safe place/s to stop along the route if needed. Hopefully for a small-scale move, you will not have much distance to travel.

### 3. Closing the entrances

After the sun goes down and bees are in their boxes, don your bee veil/

suit and gloves, and close all (top and main) entrances. (Figure 2) Fitted wood blocks or duct tape are helpful to secure the entrances.

### 4. Securing the boxes

Use ratchet straps to secure boxes together – bottom board to top outer cover. Be sure to have enough straps to secure the boxes onto the transport vehicle. Place boxes firmly together on the transport vehicle to reduce slippage and reduce wind exposure. (Figure 3)

### 5. Heavy lifting and moving

Here is the fun part. How do I get the bees, perhaps big fat honey hives, onto the truck? Well, I hope you can recruit a few strong and bee-crazy friends to help. Trucks with lift gates, dollies, a big-wheeled wagon, and

strong friends to get the bees on and off the truck are helpful. (Figure 4)

Have everyone wear beekeeper PPE to prevent against stings. Even though you may have closed the entrances a few stray bees will be flying around and they may not be incredibly happy. Have some sting first aid on hand. Once in transport drive carefully and have hive identifications or any licenses available. Having at least one trailing vehicle is also helpful to keep an eye on how well the hives are riding to prevent any potential transport mishaps. (Figure 5)

### 6. Removing restraints

Once the new colonies are in their new location, understand that the shuffled colonies may not be in a particularly good mood immediately. Give them a few moments to settle from the transport and then carefully remove straps and the entrance restrictions. It is important to establish airflow through the hive relatively soon after arrival.

### 7. Adjustment

Hives moved to a new location will need several days to “recalculate.” You may witness re-orientation flights (bees flying up and down in front of their hives), and if there are other hives in the area, robbing behavior. Adding robbing screens/entrance reducers to existing hives in the area may reduce the effects of this robbing behavior until the new hives establish typical foraging in the environment.

### A Successful Move

So, what about my move? Well, I am happy to report that with the help of a team of students, several strong maintenance crew members, a truck with a lift gate, and several dollies, we were able to successfully move 15 (big fat honey) hives about 12 miles to a new location all within one Commonwealth. We had ideal weather and a nice night for a move. We did have to move the hives during the Fall nectar flow. Five established hives in the new location were subject to some robbing by their new neighbors. After about a week, a new normal was established throughout the yard with their beekeeper playing Robin Hood to balance the colonies and prepare for Winter at a new home base.

PS Do not forget the bee shed! (Figure 6) **BC**



**Figure 6. There may be other items to consider in the move.**



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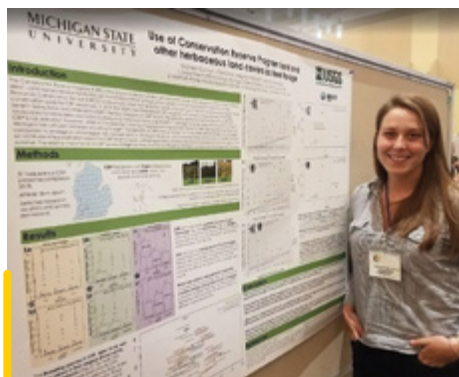


# Spartan Scientists Contribute to Global —Examination of Pollinator Habitat—

MSU Entomology professor and former graduate student collaborate with team of 80 researchers to examine global pollinator landscape needs

Justin Whitmore

This article is from [Michigan State University](#)



MSU graduate Gabriela Quinlan collaborated with MSU Entomology Professor Rufus Isaacs on a global examination of pollinator habitat published in *Science*.

EAST LANSING, Michigan – Michigan State University Distinguished Professor **Rufus Isaacs** and CANR alumna Gabriela Quinlan (Ph.D. '20), now an Assistant Professor at the University of North Carolina-Greensboro, collaborated with researchers from 19 countries to develop a framework for informing conservation policies to increase the quantity and enhance the quality of pollinator habitat in agricultural landscapes.



Isaacs

Pollinator habitat is essential for maintaining beneficial insect populations and supporting critical ecosystem functions, but habitat protection targets are often varied and poorly defined. The research team sought to develop a framework to assess habitat quantity needs and the threshold at which populations respond more to increased habitat quality than quantity.

A team of more than 80 researchers provided and synthesized data from 59 studies to define minimum the

habitat thresholds needed to support healthy insect pollinator populations on various agricultural landscapes across the United States and in areas around the world. The paper, **'Critical habitat thresholds for effective pollinator conservation in agricultural landscapes,'** was published in *Science* in September.

Providing guidance to landowners about how much land needs to be prioritized to support beneficial insects or advising conservation programs on where to prioritize resources is challenging, with researchers often relying on limited local and regional data, Isaacs said.

The framework in *Science* provides clear benchmarks on the amount of low-quality pollinator landscape needed for essential insects like hoverflies, solitary bees, bumble bees and butterflies.

"We are often asked how much of a landscape will need to be prioritized to support beneficial insects. Landowners have the option to designate more habitat for pollinators or you could increase the quality of the habitat already there," Isaacs said. "This paper explores the interaction between those two approaches and determine ways to maximize available landscape by examining a big data set with all the power you get from looking at ecosystems around the world."

In low habitat quality conditions, hoverflies had the lowest land-need threshold at 6% semi-natural habitat cover, followed by solitary bees (16%), bumble bees (18%), and butterflies (37%).

"There has been a lot of discussion about how much pollinator habitat is needed in the landscape, and ten percent is a good round number. It's simple to remember, but I think the data from this study shows that we need more land than that for some of the most beneficial insects," Isaacs said. "When we start thinking about conservation programs like the pollinator habitat cost-shares for growers

funded by the USDA via The Farm Bill, studies like this can help us think about where it would be most beneficial to deploy these resources."

Isaacs said MSU's contribution to the study relied heavily on research conducted by Quinlan during her time as a graduate student in the Department of Entomology.

Quinlan came to MSU supported by funding from the US Geological Survey, and she then was successful gaining a Graduate Research Fellowship from the National Science Foundation. Under the direction of Isaacs and Entomology Assistant Professor **Dr. Meghan Milbrath** who serves as director of the **MSU Pollinator Performance Center**, Quinlan conducted an extensive survey of pollinator landscape in Michigan, with her data used in the new study.

Dr. Gabriella Bishop, from Wageningen University in the Netherlands led this synthesis analysis, coordinating all the data files provided by researchers from multiple countries. Isaacs said the request from Bishop provided another way for data generated at MSU to contribute to understanding how pollinator populations interact with agricultural landscapes.

"Dr. Quinlan had collected pollinator data for almost four years at MSU, and she was contacted to see if her data would fit this study and their criteria, and indeed she did. Dr. Quinlan provided the data, and we worked with the team to review and help develop the manuscript," Isaacs said.

'Critical habitat thresholds for effective pollinator conservation in agricultural landscapes' provides one of the most comprehensive examinations of pollinator land area and quality published to date, and Isaacs expects the insights from large-scale pollinator research studies to improve as datasets become available from other locations around the world. **BC**



Listen along here!

<https://beeculture.com/emily-dickinson/>

From the industrious hum of the hive to “the golden angels of agriculture” moniker, bees lend themselves readily to poetic imagery. While there are a lot of notable poets that have relied on the humble honey bee as their muse, from what I can tell, Emily Dickinson (1830-1886) appears to hold the record for publishing the greatest number of poems about, or relating to bees.

Often considered to be one of America’s greatest poets, Dickinson penned close to 1800 poems during her lifetime. When she died in 1886, she was considered an eccentric by locals and was a relatively unknown poet. This was at least partly due to Dickinson’s reclusive nature which caused her to naturally shun public notoriety and attention. She even wrote a bee inspired poem about the topic of fame:

“Fame is a bee.  
It has a song –  
It has a sting –  
Ah, too, it has a wing!”  
– Emily Dickinson\*

Whether due to her desire for privacy or the fact Dickinson lived during a time when women were afforded few rights and little respect, or



Ross Conrad

# Emily Dickinson

## The Reigning Queen of Bee Inspired Poetry

“His Labor is a Chant –  
His Idleness – a Tune –  
Oh, for a Bee’s experience  
Of Clovers, and of Noon!”\*  
– Emily Dickinson

both, less than a dozen of her poems are believed to have been published during her lifetime. As was customary at the time, the poems were all published anonymously and possibly without her permission. Unfortunately, she left no instructions about what to do with the large catalogue of poetry she left behind following her death. This led to her manuscripts taking a winding and somewhat convoluted road to publication: a road filled with scuttlebutt and inter-family squabbling.

Following her death, Emily’s younger sister Lavinia decided to publish Emily’s poetry. Lavinia approached Emily Dickinson’s sister-in-law Susan Huntington Dickinson and a mentor Thomas Wentworth Higginson for help in the publishing effort.

Susan Dickinson apparently dragged her feet and did not act fast enough for Lavinia’s liking, and Higginson was apparently too busy to help make much progress. To fulfill her vision in a timelier manner, Lavinia approached Susan’s friend, Mabel Loomis Todd, the young wife of an Amherst College astronomy professor. Unknown to Lavinia, Mabel was involved in a love affair with Emily Dickinson’s brother Austin Dickinson, who was married to Susan.



“Portrait of Emily Dickinson. Public domain image courtesy of Amherst College Archives & Special Collection.”

Mabel Loomis Todd enlisting Thomas Wentworth Higginson as co-editor, and the *Poems of Emily Dickinson* was completed in 1890, four years after Emily’s death. The two made changes to the poems that often consisted of unconventional capitalization and punctuation. (I have endeavored to present all of Emily Dickinson’s poetry appearing in this article in its original form) Todd and Higginson regularized punctuation, added occasional titles (Emily apparently rarely gave her poems titles), and sometimes even altered the wording to improve clarity and meter. Three more volumes of poetry were published in 1891, 1894, and 1896.

In 1898 a nasty lawsuit between the Dickinson and Todd families occurred over a piece of land. With her love spurned, Mabel Todd’s involvement with the Dickinson family ended. For more than thirty years Mabel kept the rest of Emily Dickinson’s

“What shall I do when the Skies a’chirrup  
Drop a Tune on me –  
When the Bee hangs all Noon in the Buttercup  
What will become of me?”\*  
– Emily Dickinson



**“To make a prairie it takes a clover and one bee,  
One clover, and a bee,  
And revery.  
The revery alone will do,  
If bees are few.”\***  
– *Emily Dickinson*

son’s poetry and letters that were in her possession locked up in a wooden chest.

After Mabel Loomis Todd stopped working on Dickinson’s poems, publishing activity of Dickinson’s poems ended. It wasn’t until Emily’s niece, Martha Dickinson Bianchi, who after her mother Susan and her aunt Lavinia died, inherited the remaining Dickinson manuscripts that remained in her family’s possession and decided to publish them. Martha edited and published six volumes of Dickinson’s poetry and two biographies. She wielded a softer editorial touch than her predecessors. She also did not create titles for the untitled poems and kept their original

rhymes intact.

In response to Martha’s publishing efforts, Mabel Loomis Todd was motivated to resume publish her aunt’s poetry with the help of her daughter Millicent. This resulted in most of Emily Dickinson’s poems finally being put into print, however, no single edition featured them all. That changed when literary scholar Thomas H. Johnson published *The Poems of Emily Dickinson*, in 1955. Johnson relied on Dickinson’s original manuscripts rather than using any of the previously published versions, and tried to more accurately presented the poems as Dickinson had written them. Dickinson’s unconventional punctuation and use of

***“While there is no evidence that Emily Dickinson ever kept bees, she certainly would have observed them in the family gardens and orchard. In addition, the beautiful ornate image of a bee skep that decorated the drawer handles of this Dickinson family bureau could have been part of the household when Emily Dickinson lived there and if so, would have either consciously, or perhaps subconsciously, helped to keep the thought of bees on the poet’s mind. Photo courtesy of Burleigh Muten, Emily Dickinson Museum”***



slant rhyme (imperfect rhymes where the sounds of words are similar but not identical such as in “worm” and “swarm”) has influenced countless poets and song writers over the years. Johnson also arranged the poems in chronological order, studying changes in Emily’s handwriting to do so, since the poet rarely dated her work.

A New York Times 1998 report describes evidence uncovered by researchers examining the original manuscripts using infrared technology that at least eleven of Dickinson’s poems had been censored to remove the name “Susan”. Apparently, Emily had dedicated these poems to her sister-in-law, Susan, and this was something that Mabel Loomis Todd was not willing to endure. (Weiss, 1998).

My personal review of Johnson’s book *The Complete Poems of Emily Dickinson*, indicates that the poet wrote at least 80 poems rich in both observation and metaphor that directly mention bees or Bumble bees in the singular or plural. In my research for this article, I also came across lines of bee poetry credited to Dickinson that was not in Johnson’s work, suggesting that the “Complete” poems of Emily Dickinson, is perhaps not quite as complete as one would hope.

This count does not include poems that the poet wrote that refer to bees indirectly without specifically mentioning the word “bee” or “bumble bee.” Here is one example:

**“Where Ships of Purple – gently toss  
On Seas of Daffodil –  
Fantastic Sailors – mingle –  
And then – the Wharf is still”  
– Emily Dickinson\***

A quick review of Dickinson’s work reveals that there are at least two poems that appear to meet the definition of being indirectly about bees. Since I did not take the time to read all of her 1,775 published poems carefully, and analyze their meaning,

**“The Pedigree of Honey  
Does not concern the bee –  
A clover, any time, to him,  
Is Aristocracy –”\***  
– *Emily Dickinson*

I cannot say there are not more to be discovered. This brings the grand total number of bee poems that Emily Dickinson published to at least 82.

So what explains Emily Dickinson's fascination with bees? I did not come across anything that suggested that Emily Dickinson or her family ever kept bee hives on their property. However, the Dickinson family is known to have maintained an extensive garden and small orchard on their property where Emily would have had ample opportunity to observe bees going about their business.

Emily Dickinson is unique in the world of famous published poets in that all her work was published posthumously by others. After scanning the *Complete Poems of Emily Dickinson* it is likely that some of the published poems were incomplete and still in progress. For example, there are lines that are repeated in more than one of her published poems, suggesting that the poet may have had multiple, but different, drafts of a single poem that she had been working on at the time of her death.

*Some poems are absolute genius  
And some are rather tame  
She never had the chance to curate  
her work  
It was all published just the same*

Ross Conrad keeps bees and writes terrible poetry in Middlebury, Vermont

*Special thanks to Executive Director, Jane Wald and the rest of the Emily Dickinson Museum staff for their invaluable assistance in helping me research this article.*

**"Bee related lines of poetry such as pictured here, that do not appear in *The Complete Poems of Emily Dickinson* by Thomas H. Johnson made determining the exact number of bee poems penned by Dickinson challenging. Photo credit: Ross Conrad/ Dancing Bee Gardens"**



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# Beeing A Mentor

## Oregon Master Beekeeper Program

Dewey Caron

**men·tor** – *noun*: an experienced and trusted adviser; *verb*: training or advising someone.

New beekeepers face a steep learning curve. Do you recall how you learned (or are currently learning) to “properly” keep bees? Did a more experienced beekeeper help you? Maybe a local bee club was instrumental in your learning how to keep bees. Once you gained experience did you then actively help other newbees who have less experience than yourself? If yes to any of the above, you are or have benefitted from a mentor – and are learning how to mentor yourself.

You have undoubtedly heard (maybe even said) some version of the expression ‘ask 3 beekeepers a question and you will get 6 answers’. There are no simple answers to questions such as why did my bees swarm? How should I control mites? What do I do to improve my overwintering success? Despite how much you have read or how many videos you have watched, beekeeping is about the bees! Mentors understand bee biology – or at least the good ones do.

Our bees are the best teachers. But they don’t give up their secrets

easily. Every time we enter our apiary to open a bee hive we are seeking answers from our bees. They communicate to us and we to them. When we do something, like reduce the entrance or add another box, we are telling our bees something – communication is 2-way. They communicate to us and we to them. Mentors can help us understand bees and refine our bee communication skills.

The Oregon Master Beekeeper Program (OMB) maximizes the mentor experience for novice beekeepers. There are 4 levels of certification — Getting Started, Apprentice, Journey and Masters. Each level progressively provides opportunities and support for additional learning. Course instruction and guided self-study, plus beekeeping practice in the field, are components of each level. Learning via helping other beekeepers earn service points. After the apprentice certification, service points can be obtained through mentoring of others.

The Oregon Master Beekeeper (OMB) Program Apprentice level is unique by matching an Apprentice student with a mentor. Mentors are individuals that have had bees for a minimum of three years and are

willing to assist others. A mentor training program has been developed. Apprentice level mentors meet with each mentee a minimum of 4 times, once each bee season, to discuss a worksheet covering the basic appropriate seasonal information. These meetings usually are in the mentee’s bees, although initial sessions may be in the mentor’s own bee yard.

Information on the program requirements of each level can be found on the website <https://extension.oregonstate.edu/mb>. See Journal of Extension report at <https://archives.joe.org/joe/2015june/iw6.php> for program overview. There is a master beekeeping program in over ½ the States. If you are not sure if your state has a Master Beekeeper Program, check your state association website.

Individuals start their journey in the Oregon Master Beekeeping Program by working toward certification as an Apprentice. This level is designed to give those just starting in beekeeping solid information and support. The goal is to help flatten the learning curve and increase the likelihood of new beekeepers continuing their beekeeping journey. There is a new Getting Started level for individuals merely thinking of possibility of starting bees.

### Elaine Timm – mentee

Elaine Timm began beekeeping in 2017 with a single nuc. It was pur-

Elaine Apiary, 3 Colonies, 2 Nucs. Photo by Dewey Caron.



Elaine counting mites in alcohol sample. Photo by Dewey Caron.







*Elaine with open brood frame. Photo by Dewey Caron.*



*Todd removing drone frame. Photo by Dewey Caron.*

chased from a local beekeeper. Elaine was looking for a hobby – the year before she had noted commercial bee hives in blueberry pollination fields near where she was brought up and her dad currently lives. A client in the UPS Store Elaine manages in her hometown of Lebanon, OR referred her to the beekeeper.

The hive was established in the agricultural area outside of town at her dad's. This is an agricultural area of grass (hay) and Hazel nut plantations, neither of which benefit bees. While she successfully transferred the nuc to a standard box she delayed adding a second brood box. The colony did not survive the initial Winter.

After the loss of her colony, she was ready to quit. A beekeeper invited her to the local bee association meeting in Salem, the State Capital. The program speaker was Todd Bartlem. She liked what he said and struck up a conversation with him following his talk. Todd agreed to help mentor her. Reinvigorated, she again started two nucs the next year on Todd's recommendation to keep more than a single colony. She signed up for the

local club's swarm hotline.

That second season, one of the two nucs ended up with a drone laying queen. Todd offered her a queen cell replacement. With swarm captures, she ended the 2nd season with 4 colonies, enabling her to harvest 80 pounds of honey. Elaine, not hesitant to ask questions, confesses to having numerous conversations with Todd as she guided her nucs and swarm captures to full colony size. She says, "No one could hope for a better mentor... He is a natural teacher and is incredibly generous with his time and knowledge."

#### **Todd Bartlem – mentor**

Todd Bartlem has been keeping bees in Oregon since 2008. He has been a mentor for a couple dozen local beekeepers for the Oregon Master Beekeeper Apprentice Program as well as for others starting beekeepers in and around Salem, the state capital. As a teenager he was a 4H project beekeeper while growing up in Orland CA. His colony was in the apiary of Koehnen & Sons, queen and package bee dealers, in Glenn, California. His

return to beekeeping came about when his sister gave him a beehive for Christmas. He ordered bees as a package from GloryBee in Eugene to fill the gifted beehive.

The initial Oregon colony lost its queen. A replacement queen didn't take. So he visited Rich Farrier, President of the local Willamette Valley Beekeeping Association, to obtain a new queen. This 3<sup>rd</sup> queen was the charm. The colony survived the Winter. Todd subsequently enrolled in the local bee course taught by Farrier.

After a couple of years of modest returns he enrolled in the Initial offering of the Apprentice level of the Oregon Master Beekeeper Program. Todd's mentor was a local beekeeper in the Salem area. Todd keeps his bees at 1000 foot elevation where the Spring vegetation can be about a week behind his Salem-area mentor. His mentor says, "I learned as much from Todd as I was able to provide I believe. He was able to do his basic management after I had to do it. It was a great experience for both of us."

Todd uses colony splitting for swarm control and scaling up. He be-



believes in nucs as resource colonies. He has had as many as 9 colonies but feels his comfort level is 7 production colonies and 5 nucs. He is a believer in drone brood removal for early season mite control. He rotates capped drone brood filled frames into a freezer, replacing the removed drone brood frame with another from the freezer. He will do this 3-5 times during Spring build-up in conjunction with his looking for swarm cells as part of his swarm control management.

Todd has completed both the Apprentice (2012) and Journey (2016) certificates in the OMB Program. He calls the mentor portion of the program “one of the better ideas.” He sees as program strengths that “everyone comes from same factual basis with continuing access to reliable sources of scientifically sound information.” Mentor training sessions and OMB materials “provide the mentor with an organization for helping mentees.” He believes mentoring gives a personal, face-to-face side to an otherwise solitary hobby.”

Following honey super removal using triangle bee escapes, the honey supers are warmed in his pickup truck to mid-80° F and then moved to his basement level office for extraction. The honey flows easily once it has been warmed but the extracting room remains at a comfortable temperature. Two or three supers at a time are moved

from the warm truck to the cooler basement. Usually several mentees join to assist Todd and then he in turn assists them to use the extracting setup for their honey.

Todd uses formic acid to control mites if sampling reveals high numbers following removal of supers. Todd also relies on oxalic acid vaporization for mite control. During December, he joins with another beekeeper to perform an oxalic Santa-run fumigation using an Instant-Vap machine applying 3 grams per box to Elaine's colonies and several current and former mentees. He encourages his mentees to practice drone brood removal in the Spring.

Todd is a frequent visitor to meetings of the local club. Mentee Elaine has become the club's secretary. Todd has a record of bloom dates of major nectar plants for his 1000 foot elevation site. Todd was a State Fair honey Committee individual responsible for organizing and conducting the Oregon State Beekeepers information booth for the 10-day state fair. The fair receives an average of 27,000 visitors per day for the 11 fair days. The honey bee exhibit, with observation bee hive, state honey show, children's activity area, free honey straws and display of the importance of bees in pollination, is a popular visitor stop.

Todd continues to assist Elaine and other mentees with swarming and colony management basics. Elaine captured swarms and established another apiary site in town, which

was fortunate as it has become an excellent productive site. Elaine was an attentive mentee. She was caring for the Kiwanis Pollinator garden in town, helping her in-town bee hives with additional forage. In 2021 Elaine developed her honey label and began to sell surplus honey at a popular breakfast bakery in center of town.

In 2022 Elaine took the OMB Challenge exam to pass to the Journey level which she subsequently achieved. Elaine with growing colony numbers added a home apiary site after first successfully getting 12 signatures of neighbors as required by local ordinance. And yes she has taken on a mentee with the or Master Beekeeping Program while working on her Journey certification.

Elaine, like her mentor, is a faithful mite sampler. She washes a 300-bee sample with alcohol. She uses 2-3% as an action level. She has tried different control methods. This year she and Todd “split” a tub of Apiguard to treat for mites. She has a city apiary with very low mite counts but the bees in the agricultural area, within flight distance of commercial beekeeper apiaries, have higher mite numbers.

Mentors like Todd help mentees like Elaine learn the practice of keeping bees. Experienced mentors have made many mistakes which mentees need still experience. Like their social bees they communicate. Learn from the bees and bee mentors for success. **BC**

**Todd overwinter nucs. Photo by Dewey Caron.**



**Todd banking queens for Fall requeening. Photo by Dewey Caron.**







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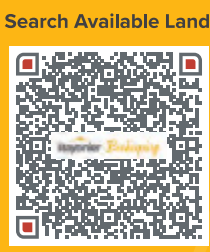
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# Minding Your Bees And Cues

## *Varroa* vs. World: Winter Games Edition

Becky Masterman & Bridget Mendel



<https://beeculture.com/minding-your-bees-and-cues-52/>

Listen along here!

Next year's Beekeeping season is still in the future, untouched by the realities and limitations of timing, weather, blooms, bees, and their pests. There's still time to mend equipment, to plot and plan for the most perfect beekeeping season. To help, we've done a scan of new bee-*varroa* news, looking for science-grounded clues for how to best approach management this season. And we're going to try to make a game of it.

Is it ruining games or making *varroa* fun to combine the two?

*Varroa* - 1 Honey Bees - 0

In one study, 45 colonies were observed from June to October 2024, and three different natural selection breeder categories were compared (Akongte et al., 2026). The different groups included: 1) 12 hygienic and low grooming colonies; 2) 20 non-hygienic and high grooming colonies; and 3) 13 intermediate hygienic and grooming colonies.

The devastating but not-surprising results showed that by the end of the 5-month study, all of the groups suffered high losses. In Group 1, there were no surviving colonies. Group 2 had approximately 30% of the colonies alive and in Group 3, less than 10% percent of colonies survived. All groups were confirmed to have deformed wing virus (DWV). Colonies from Groups 1 and 3 also tested positive for Acute Bee Paralysis Virus (ABPV) and Israeli Acute Paralysis Virus (IAPV). The researchers found interest in the higher survival rate of the non-hygienic, high grooming colonies.

We are respectfully curious just how long the surviving colonies survived.

Honey bees - 1 Beekeeper - 0

A laboratory study performed on individual worker bees compared the sting response threshold of *Varroa*



**Researchers observed that higher colony *varroa* infestations were related to higher protein content in pollen collected by foragers suggesting that colonies were compensating for the impact of parasitism using nutrition (Hilsmann et al., 2025). Photo credit: Rebecca Masterman**

destructor-parasitized-bees compared to non-parasitized bees (De la Mora et al., (2024). The parasitized bees stung faster when provoked. We're sympathetic: who wouldn't sting faster if already in a bad mood carrying around a giant, vitality-sucking arachnid?

Researchers demonstrated that being fed upon by *varroa* lowered

the sting response threshold of individual workers. The authors suggest that the change in the sting response threshold of parasitized bees results in an increased colony level defensive behavior, improving the parasitized colonies ability to defend themselves against predators.

Our takeaway: listen to your bees. If they greet you with more





**In another study of colonies not treated for varroa infestations, all colonies were confirmed to have deformed wing virus (Akongte et al., 2026). While some infected workers will have deformed wings, workers can also be asymptomatic for this sign. Photo credit: Rebecca Masterman**

stings than usual, do a quick alcohol wash to test for heightened *varroa* levels.

Raspberry Pi camera + Beekeeper - 1  
Varroa - 0

Don't like doing alcohol washes? Neither do a group of researchers who are trying to bring back the Raspberry Pi. Remember Raspberry Pi? Think small, affordable computer with a camera. Well, we actually haven't asked them how they feel about sampling for *varroa*, but something is motivating a number of research teams to improve on jarless *varroa* detection technology. New sampling technologies will use cameras to search for *varroa* on the mites. One recent report by Su et al. (2026) states, "By reducing reliance on manual inspections, the proposed

approach provides a practical, low-cost, and scalable solution for early pest detection and sustainable colony health management." We applaud these efforts and look forward to this technology being a part of colony care.

Varroa - 1 Honey Bees - ?

You are all familiar with the saying, "Ask a beekeeper how to control *varroa* effectively and watch them break out into a nervous sweat." A research team in Germany led an innovative study comparing two different types of *varroa* management and the impacts on the honey bees (Hillsman et al., 2025). They called one method *Conventional* and it included: regular drone brood removal in the mating system, formic acid treatment in the Summer and

oxalic acid in the Winter. The other method was *Innovative* and included no drone brood removal, a Summer brood break followed by an oxalic acid treatment and a possible Winter oxalic acid treatment depending on mite drop counts exceeding their threshold. They reported significantly higher *varroa* infestations in the *Innovative* treatment group. While there was no reported difference in honey production, they did report that the *Innovative* treatment colonies foraged for higher protein source pollen, possibly to offset the impact of the parasite levels.

The bees in the *Innovative* management regimen group also had significantly higher levels of juvenile hormone III in their hemolymph. This hormone is important in the control of age-related behavioral tasks in a colony. While no mention of colony survival was mentioned, this was a multi-year study.

Our takeaways (and admit it, some of yours too!):

1. The *Conventional* treatment regimen is not aggressive enough for *varroa* control in our apiaries.
2. It is alarming to note that based on the status of *varroa* in your colonies, their hormones are impacted by higher infestations, and they might be increasing their protein foraging efforts to offset the impact of *varroa*.
3. It would be interesting to compare other treatment regimens to see the potential impact of infestation in honey production and survival in relation to the physiological and behavior changes reported in the study.

Varroa - 0 Beekeeper - 1 Honey  
Bee - 1 Formic Acid - 1

Some of us depend on using a formic acid treatment in our colonies to manage the mite population. It has been a reliable source of mite control and depending on how and when you use it, it is good for the colony and queen issues are not a major concern. While we understand that some beekeepers have had issues with using formic acid to control *varroa*, we have a few tips: 1. Follow all instructions provided by the manufacturer including temperature ranges, colony size, and placement. 2. Understand that a heavily *varroa* infested and diseased colony is not going to be able

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to tolerate and respond to a formic acid treatment well. Formic acid will not cure a colony with parasitic mite syndrome.

The good news for those of us who use formic acid as part of our mite management plans is that a review of the literature (Kosch et al., 2025) has reported no evidence of resistance to formic acid control of *varroa*. While they recommend that beekeepers and researchers stay vigilant (beekeepers – keep rotating control methods! Researchers – keep looking for signs of resistance!), we can start this year knowing that *varroa* infestations are still a threat to colonies thriving and surviving and formic acid is still a threat to *varroa* thriving and surviving, too. **BC**

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Becky Masterman earned a PhD in entomology at the University of Minnesota and is currently a host for the *Beekeeping Today Podcast*. Bridget Mendel joined the Bee Squad in 2013 and led the program from 2020 to 2023. Bridget holds a B.A. from Northwestern University and an M.F.A. from the University of Minnesota. Photos of Becky (left) and Bridget (right) looking for their respective hives. If you would like to contact the authors about your plans for planting bee flowers, please send an email to [mindingyourbeesandcues@gmail.com](mailto:mindingyourbeesandcues@gmail.com).



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# Preparing Colonies for Spring

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B Worthy

As cooler months are here, we should begin planning now for a smoother, more successful upcoming beekeeping season. Winter months fly by with holidays, parties and meetings; then Spring will be slapping our face again.

Naturally, small-scale beekeepers follow a reduced regimen than sideliners or commercial beekeepers, however the basic prerequisites for Spring preparation are the same. These may not be in the exact order for each beekeeper, however they all need to be considered and accomplished before the Spring rush and before the best queens/bees/ yards are taken.

## I. Inventory

- Update the complete list of equipment, supplies, feed and pest/disease control items in stock.
- Consider what you needed this season and how much you plan to grow the business. Do you want to sell nucs or queens? Invest in pollination contracts? Most of these supplies can be obtained at state and national beekeeping meetings. Support your commodity and purchase from the exhibitors and local beekeeping supply companies.

### Organize stacks of bee equipment



**Upcoming National Conferences**



The American Beekeeping Federation 2026 Conference and Tradeshow will be held at Mobile, Alabama on January 6 – 10. <https://abfnet.org/2026-abf-conference/>



January 8-10, 2026  
Kentucky Expo Center - Louisville, KY  
<https://www.nahbexpo.com/>



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Fri, Feb 6, 2026 Sat, Feb 7, 2026  
<https://www.midwesthoneybeexpo.com/>



Thu, Feb 12, 2026 Sat, Feb 14, 2026  
BEE TECH 2026  
<https://honeycouncil.ca/beetech2026/>

### Upcoming National Conferences

- Talk to queen suppliers and beekeepers who sell packages and nucs. Find out where they obtain stock and visit their mating yards. Where do they obtain their mating queens? Is that company reliable? Do they have a current health certificate for each yard and state in which they raise queens? Is their equipment clean? Be especially careful of bee yards that are in states and regions where honey bees with Africanized genes have been confirmed. To date, they have been found in southern Florida and most of the southwest. Do the necessary research to know the true source and health of the bees you want to purchase as soon as possible so that you still have time to place the order.

### Make sure that queens are healthy and have a recorded history





- Do you plan to collect swarms? Order pheromone and build boxes as needed. Determine sites to attract maximal swarms.

## II. Clean and Prepare the Equipment

- Clean and paint equipment, repair what is necessary and organize everything while time allows. Build any equipment needed for the upcoming year except for what will be purchased.
- Extractors, Uncapping Tanks and Bottling machines consistently break down when they are being used. Have someone check all the equipment and replace worn parts ahead of time! Some parts can take weeks to months to obtain which costs your business dearly during the season.

## III. Property Prep

- Prepare the sites for the apiaries. Some undoubtedly have low areas or require more gravel, grading or the path to the yards need to be cleared. Cut trees back and fill holes or remove debris which can flatten tires.
- Inspect online maps such as GoogleEarth to find new yards which are adjacent to wild areas with mixed forage. Talk with the property owners and preferably sign a contract or memorandum of understanding, especially if crops are grown on the property.

## IV. Paperwork, Paperwork!

- Renewals – Renew subscription to *Bee Culture Magazine* and associations as well as local clubs.
- Register all apiaries in states that require it. Check current state laws, as some have changed.
- Keep track of costs! Evaluate expenses and losses- where can costs be trimmed? Look for online bookkeeping programs that may help improve record maintenance. Also review colony records. Many states and the USDA will ask for colony records as well as Emergency Assistance (ELAP - [https://www.fsa.usda.gov/sites/default/files/2024-12/FSA\\_ELAP\\_HoneybeeFact%20Sheet\\_24.pdf](https://www.fsa.usda.gov/sites/default/files/2024-12/FSA_ELAP_HoneybeeFact%20Sheet_24.pdf)) if you have applied for it. It is vitally important to have accurate records to share with these programs in order to obtain loss funds. Create datasheets or use one of the online applications. Many are now available for small- or large-scale beekeeping operations.
- When dealing with brokers and truckers, determine the insurance and shipping costs. Who pays what? What happens in a trucking accident? Is the trucker available for the time when you need him/her? Are the colonies in lots for which trucks can access?
- Is it time to update your company's website? Perhaps enhance the e-store if you have one? Consider trying new honey bottles or a honey product- this is the time to research and determine what best fits your business model.
- Design and print new labels so that sufficient quantities are available to last for at least the first half of the season.

## V. READ!!

- Read Beekeeping magazines which have piled up over the season. Many beekeeping books are available as well as online books, fact sheets and journal articles. While

social media is entertaining and provides quick advice, remember that it is only someone's opinion and may not be correct, legal or even safe for the bees or you.

- Consider changing some management techniques based upon current recommendations; what could be improved? What were some "Uh Oh!" moments that should be avoided?

## V. Late Winter

- Colony checks
- Make sure that brood has honey nearby. Do they need to be fed?
- Apply a mite treatment based upon the season and management plans. When are the colonies to be moved if at all? Are the hives free of rodents and other pests?
- How many colonies need to be requeened? How many queens need to be ordered? It is vital that colonies have a strong queen in the Spring so that they can grow and be productive.
- Make arrangements for apiaries to be inspected so that health certificates are received on time.
- Stay on top of colony growth as Spring Has Bee-gun!



**Strong colony despite Winter temperatures**  
Photo credit Dwight Wells Feb 2017

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Patrick (videographer), David and Ryan



Chris and Sunshine



David and sister Phyllis



David and Jaimie

One of the greatest joys in beekeeping is helping a prospective or new beekeeper get started. It is so enjoyable when you can open up a hive with a new beekeeper and spend time explaining what the bees are doing and to show the various contents on a frame, stages of brood and the difference between honey and nectar. I will always have them poke their finger into capped honey and watch it collect on their finger and then see the look on their face when they taste real, fresh honey.



Listen along here!  
<https://beeculture.com/the-joy-of-helping-others/>

Now with the saturation of social media, the opportunity for hands on training is less of an option than it once was. There are so many new beekeepers now that it's im-

possible to match each one with an experienced beekeeper near them. I totally understand the value and importance of helping beekeepers through social media and that's why I've had a beekeeping YouTube channel now for 17 years. It's a ton of work, but it helps so many beekeepers around the world. But I miss being in the hive one on one with new beekeepers.

That's why each year I pick several people to come and work bees with me one on one. This year I selected six new beekeepers to spend time with me in the hive. I start this year with my sister Phyllis from Tennessee. She is not a beekeeper but she is interested. She is a retired RN and lives out in the country and has lived vicariously in the hive through me and my telling her how much I love everything about beekeeping.

I suited her up and we dove into a

large hive. She was great. She wasn't afraid and was so fascinated with the inside of a hive. She found the queen, tasted fresh honey, and learned everything I could show her in twenty minutes. Being a RN her whole life, she immediately would answer my introductory biology lessons perfectly. She handled the frames and the bees like a nurse would handle a patient. It was so rewarding and she is excited about starting beekeeping in the Spring. It was a hoot for me because as her younger brother I got to show off my favorite thing that I love to do, play in a hive.

Judee and her husband flew up from Texas to work bees with me next. I met Judee when I spoke at the Texas State meeting early in the year. Judee had such a great respect for the bees and handled the inspections like a veteran beekeeper. I was teaching Judee how to not wear

# The Joy of Helping





David and Judee



David and Mark

gloves and how to mark and handle queens. She loved it.

Next was Ryan from Ohio. I had a big project of moving a large hive a significant distance. Ryan was a trooper and dove right in and we were able to move the hive and inspect other hives.

Next was Jaimie from Indiana. Jaimie admitted that he mostly learned everything he knows about bees from my YouTube videos. It showed. His techniques were so similar to my specific techniques. And Jaimie was kind enough to bring me an entire hive that he built and stained for me. It is beautiful. He is a cancer survivor, and it was inspiring to learn of his journey and great endurance.

Next was Sunshine and Chris. I met them a year ago when I spoke in Indianapolis at a meeting they were at. They were the first married couple I mentored in the hives. They worked

hives as a couple and they were each very helpful to each other as they worked bees.

Next was Mark from Indiana. Mark showed me an entire notebook of notes and beekeeping information that he had gathered up to increase his bee knowledge. Mark was very good at working the bees and understanding how to read their behaviors as he worked the hives.

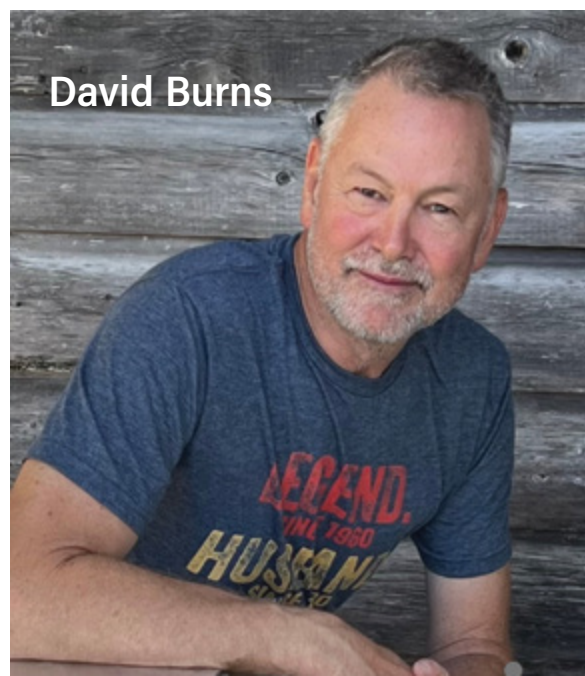
Each learned a few new ways that would help improve their future in working bees. I learned a few new things from them as well. It was such a pleasure to share my almost 30 years of experience with each of these mentees and to see how hungry they were to learn anything they could about bees and inspecting a hive.

I know that most beekeepers with years of experience and knowledge are deep into various beekeeping projects and taking time to spend the day helping a new beekeeper can seem impossible and a disruption of a demanding schedule. But I would strongly encourage experienced beekeepers to find the time to invite new beekeepers to learn

from your vast years of experience and knowledge.

I'm already contemplating if I can invite someone out once a week next year for the whole bee season. Can't promise it will work out, but it is my hope that I can do that because it is not only helpful to our future beekeepers but so rewarding to know that what we've learned over the years can continue to the next generations.**BC**

# Others



David Burns



# Bees and Women

## *Mrs. Lydia Crawford Harris*



**The Uncompahgre River that ran behind Mrs. Harris's Apiary.**

I recently came across an intriguing photograph of Lydia Crawford Harris in a 1901 issue of *Gleanings in Bee Culture*. The piece titled “How 500 Colonies in the Rockies are Operated by Women Only” features women who could vote by E.R. Root, features — captivated me at first glance. The striking black-and-white image highlights an apiary just two miles south of Delta, Colorado, in Olathe, set along the banks of the Uncompahgre River. It showcases 167 ten-frame beehives, gracefully framed by towering bare cottonwood trees.

In the photo, a horse and buggy add to the atmosphere, featuring two silhouetted figures sitting side by side, their identities enveloped in mystery. In the upper-left corner, Mrs. Harris is pictured wearing an Edwardian-style black top hat — a unique part of women's fashion during that era, particularly for sporting or outdoor activities. It appears that she's holding the reins, and her attire conveys a sense of strength. Although the details of the hat, possibly adorned with a satin bow or flower, are difficult to discern, it perfectly complements her serious expression and her high-collared, long-sleeve black dress, embodying a commanding presence despite the demands of her environment.

Mrs. Harris was a woman who managed over five hundred hives in the largest alfalfa district on the western slope of the Rockies. I had a name and a photograph to guide my research, yet, given the societal norms of the early 1900s, it seemed unlikely that a woman would venture into beekeeping independently in Colorado. I wanted to know more about who she was.

### Nina Bagley

As Mrs. Harris herself noted, “We women in Colorado enjoy all the rights of voting, from the lowest county officers to the President of the United States. I propose to operate these yards with women's help.” (*Gleanings in Bee Culture*, April 1901.) This statement, made at a time when women's rights were still a contentious issue, carries significant historical weight. Foulbrood was an issue in Colorado in 1900. Mrs. Harris started a petition to appoint a bee inspector in the area. She signed it along with five other prominent beekeepers. It was apparent she was involved in beekeeping. So what was the connection? With persistence and patience, I pieced it all together. I'm thrilled to share my findings. Let me introduce you to Mrs. Lydia Crawford Harris.

Lydia Jane Crawford was born on September 3, 1874, in Marion, Ohio, to King and Elizabeth Crawford, both of whom were immigrants from Ireland. Her father, a farmer, arrived in Philadelphia, Pennsylvania, on May 13, 1856, and subsequently settled in Marion, Ohio, where he married Elizabeth in 1871. Lydia was the second of six siblings, which included an older brother named Harry and a twin sister, Eliza Jane, who tragically did not survive.

During the late 1800s, the Crawford family relocated westward to Boulder, Colorado. At the age of six, Harry, Lydia's older brother, developed an interest in beekeeping, a skill he likely learned from their father. In 1891, at the age of twenty, he relocated to Broomfield, Colorado. He was 28 when he married Ada Elizabeth Coward. Harry became the first official bee inspector in Broomfield and eventually established himself as the area's largest beekeeper, managing over 1,000 hives. Eventually, Mr. Crawford would hand the operation down to his son, Miles. The Crawford and Sons Honey House, founded in 1905, remains a historic site today at the Broomfield Depot Museum's land in Zang Spur Park.



**Mrs. Harris**

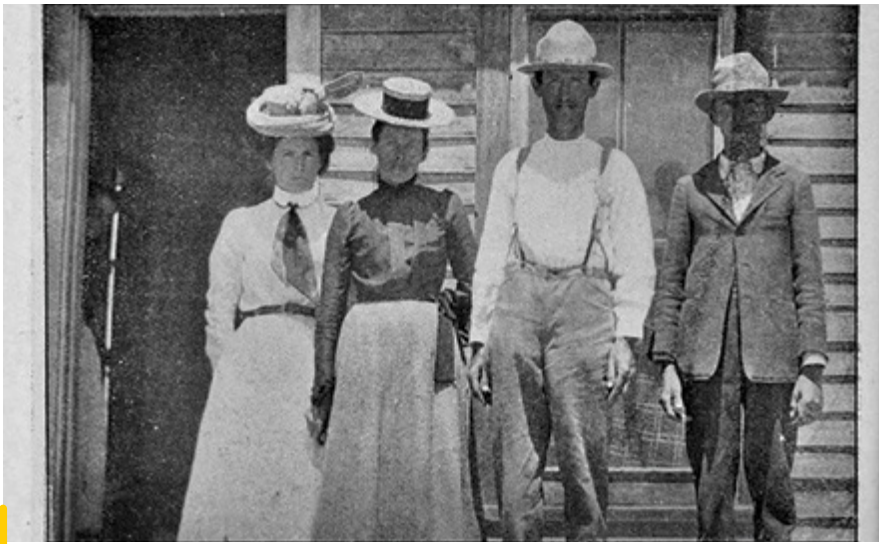
In 1899, Lydia married John Alexander Harris, born in 1861 and 14 years her senior. The couple crossed the Rockies in 1900, settling in Delta, Colorado, in search of suitable agricultural land. By 1902, E.R. Root ventured out west to report on the irrigation schemes in Western Colorado and the potential to reclaim desert lands. At that time in Colorado, land and water rights were separate entities; a settler could either buy or homestead land, but needed to secure additional rights if they planned to irrigate their property. My narrative was coming together through the articles in the 1902 *Gleanings in Bee Culture*, where E.R. Root detailed his journey and observations on irrigation in Colorado.



**One of John A. Harris' Out-Apiaries, Delta, CO.**

During his visit to Delta, Root connected with Mr. Nelson from the Delta Fruit and Produce Co. and later met Mr. Harris, a former President of the Colorado Beekeepers Association, who, alongside his wife, Lydia Crawford Harris, contributed significantly to the area's beekeeping scene. Mr. Harris, the region's largest beekeeper, purchased 100 bee colonies on credit and quickly paid off the loan in the first year. The following year, he expanded his operation to 350 colonies, eventually growing to 950.





**John A. Harris and Family, formerly of Delta, CO.**

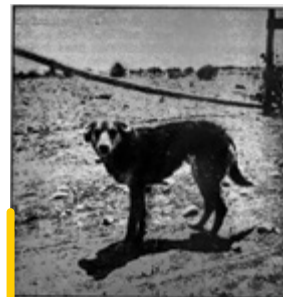
Initially, the Delta region was cultivated with alfalfa, but the effects of irrigation alkali took a toll on the soil, leading to reduced crop yields. Interestingly, sweet clover flourished in these conditions, surrounding the Harris' apiaries. What was once considered unsuitable for farming due to alkali became increasingly valuable for beekeeping, with both sweet clover and alfalfa remnants blooming throughout the season.

E.R. Root recalled an encounter in the extracting house in the absence of Mr. Harris: "I heard the rhythmic whirring of an extractor and, stepping inside, found a young lady hard at work. She seemed as flustered as I was. After awkwardly introducing myself and apologizing for the interruption, I requested to take a Kodak picture of the beeyard, which she graciously allowed." (*Gleanings in Bee Culture*, 1902, pg. 945). While Mrs. Harris was hesitant about having her picture taken at first, she later permitted Mr. Root to snap a family photo the following day. Root mentioned that although he wasn't particularly keen on irrigation, he was committed to supporting his fellow beekeepers. Mr. Harris's thriving beekeeping business owed much to his wife's contributions, as noted by E.R. Root. (*Gleanings in Bee Culture*, 1902.)

The family picture taken by Mr. Root features Mr. and Mrs. Harris at the center; she wears a stylish straw hat, while her sister, Frances, opts for a more traditional city hat. Their dresses resemble Sunday best attire, and although the sisters sport serious expressions, Mr. Harris has a faint smile. The young boy in the

picture is a hired helper. Mr. Root also snapped a photo of Mrs. Harris's dog, half coyote and half shepherd. He seemed to think he was the special guardian, and when Mrs. Harris was left at home alone on the mesa, the dog was the equal of any man.

The beekeeping business posed challenges, often leading to varied success each year due to unpredictable weather. Eventually, Mrs. Harris's brother needed to pursue a more lucrative job, so he passed the bee business down to his son, who later sought employment elsewhere. Likely, Mr. Harris felt similarly about the situation, and the family decided



**The coyote shepherd that objected to having his picture taken.**

to move to New Mexico, where he became involved in the local community of Mesilla Park. They had three children and made New Mexico their permanent home. From 1920 to 1930, Mrs. Harris served as acting postmaster at the Mesilla Park office. Their residence was located on Bowman Street in Mesilla Park, a charming community within Dona Ana County. They owned their home there. Mr. Harris passed away at his residence in 1937 at the age of seventy-six, while Mrs. Harris stayed in their home until her death at the age of ninety-four. Both are laid to rest at the Dona Ana Municipal Cemetery in Las Cruces, Dona Ana County, New Mexico. Moreover,

Mrs. Harris's brother, Harry, passed away in 1947, and her sisters lived on into their nineties.



**The Crawford Honey House in its heyday at the original 7380 West 120th Ave. location before it was moved to Zhang Spur Park. (Courtesy photo, Broomfield History Collection).**

It is fascinating to consider Mrs. Harris's emotions as she navigated the vast technological changes throughout her lifetime. From her childhood rides in a horse and buggy across the rugged Rockies to the freedom of traveling by automobile, the feelings she must have experienced during such remarkable transformations are profound. **BC**



Nina Bagley has been an urban beekeeper in Columbus, Ohio, for over 20 years. Nina worked with a master beekeeper for eight years, raising queens. She has several apiaries in the City, raising her own Queens, and has her own Ohio Queen Bee LLC business. Nina has completed Dr. Joe Latshaw's instrumental insemination class. She completed the Master Beekeeping class taught by Dr. Jerry Bromenshank (Program through the University of Montana.) Nina avidly collects early bee books and history from the 1800s. She writes articles *Bees and Women* for the *Bee Culture Magazine*. Nina has managed the Bee Pavilion at the Ohio State Fair for ten years, sponsored by OSBA. She oversees the State House bees and the Franklin Park Conservatory bees. She also managed the Frank Fetch Park Bees. In 2010 it was the first pilot hive placed in a park in Downtown Columbus, Ohio. She is currently the Franklin County Bee Inspector for Ohio. Nina mentors inner city kids educating them on the importance of honey bees.



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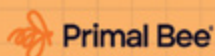
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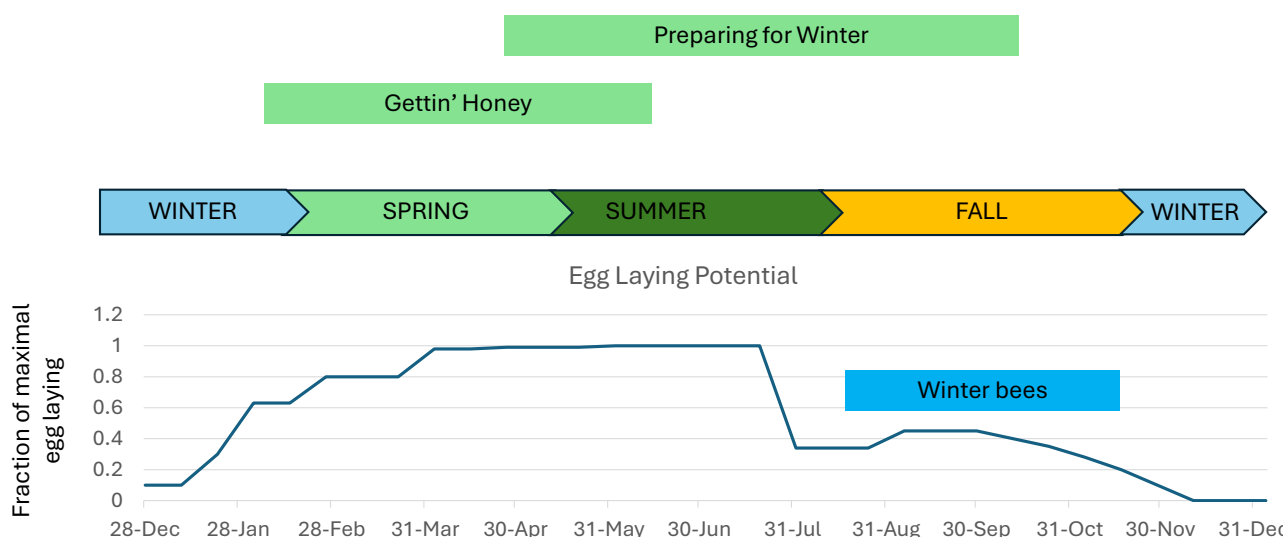


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# THINK OF WINTER BEES WHEN MAKING DECISIONS

James Masucci

## “Two Seasons” of Beekeeping



**Figure 1 legend:** Most of us think about beekeeping in two phases. In the Spring, we are thinking about optimizing honey harvests. After that, we think about preparing for Winter. Preparing for Winter requires the colonies to produce healthy Winter bees. In my area, Winter bees are produced late Summer/early Fall when egg laying starts to decline. The bottom graph is the egg laying potential of the queen throughout the year. Because of the limited number of eggs that can give rise to Winter bees, it is important that our management decisions are geared at ensuring these eggs result in sufficient number of healthy Winter bees.

How do you make bee keeping decisions? Is it “WWJHD” (What Would Jerry Hayes Do)? Or...“My friend does it this way, so I do too”. How about, “This is what my bees need?” Do you ever stop to think about the long-term implications of your decisions? What we do today really impacts the colony 6 months from now, perhaps longer. I think we need to keep that in mind as we develop our beekeeping strategies. But what is the correct criteria to use?

I am going to make the argument that if we do what is best for Winter bees, then we are on our way to a successful year. I believe there are two critical time periods for beekeepers. The first is in the Spring when bees transition from Winter bees to Summer bees. The second is in late Summer/early Fall when the colonies are producing Winter bees. You see,

Winter bees are special. Unlike Summer bees, which live around 6 weeks, Winter bees live for 4-6 months. These are the bees that live through the Winter and are responsible for getting the colony into the Spring build-up. Any stress that impacts Winter bees will increase the probability the colony won’t make it through the Winter. These stresses are the stresses everyone recognizes as being harmful to the colony: Pests, Pathogens, Poor Nutrition, Pesticides, and Poor Management. Thinking about these special bees when managing our hives will give us some criteria on which to base our management decisions.

I first gained an appreciation for Winter bees from Lloyd Harris, a beekeeper/researcher from Manitoba, Canada. He did his Master’s thesis studying the longevity of honey bees.

Every 12 days throughout the year he painted a bunch of newly emerged honey bees and kept track of how long they lived. His results are quite telling. Most bees lived for 4-6 weeks during the beekeeping season, until about the third week of September (in Manitoba). At that point, the bees start living a long time. These are the Winter bees. His take home message was this...all those bees in your August colony will be dead by Christmas. Only the Winter bees will continue until Spring.

I was curious, when do bees in St. Louis, MO (where I am located) start making Winter bees? I had a high school student repeat the experiment in our bee yards. The results were cool...Starting around September 15<sup>th</sup>, a week before the magic Manitoba date, the bees stopped dying. Winter bees started



to arrive mid-September. That means their eggs were laid the last week in August. I had her present to our local bee club and at the end of the presentation someone asked, “What are we supposed to do with this information?” Well, I submit to you that this information allows you to make informed decisions throughout the year. Numerous, healthy Winter bees means Winter survival. So I think of Winter bees when developing my mite control strategy, when setting up nucs, when requeening, when combining hives, and when feeding. Let me explain.

Simply, most of us have two “beekeeping seasons” (see figure 1). In the Spring we are trying to optimize our honey crops. This entails getting the bees into Spring build up, managing swarms, and getting as many foragers as possible for the nectar flow. During this time of year, with maximal egg laying, plenty of food, and general beekeeping bliss, you can get away with a lot. The second season is preparing for Winter. This is where we do our post extraction mite treatments, feeding, and insuring everyone is queenright. During this time, mistakes on our end can

easily lead to a dead colony by next Spring. On the bottom of figure 1 is the “egg laying potential” of the hive. These numbers are only directional. I use them in a population model that I built, based on Lloyd Harris’ results, my own experience, and some published bee models. Basically, in the Spring, once pollen starts coming in, the queen has the potential to lay a lot of eggs. Once the nectar flow is over and we head into Fall, she doesn’t lay as many eggs, colony population decreases and, ultimately, egg laying ceases with only winter bees surviving the Winter. It’s important to note that Winter bees are made during the time egg laying is declining. Which means the opportunity for producing these bees is limited. Which means we have to optimize that opportunity.

Even though “time of year” is a big determinant for brood potential, and there is nothing we can do to alter that (short of migratory beekeeping), there are several other factors influencing brood potential that we can manage. Some of these factors are: colony health (specifically, mite treatments), queen quality/health, colony population, and food availability. As we are managing these factors,

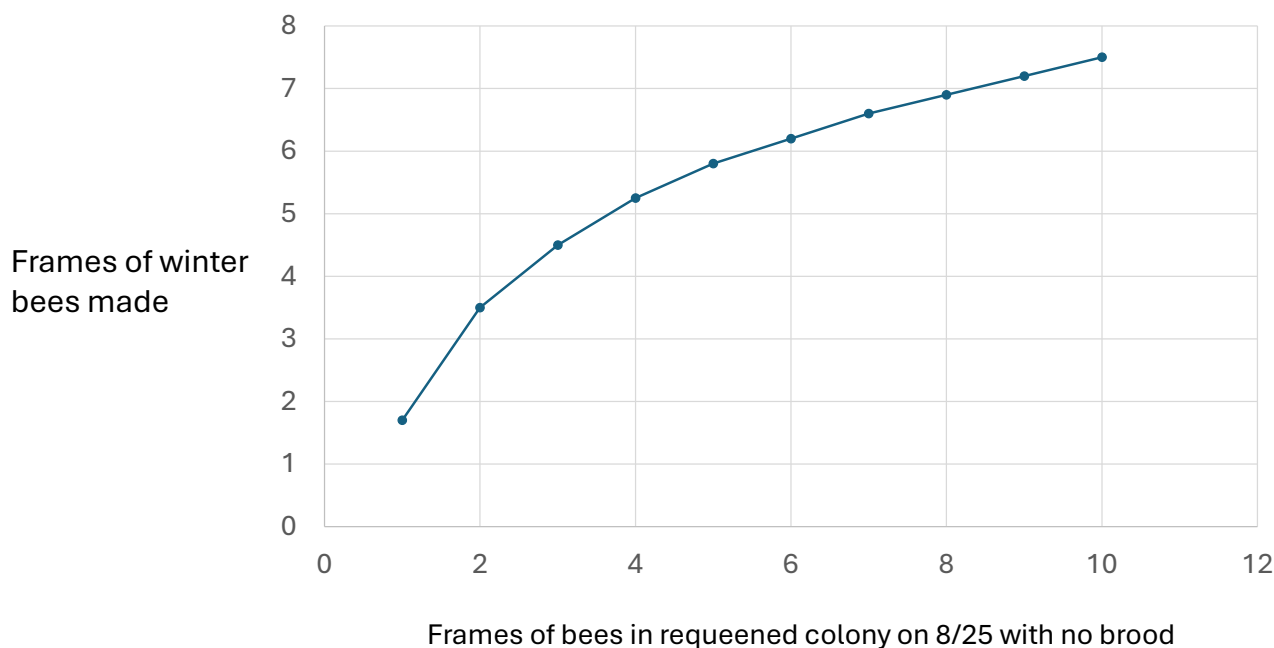
we should keep in mind Winter bees as we make our decisions. We need to ensure a good crop of healthy Winter bees.

### Colony Health:

Healthy bees live longer, including Winter bees. Knowing Winter bees are made late Summer/early Fall, we should focus our efforts to make sure our colonies are healthy at this time. The most meaningful health-related decisions relate to mite management. How many people treat once a year in Fall? I argue this is too late. High mite levels in late Summer mean Winter bee production is more likely occurring with higher viral loads. Higher viral loads mean a shorter life span. You should focus on keeping mite levels low before Winter bees are produced to minimize viral loads in the hive during Winter bee production. I have been able to accomplish this with a Winter OA vaporization. I am altering my strategy with the recent approval of two new mite control products, Norroa and VarroSan, that give long-term mite control and are safe to use during honey flows. These make perfect options for Spring treatments which would result in

**Figure 2 Legend:** The prediction of my bee population model showing how many Winter bees a colony of a certain size on August 25 is capable of producing. The take-home message is that you can’t expect to have increasing hive populations in late Summer/early Fall. This helps you decide whether you need to add brood, combine hives, or walk away when trying to rescue colonies.

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low mite levels when we need it. We can then follow up with a Summer/Fall treatment to clean things up for Winter.

### **Queen Quality/Health:**

Some beekeepers requeen every year, some never requeen. But queen quality can have a major impact on the number of Winter bees you can produce. Compare a spotty pattern, where maybe 60% of the cells produce bees to a great pattern where 90% of the cells produce bees. The good queen can produce 50% more bees than the poor queen. That matters. Remember, Winter bees are produced during a time of diminishing egg laying so every viable egg matters.

When is the right time to requeen? That's a personal decision. However, thinking about Winter bees allows you to determine when the wrong time is to requeen. If you requeen with a mated queen, conservatively, you will see your first egg in 9 days (4 days in the cage and a few days to get into egg laying mode). If, like me in St. Louis, eggs for Winter bees start being laid around August 25, then the latest you should try to requeen would be August 16. Similarly, if you are going to use a queen cell, then the first egg is in 17 days the latest date would be around August 8. If you are going to let the hive make their own queen, first egg is around 22 days, and the latest date would be August 3. Having these simple guidelines can help you make better decisions. The later you are in the Summer, in the year the riskier the proposition. Perhaps requeening with a nuc is necessary.

### **Fixing Queen Less Hives/Colony Population**

Requeening a queenless hive is not the same as requeening a queen right hive. A queen right hive has the appropriate age distribution of bees with all the castes fully represented and a certain amount of brood. A queenless hive is skewed towards older bees and will have less success raising brood because they won't have the full complement of nurse bees. This is exacerbated the longer the hive has been queenless. When you realize that it takes 30 days to get your first bee when you requeen with a mated queen, you realize that most of the original bees will be dead by the time those bees emerge. It takes time for a colony to recover from that

dynamic which pushes the "latest" dates described above back even further. It will be difficult to rescue a queenless hive in August without at least giving them some brood to help alleviate the old bee disparity.

As a mental exercise, think of a beautiful 20-frame colony. When you make the determination it is queenless, it has no brood, meaning it has been queenless for at least 3 weeks. The lifespan of the bees is about 40 days, and it is 30 days until the first bee from the new queen emerges. That means 75% of the bees die before bee population starts to replenish. At this point, you are down to a 5-frame colony. The size of a nuc (without a good population demographic). Does this colony have enough time to produce enough Winter bees to get through the Winter? It all depends on timing.

Figure 2 shows the results of my population model when I evaluate hive size on August 25 (Winter bee eggs being laid) with the number of Winter bees produced. Again, my model is just a model, and not super accurate. The conclusion is that colonies don't get bigger late in the season. Usually, you can't grow colonies late Summer. If you have a small colony, it's going to stay a small colony. This tracks with my experience in my region. So, if that colony you requeened had about 5 frames of bees in late August, it will produce about 5 frames of Winter bees (10,000 Winter bees). Is that big enough? It depends on your region and your experience. The important thing is you can think about this before you make your decisions. In the Spring, you are fine, in the Summer, adding brood may be important. Always keep in mind the impact of what you do on the number and health of Winter bee production.

### **Feeding:**

If there is no food available, brood production shuts down. If there is too much food available, cells get back-filled with nectar and brood production shuts down. Every Fall, we walk this tight rope trying to ensure our colonies have enough stores for the Winter. Several years ago, friend and Manitoba beekeeper Daryl Wright told me the story of how many Canadian commercial beekeepers shot themselves in the foot preparing for Winter and paid for it with super high colony losses. Many of their

workers came in on visas and had to leave the country by Oct 1. Because of the loss of work force, beekeepers prepared their hives for Winter in September. They filled them with syrup and wrapped them up. What would a Winter bee mindset tell you would happen? They filled their hives up too soon which shut down brood production. Not enough Winter bees were made because the queen shut down early. Hence, high colony loss. The goal with feeding is to sustain normal activities in the colony and you want to fill them up in a way that does not negatively impact Winter bee production.

Beekeeping is complicated. There is a reason most new beekeepers give up after 3 years. As a mentor, I get asked a lot of questions about what people should be doing with their bees. My answers are never simple. It usually starts with "that depends". I usually try to describe all the stuff going on in my mind that leads to the advice I am going to give them. The bottom line is that I have a set of criteria that I use to base my decisions on. Even in their most abstract way, I can trace them back to the simple question, how will this impact the future Winter bee population. I've given a few examples here. Rest assured, there are more. Try this exercise. Think of some scenarios in your bee yard and think about how your decision would affect Winter bee production. See if it doesn't start making sense. **BC**



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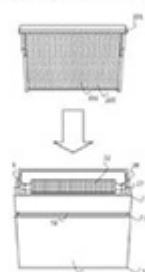
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# EUROPEAN FOULBROOD (EFB)

European foulbrood (EFB), caused by the bacterium *Melissococcus plutonius*, is a widespread brood disease affecting honey bees and has a near-global distribution. The disease impacts unsealed larvae, often manifesting early in the spring when colonies are building up their populations.

Under typical conditions, symptoms of EFB often subside spontaneously during periods of strong nectar flow. However, in recent years, more virulent strains of *M. plutonius* have emerged and are actively spreading through Alberta. Unlike typical forms of the disease, these new variants can cause significantly greater harm, severely weakening colonies and, if left unmanaged, potentially leading to colony mortality.



## WHAT IS EFB?

It is a disease caused by a non spore-forming bacterium that infects the digestive tract of honey bee larvae. Larvae younger than 3 days are the most susceptible to infection, with death typically occurring around 5 days of age, while the cell remains uncapped. Although rare, mortality can also occur later, after cell is capped. The disease is transmitted by nurse bees feeding larvae contaminated food, or through residual bacteria persisting in the brood cell from previous infections.

## SYMPTOMS

- A spotty brood pattern.
- Visible midgut in infected larvae.
- Larvae, in the “C” shape, will begin to change from a healthy pearly white to a sickly yellow in colour, then to grey and eventually a brownish-black colour.
- Larvae may become twisted or stretched in the cell and may move out of the characteristic “C” shape at the bottom of the cell.
- Infected larvae will rope less than 1.5 cm when drawn out with a toothpick.
- As infected larvae dry out, they may form a scale or plaque on the cell floor. However, unlike AFB, these dried remains do not adhere firmly to the cell wall and can usually be removed more easily.





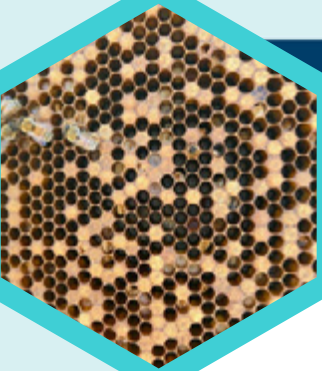


## CAUSES

Outbreaks of EFB are commonly associated with a combination of stress-related and environmental factors that weaken colony health and promote bacterial growth. Key contributors include nutritional deficiencies due to adverse weather, limited forage (particularly poor pollen quality) and a shortage of nurse bees. Additional factors may involve water scarcity, bee transportation, larval immune response, genetic susceptibility, and broader environmental stressors.

## IPM STRATEGY FOR EFB PREVENTION

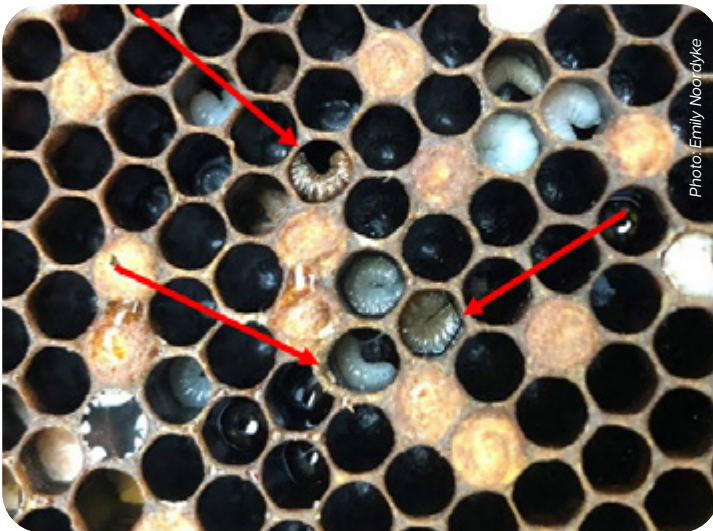
- Regularly inspect colonies for signs of disease and practice good sanitary management practices.
- Use bee stocks known for strong hygienic behaviour to enhance colony resistance.
- Provide supplemental protein during periods of poor weather or limited forage availability.
- Replace old brood frames every 3–4 years to minimize pathogen buildup.
- Be cautious when transferring equipment and combs between hives.
- Remove symptomatic colonies and dead-outs from apiaries to reduce robbing and transmission of EFB and other diseases.



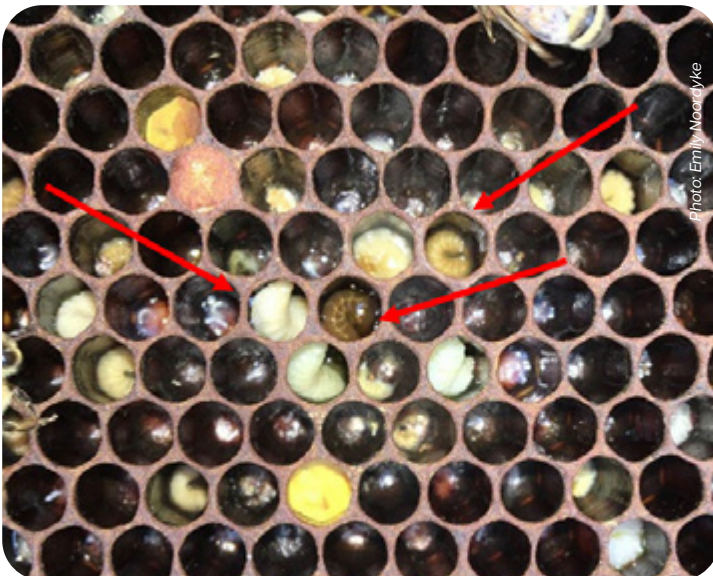
## I HAVE EFB, WHAT SHOULD I DO?

- Remove frames showing clinical signs of EFB and dispose them appropriately to reduce disease transmission within and between colonies.
- If the EFB infection is severe, burn your infected colonies. Irradiate your comb (min. 15 kGy of radiation).
- Use the 'Shook Swarm' method for mild infections, but note this is only recommended as a control measure until the end of July.
- Antibiotics should be used sparingly, only on strong colonies and under veterinary supervision, using products registered for EFB control.
- Quarantine all purchased used equipment and nucs to ensure they are disease-free before introducing them to your apiary

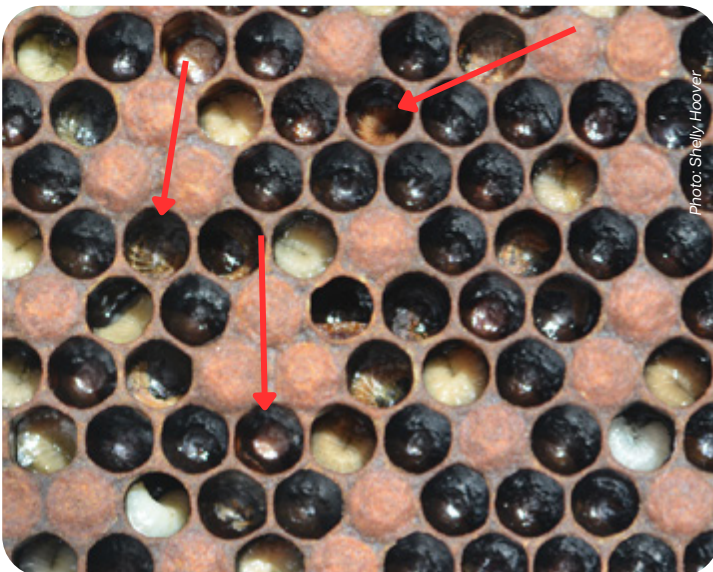
## EUROPEAN FOULBROOD GALLERY



Irregularly positioned larvae in the cells with the white trachea and midgut discolouration.



Larvae will begin to change from pearly white to a sickly yellow in colour, then to grey and eventually a brownish-black colour.



Larval scales retains the curled shape and is easily removed from the comb. Some sour odour may be present.



# AMERICAN FOULBROOD VS EUROPEAN FOULBROOD

Unlike EFB, American foulbrood (AFB) is caused by a spore-forming bacterium (*Paenibacillus larvae*). AFB is considered the most serious honey bee disease due to its extremely resilient spores, which can remain viable and infectious for decades, and its ease of transmission between colonies. The disease is highly contagious, only a few spores are sufficient to infect an otherwise healthy colony. While the clinical signs of AFB are distinct from those of EFB, they can vary depending on the stage of the infection and how much time has passed since initial exposure.

## AFB

## VS

## EFB

1. Spotted brood pattern
2. Sunken cappings
3. Off center holes in cappings
4. Larval scale

**5. Caramel colour of dead larvae\***

**6. Pupal tongue\***

**7. Will rope out about 2 cm\***

\* These three signs are unique to AFB

1. Spotted brood pattern
2. Sunken cappings
3. Off center holes in cappings
4. Larval scale

**5. Yellow/dark brown dead “C” shape larvae\***

**6. Larvae with white trachea and midgut discoloration\***

**7. Will rope out about 1.5 cm\***

\* These three signs are unique to EFB



AFB Pupal tongue



Ropiness Test and Larvae of AFB Caramel Colour

## REFERENCES

Agriculture and Forestry Bee Health Assurance Team. (2020). *European Foulbrood*. Alberta Bee News.  
Government of Alberta. (2024). *Honey Bee Pests and Diseases*. Bee Health Assurance Team.  
Pernal, S. F., & Clay, H. (2013). *Honey Bee Diseases and pests (3rd ed.)*. Canadian Association of Professional Apiculturists.

## STANDARD SANITARY MANAGEMENT FOR EFB INFECTED COLONIES

1. SCORCH OR CHANGE YOUR HIVE TOOL AFTER OPENING A COLONY THAT YOU SUSPECT HAS EFB.
2. IF THERES IS A HIGH INFESTATION OF EFB, CHANGE TO A CLEAN BEE SUIT AFTER INSPECTION.
3. SANITIZE ANY OTHER TOOLS OR EQUIPMENT THAT MAY HAVE COME INTO CONTACT WITH INFECTED FRAMES.
4. CLEARLY COMMUNICATE WITH ALL TEAM MEMBERS WHICH COLONIES ARE INFECTED WITH EFB.

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# Exploration of Scents to Improve Apiary Visitor Safety and Reduce Smoking of Honey Bee Hives

University of Montana | Master Beekeeping | Dr. Jerry Bromenshenk, Dr. Scott Debnam & Phillip Welch  
Robin Forde & Marcy Frantz



Figure 1 Wagner Farm Apiary with three established colonies (used in scent tests) and one developing new split.

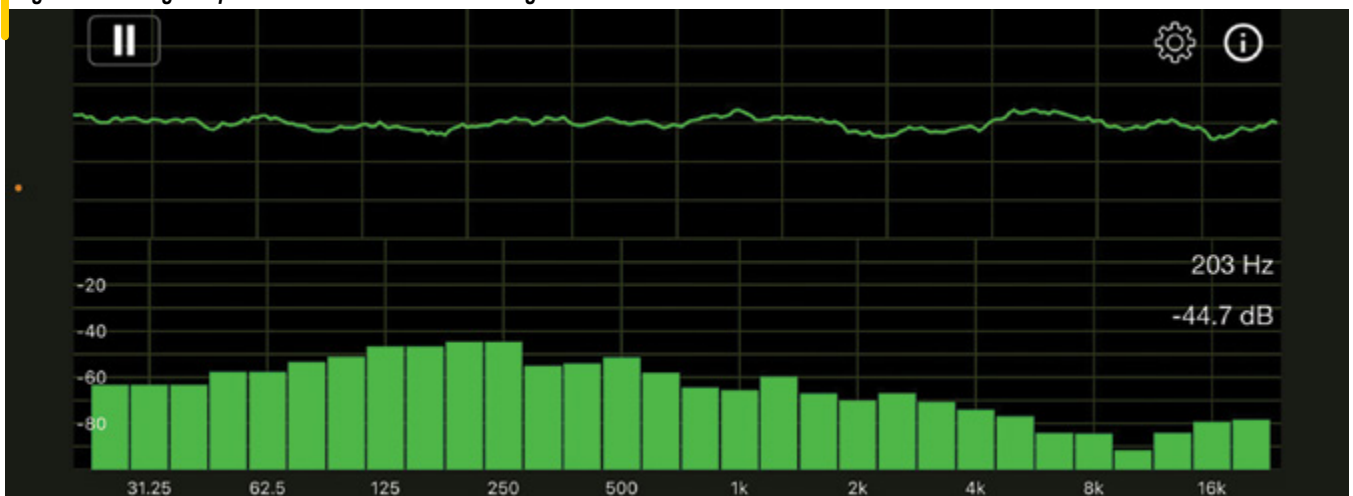
## Abstract

This study explores alternatives to traditional hive smoking for educational bee yard visits and minimally invasive beekeeping tasks. Eleven scents were tested to observe their impact on the behavior of the bees at the hives entrance. Three of the eleven scents prompted no visits to the test glove containing the scent and no significant increase in measured bee colony sounds. These three scents were then tested at the top of the opened hives. These findings suggest certain scents may serve as tools for calming honey bees during brief interactions, potentially improving visitor safety and reducing disruption to the honey bee colonies. A guide based on this research has been developed to help farm docents and 4-H members conduct safer, smoke-free tours of the apiary.

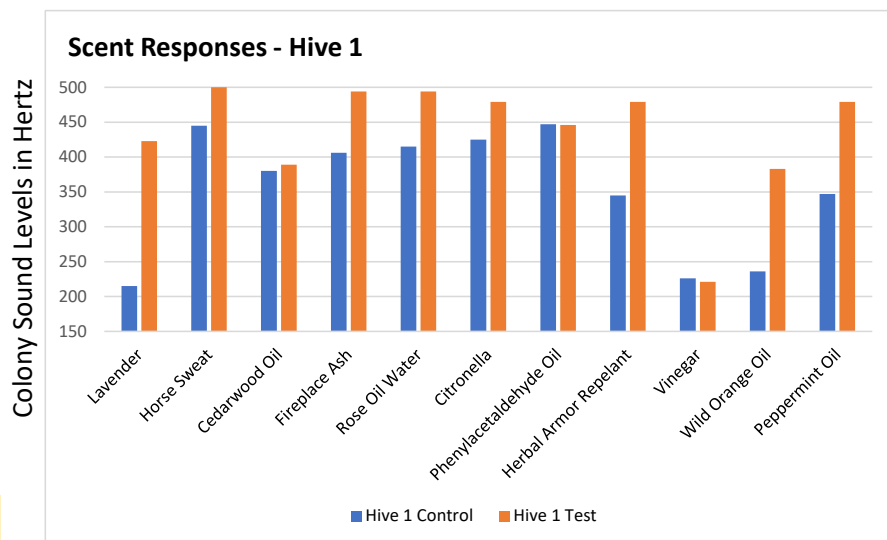
## Introduction

At Wagner Historic Farm in Glenview, IL, beekeepers and 4-H club members are often asked to provide tours of the hives or to provide information that the farm's docents can reference when bringing guests for bee yard visits. Visitors include volunteers and 4-H club members who may have groomed livestock or worked cleaning pens. Others may be corporate groups, financial donors, or school groups. The intention of the safety information document is to reduce the circumstances that provoke stinging. According to *Graham (2015)* a smoker is considered one of the most important tools the beekeeper has to work hives safely. However, many visits to the Wagner Farm apiary are brief and do not involve highly invasive work. Alternatives to smoking beehives are being explored

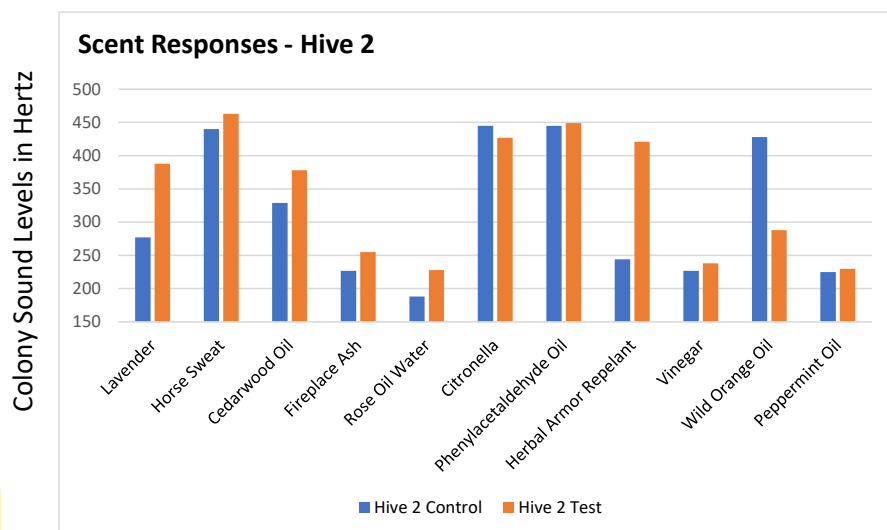
Figure 2 Reading sample from one of the hive recordings.



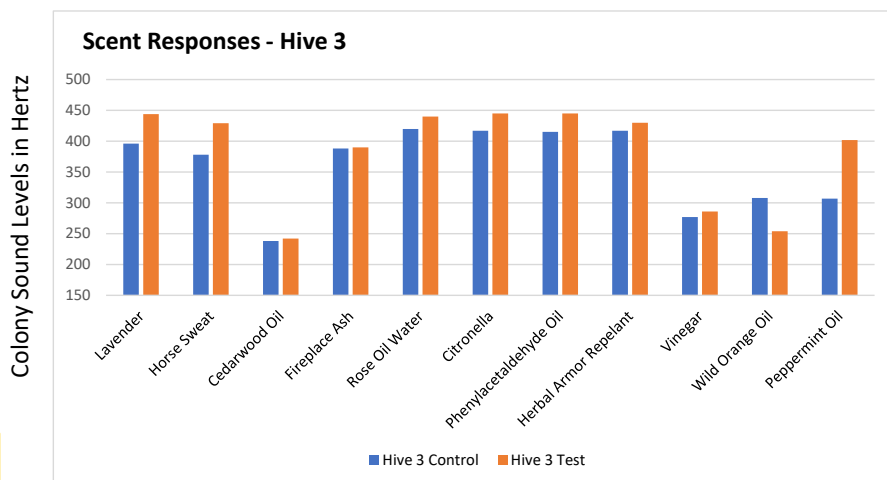
## Procedure



**Figure 3** Hive 1 hive buzz frequency (in Hz) test results with each of the eleven scents presented outside the hive.



**Figure 4** Hive 2 hive buzz (in Hz) test results with each of the eleven scents presented outside the hive.



**Figure 5** Hive 3 hive buzz frequency (in Hz) test results with each of the eleven scents presented outside the hive.

for such visits. Crane (1999, p.332) notes historical references which seem to be relevant even today:

“It was known in the time of Aristotle that certain odours could alert bees to sting: ‘They are annoyed by all bad smells and by the scent of perfumes, so much so that they sting people that use perfumes’ (Historia animalium IX.40.626a). Section 20.4 quotes a statement from about 200 BC, that beekeepers in Alexandria had their heads shaved because of the bees’ dislike of perfume. In Rome, Varro (III.16.6) and later Pliny (XI.19.61) wrote of bees stinging anyone smelling of perfume.”

## Method

Wagner Farm is a 20-acre former working family farm in suburban Cook County, in the Chicago area, acquired by the Village of Glenview in 2003. It is owned and operated by the Glenview Park District and seeks to interpret 1920s family farming practices in contrast with modern farming methods. The bee yard at the farm (Figure 1) currently has four hives: three owned by us, the volunteer beekeepers who authored this report, and one belonging to the Glenview Clovers 4-H Club. The three established colonies used to conduct this experiment are made up of Buckfast and mixed ancestry bees and queens. Two of the colonies were installed in early Spring, 2025. One colony installed Spring of 2024 and overwintered. All three colonies appeared healthy and productive throughout the weeks of the scent exposure and data collection period. The bee yard is away from public access within a fenced area adjacent to the horse pasture.

## Materials

Care was taken to minimize the influence of extraneous factors during the experiment. Eleven scents were tested: lavender, wild orange, rose, fireplace ash, horse sweat, cedarwood, peppermint, vinegar, phenylacetaldehyde, citronella, and Herbal Armor Kids insect repellent (DEET-free containing a combination of soybean, citronella, peppermint, cedar, lemongrass, and geranium oils). Some scents are potentially provocative



odors that visitors (or beekeepers) might pick up as they move about the farm, hence the inclusion of horse sweat and fireplace ash.

The beekeeping community engages in cultural transmission of anecdotal knowledge which can result in the establishment of widely accepted practices that may not be scientifically supported. The scents of peppermint, vinegar and lavender were chosen for this study based on informal information shared by beekeepers on online forums and the like. The Glenview Clovers 4-H beekeeping members (8-18 years old) wanted to test insect repellent, resulting in the inclusion of Herbal Armor Kids.

The inclusion of phenylacetaldehyde was based on, *Visscher et al.*, (1994) who referred to using the floral odor to investigate the concept that smoke interferes with olfaction generally, rather than specifically with honey bee alarm pheromones. Phenylacetaldehyde is present naturally in a wide range of fruits, plants, and other food items and used in perfume-making and is described as a powerful scent of green wood sap and is used in perfume making. A small amount was ordered from an online vendor. The remaining scents, rose water and citronella, were chosen because the Nazonov pheromone emitted by bees contains geraniol (Graham, 2015). The National Center for Biotechnology Information (2025) states this compound is naturally occurring in roses, citronella grass and other floral scents. All eleven of the scents in this experiment were tested to confirm or eliminate them as viable alternatives to smoking when R. Forde, opening honey bee hives for minimally invasive tasks such as pulling a honey frame to show visitors, or checking for bee population and assessing a need to add honey supers.

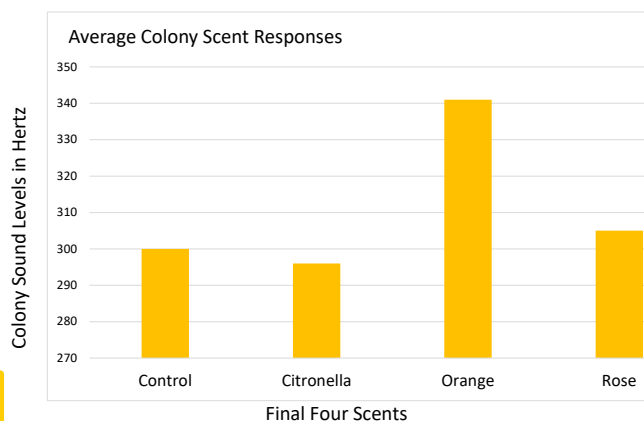
Over two weeks data were collected four afternoons in July, 2025. A white cotton glove without added scent and a small wireless lavalier microphone were placed on a twenty-four inch long stainless steel rod and placed four to six inches from the landing board of each hive in the Wagner Farm apiary. The control glove remained at the hive entrance for one minute. After one minute (allowing time for possible alarm pheromone to spread), ten seconds of observational data were collected, and hive sounds were captured using the lavalier microphone attached to the scented glove, an iPhone and an RTS Audio/Spectrum Analyzer mobile application (Figure 2). Prior to the introduction of each of the eleven scents to the three hives, a control observation and baseline sound recording were

conducted (Figures 3, 4, 5). Each scent on a glove was presented in the same way as the control glove. The order of scent introduction was randomized, giving at least one minute between control recording and scent presentation, with at least fifteen minutes between each new control/scent presentation.

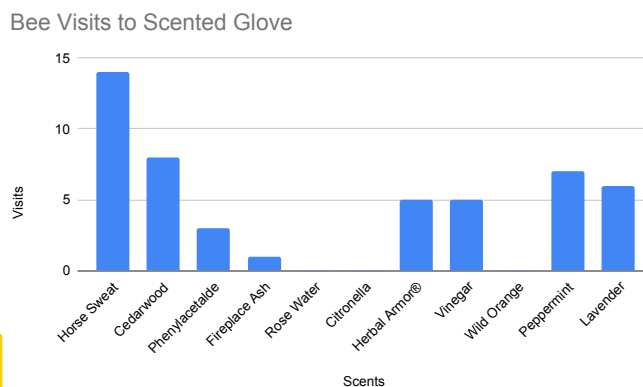
After external presentation of scents, bee activity and hive sound responses were recorded and analyzed. Only three of the eleven scents met the criteria of eliciting no visits, stinging, or chasing/alarm behaviors. These scents were then chosen to be presented inside each hive the following day. Raising the telescoping lid of each hive four to six inches off the hive allowed for an internal presentation of a control glove held two to three inches above the inside cover or top frames containing each of the three scents—citronella, wild orange, and rose. A twenty second video recording was made of bee reaction to the presence of each scent as well as the control glove. During this time a recording of the hive sounds was sampled after one minute by placing the lavalier microphone on the surface of the opened hive. Together, the video recording observation and average bee hive sound response was compared for the three scents (Figure 6) Each were analyzed to determine if it may be a possible alternative to smoking for quick visits or inspections, reducing the impact on colony wellbeing.

## Results

External presentation of the eleven scents provided inconsistent hive sound and bee behavior measures. Shown in Figures 3, 4, and 5, when peppermint was presented, a higher pitched hive sound (significantly higher than control readings for each) was recorded in hives one and three and the sound recording in hive two was essentially unchanged. The sound samples in response to wild orange oil in hives one and three showed a decrease in hive sound pitch as compared to control measure. The sound recording of hive two when presented with wild orange oil showed a significant increase in hive buzz frequency. While the hive buzz frequency response was inconsistent between the three hives, all three ten-second observational data of bee visits to the scent had no visit of bees from each colony (Figure 7). When collecting data on the external presentation of each of the eleven scents, the criteria to evaluate the colony responses to the exposure were sound frequency measured in hertz, and bee visits



**Figure 6** Average hive buzz (in Hz) response to control and three scents across all three colonies during internal presentations.



**Figure 7** Number of visits to each scent presented on a glove outside the hives in a ten second observation period.

to the scent. Only three scents met this criteria set for testing within the open hive.

Three scents were selected based on colony sound response measurements and bee behavior data showing they caused the bees to move away, and not present aggressively toward the scent. Figure 6 displays the average sound responses to each scent. The lowest average bee hive sound measurement was recorded during citronella scent presentation within the open hive. The twenty-second video recordings of the bee behavior during the three scent presentations within each open hive was consistent. The control glove had four bee visits when recorded. Citronella, wild orange, and rose recordings all showed no visits to the scented gloves. (Figure 7)

Bees did not move more rapidly, extend abdomens into the air in fanning behavior, increase alarmed flight, or exhibit stinging behaviors. Further exploration of the three test scents should be done and bee responses noted along with beekeeper observations. Bee suits, gloves should always be worn when visiting inside the bee yard to ensure a greater level of safety. Smoke should still be used when working bees for invasive hive management tasks beyond a quick visual observation of the hive or opening of the hive to add supplemental feedings.

### Benefits Discussion

The presentation of citronella, rose, and wild orange scents did not seem to increase defensive bee behavior nor did it significantly change the hive buzz measurements during the testing period. The bees in all three hives remained calm during scent test periods. This is promising for the use of one of the three test scents to make visits less disruptive for the bees, allowing beekeepers to make brief inspections without eliciting aggressive behavior. Therefore, smoking the hive may be required less frequently. Using smoke less often may benefit the bees by reducing hive disruption, thereby reducing gorging on honey stores, impacting later honey harvests and Winter survival.

A light application of one of the floral scents in the general area around the bee yard offers the possibility of visits from visitors who may be nervous about the bees but who are curious, a level of calm confidence. The 4-H members, students and volunteers will be able to open the hives to check syrup levels and other light chores without having to light and use smokers to calm the colonies. As a result of this study (preceded by beekeeping experience, scientific readings, and formal training) a visitors guide (see Appendix) was developed to introduce new 4-H beekeepers to the bee yard and enable docents to safely conduct tours. This will be valuable to expand the opportunities for further access to the Wagner Farm Apiary beyond the times beekeepers are available to accompany docents and groups.

If next steps for further exploration of scent impact are pursued, investment in more advanced sound analysis software—able to record an average Hz during data collection periods—should be considered. Small amounts of the internal hive test scents (citronella, rose, and wild orange) may be applied to beekeeper gloves or suits during future hive inspections or brief tasks within the hive. Bee responses can then be observed and recorded on record keeping log (Appendix B) to create a database of historical use of these scents as potential alternatives to smoking. **BC**



Robin Forde and Marcy Frantz are Master Level Beekeepers, certified through the University of Montana. As volunteer beekeepers and co-leaders of the Glenview Clovers 4-H Beekeeping Club, they are passionate about educating the next generation of beekeepers and promoting pollinator health at Wagner Farm in Glenview, IL.

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### Appendix A

#### Wagner Farm Apiary Visitor Guidelines

Welcome to Wagner Farm for a visit to the bee yard! Your safety and the wellbeing of our bees are of utmost importance. These guidelines will help ensure a safe visit.

- Remain outside the fence to view the bee yard without a beekeeping suit.
- Should you enter the bee yard, wear a well fitting beekeeping suit and gloves. Ensure all zippers are securely zipped and gloves cover your wrists.
- If you have been working with livestock, hose off boots and wear gloves specifically for beekeeping.
- Do not groom or pet draft horses before visiting the bee yard.
- If hosting groups who will be visiting many areas of the farm, schedule a bee yard visit before other livestock visits.
- Avoid wearing strong scents including perfume, cologne, heavily scented shampoos or laundry detergents/fabric softener.
- Remain calm and use a calm voice while in the bee yard. Quietly exit the bee yard and view from outside the fence if you are uncomfortable. Never run, yell, or swat at bees.
- Only enter the bee yard with a beekeeper, but feel free to view from outside the fence in the absence of a beekeeper.
- Smoke should be used when invasive tasks are performed or a hive is opened for an extended period of time.
- We are stewards of the bees. Avoid opening hives during rain or when temperatures are below sixty degrees. All visits and actions should keep the wellbeing of the bees a top priority.



## Appendix B

### Scent Experiment Additional Data

| Date | Hive # | Scent | Smoke | Task | Notes | Initials |
|------|--------|-------|-------|------|-------|----------|
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# A Beekeeper's Blind Spot:

## Discovering Wing Wear Through Macrophotography

Patrick D. Krantz



One Summer morning, walking into my apiary as I often do, I stumbled upon photographer Zach Allerton crouched near the hives, his lens trained on a worker bee. He was using macrophotography to capture the fine details of her wings. He shared several images with me and for the first time, I noticed the ragged edges. I had not previously given much thought to it. Seeing his images was eye-opening — it inspired me to include a macrophotography assignment in my college environmental science class, so students too could discover these hidden details.

The following images are some of the results. They were all taken using macrophotography, which allows us to magnify tiny features like the serrations of a bee's wing. Basic tips include stabilizing the camera, using natural light or a fill light to reduce shadows, and maintaining a steady distance from the subject. It will most likely require shooting a lot of images before capturing the right perspective, in focus. In class, I required only an inexpensive \$40 macro lens that clipped onto my student's cell phones. This affordable option still produced striking results.

### Pic #1

Honey bees are born with wings that appear delicate, translucent, and nearly flawless. These wings are their lifeline to the world outside the

hive, carrying them on thousands of journeys in search of nectar, pollen, and water. But unlike muscles or internal tissues, wings cannot repair themselves. Every trip into the field marks the beginning of a slow, irreversible decline in wing condition.

### Pic #2

This decline is known as wing wear, a process in which the edges of the wings become frayed, nicked, and torn with time. Wear accumulates through repeated contact with vegetation, the mechanical strain of flight, and simple aging. It is not a disease, nor is it caused by parasites — it is the inevitable cost of being a forager.

### Pic #3

Scientists have shown that wing wear is closely linked to a bee's foraging history. While beekeepers often measure a bee's age in days, wing wear better reflects the number of hours spent flying. Younger bees can be pushed into foraging early, and older bees may continue to work longer than expected. For this reason, wing wear is a more reliable measure of experience than chronological age (Mueller & Wolf-Mueller, 1993; Higginson & Barnard, 2004).

### Pic #4

The scale of that effort is staggering. To produce just one pound of

honey, honey bees collectively must visit an estimated two million flowers and fly more than 50,000 miles. Over the course of her brief life, a single worker bee may log more than 300 miles of flight, all on wings no larger than a fingernail. Each mile flown carries a cost, etched into the margins of her wings.

### Pic #5

The effects of wear go far beyond appearance. Bees with worn wings must work harder in flight, beating their wings faster to generate the same lift as younger bees. As damage accumulates, their hovering ability, maneuverability, and carrying capacity are all reduced. Symmetric wear is difficult enough, but asymmetry — when one wing is more damaged than the other — exacts a particularly heavy toll (Vance & Roberts, 2014).

### Pic #6

Experimental work has confirmed these costs. Dukas and Dukas (2011) found that clipping about 20% of a bee's forewing reduced the total amount of food delivered to the colony by roughly the same proportion. The bees kept flying, but they carried less per trip and lived shorter lives. This shows the determination of the honey bee: even when damaged, she does not rest, but instead works herself more quickly toward death.



Photo Credit: Z. Allerton



Photo Credit: Z. Allerton



Photo Credit: Z. Allerton

#### Pic #7

In observation hives, researchers noticed that bees with significant wear often shortened their trips, stayed closer to the hive, and recruited fewer nestmates to distant flowers. Their waggle dances reported food sources of lower profitability, subtly shifting the colony's foraging strategy (Higginson, Barnard, & Tofilski, 2011). These findings reveal how the damage of one individual ripples outward into the collective behavior of thousands.

#### Pic #8

For most beekeepers, wing wear is almost invisible. Foragers rarely linger inside the hive. They arrive loaded with nectar or pollen, quickly



transfer their burden to younger bees inside, and depart again. By the time their wings are tattered, they are seen only briefly at the entrance. Their end comes quietly, often far from the hive, when they no longer have the strength to return.

#### Pic #9

The honey bee's life is already brief, measured in weeks rather than months. In the height of Summer, a worker may live just six weeks, most of it spent flying. During that time, she may visit 5,000 flowers in a single day if resources are abundant. Wing wear is thus not an abstract scientific curiosity — it is the physical evidence of a body pushed to its limits. Bees literally work until their wings fail.





10



Photo Credit: Z. Allerton

11



Photo Credit: Z. Allerton

12



Photo Credit: Z. Allerton

**Pic #10**

This deterioration is part of a larger pattern of senescence in honey bees. Just as flight muscles accumulate oxidative damage (Seehuus et al., 2006), wings record the visible toll of labor. Together, these processes underscore a central truth: the honey bee worker is designed not for longevity, but for service. Her life is short, but every moment is spent for the colony.

**Pic #11**

While wing wear can be scored by scientists using standardized methods, from ordinal scales (Mueller & Wolf-Mueller, 1993) to experimental clipping (Vance & Roberts, 2014), its real significance is philosophical as much as biological. Wing wear tells a story about sacrifice, resilience, and the limits of living systems under constant strain.

**Pic #12**

From an ecological perspective, wing wear has practical applications. Researchers can use it as a low-cost proxy for foraging intensity, helping to compare colonies across seasons or landscapes. Heavier wear often appears later in nectar flows or in habitats with dense vegetation, where wings fray more quickly. For beekeepers, it offers a window — if they look closely — into the hidden lives of their foragers.

**Pic #13**

But for the bees themselves, wing wear is not a metric, it is their fate. Each forager that lifts off into the field does so knowing, in a biological sense, that her wings will never return unchanged. Each fray is the mark of a trip made, a flower visited, a load carried home.

**Pic #14**

In this way, the story of wing wear becomes the story of the honey bee itself: a narrative of bodies consumed by labor, of strength transformed into collective wealth, and of lives measured not by duration, but by contribution.

**Pic #15**

And so, when a bee's wings are finally shredded and she fails to return, her absence is barely noticed by the colony she served. Yet in her wings remains the trace of her devotion—a life spent in flight until the very end.

**Pic #16**

Not a bee!

**About Macrophotography**

Lens kits vary greatly, from professional glass to simple cell phone

13



Photo Credit: V. Henry

14



Photo Credit: V. Henry

15



Photo Credit: Z. Allerton

16



Photo Credit: Z. Allerton

attachments. One cell phone option includes the Xenvo Pro Lens Kit for iPhone and Android. With even a basic clip-on lens, you can marvel at details normally unseen: the tattered edge of a wing, the pollen grains clinging to a leg, the reflection in a bee's compound eye. **BC**

#### Photo contributors:

Zack Allerton shoots with an Olympus EM-1 Mark II camera body, Olympus M. Zuiko 60 mm f/2.8 macro lens, Olympus FL-600R flash unit, and an AK Macro Flash Diffuser.

Glenn Thompson shoots with a Canon R6 camera body, RF 100-500mm lens @ 428mm (1/1600", f/6.3, ISO 2000)

Faith Giannamore uses her iPhone 15 camera with a 0.06x wide macro lens.

Valan Henry uses their Android 15 50MP OIS camera.

#### About the author:

Patrick D. Krantz is a faculty member at Westminister College, New Wilmington, PA, in the Harms Center for the Environment. Along with his students, he maintains a very active bee yard, which provides opportunities for teaching, research, and community engagement.

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# BEESWAX AND CANDLES

## A Hive Byproduct

### A cool season bee project

It is late mid-Winter, cold and snowy. My apiary is loudly quiet. No bees flying, no birds singing, no noisy insects – just cold and quiet. What to do? Reflect about last year or anticipate next year? As I recently stood in my bee yard, I decided to do some of both. In a friendly way, the Winter bee yard is lonely, reflective place. It always offers hope for the Spring season that is just a few months away.

My small honey crop has been processed and is history. I got an okay crop – not great. I have told you about all those swarming and supering adventures in previous ramblings. For the most part, my small wax crop has been rendered and is in storage as rough-rendered cakes. I've been accumulating small amounts of wax for several seasons. Now that things are so quiet with little bee yard work to do, it seems appropriate to turn my energies back to my small wax crop.

### Beeswax Production

Beeswax is produced as a highly vaporous liquid by four pairs of glands on the bees' bottom side. The liquid wax flows onto eight "mirrors" or shiny plates where it rapidly hardens into small, white flakes. Strangely, bees often drop these flakes where they can be seen accumulating on bottom board. Seemingly, they are not retrieved.

**James E. Tew**

These discarded wax scales are an indicator that a nectar flow is underway. The wax-secreting bee uses a long spine on her middle leg to pass the crumbly flake to the front legs where it is chewed, hardened a bit, and then – using jaws that look like a couple of cement workers' trowels, it is molded in the familiar new comb that beekeepers have seen in past Spring seasons.

Wax is produced only when storage comb is needed. That is usually during Spring and early Summer in most parts of the USA. Since it takes about 8 pounds of honey to produce one pound of wax, it is a building material that bees do not produce unless it is needed. When a hive becomes packed with honey and nectar, returning field bees, loaded with nectar have no place to unload. During these times, even the house bees' internal storage structure (the crop) is filled with nectar. Bees that are of the right age, forced to hold surplus nectar, will involuntarily secrete wax. The beekeeper cannot make bees secrete wax – short of feeding heavy sugar syrup. Before the major flow starts, be sure to give colonies the space they need *BEFORE* they need it.

At this point in the crowded hive, the bees do one of three things:

1. If the hive is not given extra space, they do nothing. So, part of the honey crop is lost.
2. In early Spring, crowded bees will swarm and again, part of the honey crop is lost.
3. The colony is given extra space, so it can build comb and continue to grow and store surplus honey.

### Processing Beeswax

Melting down beeswax is a pleasant process. Beeswax has an agreeable aroma. However, beeswax is highly flammable and can result in a quick, hot fire. In many commercial beekeeping operations, the wax rendering facility is a separate building from the main facility. Beeswax melts at 147° F and molten wax floats on water.

Beekeepers having only a few hives can render a small amount of wax in a double boiler where it can

be ladled off and allowed to solidify into molded beeswax cakes. For larger operations, there are many models of melting devices that can be used to melt beeswax. Though most of these devices require hot water to accomplish wax rendering, some wax melters use hot air as the heat source. Wax is extremely durable and stable but will readily absorb residues from surrounding chemical sources.



**Figure 1. A double boiler hobby wax rendering system.**

A popular melting device for the hobby beekeeper is the solar wax melter. It is primarily a box, painted black on the outside and white on the inside with a glass covering. The box is normally tilted for melted wax to run out into a collection pan. Many times, discarded refrigerators with the door replaced with a double glass cover have been modified into solar wax melters. Other beekeepers have put their melters on pivot posts to have the melter always facing the sun.

Though solar wax melters are extremely cheap to use, they are inefficient. Probably only about 50% of the wax is recovered from a solar melter. Additionally, old hard combs are nearly impossible to melt in solar melters.



Listen along here!  
<https://beeculture.com/beeswax-and-candles-2/>



**Figure 2. Cakes of rough rendered beeswax**

### Slumgum

Slumgum is that ugly residue that clings to the bottom of a rough-rendered cake of beeswax. It is made up of everything that is not honey and wax - though it does include a significant amount of wax. As it builds up inside the melter, it begins to form an insulating layer between the heat and the wax to be rendered. Melters require frequent cleaning - a messy job. Having a large content of cocoons and hive litter, the dark slumgum can be pressed under pressure to yield more wax, but pressing devices are

rarely available to hobby beekeepers. Other than being an excellent fire starter for Wintertime fires, slumgum has little use. Neither is it attractive to bees or wax moths.

### Beeswax Candles

In years past, the production of beeswax candles was a prominent reason for keeping bees. Even today, beeswax candles are high quality candles that are nearly smokeless and dripless. Candles can be either poured or dipped. Poured candles are generally smoother but may not have the character that hand-dipped can-

dles have. Though still available as new devices, antique candle-pouring molds are frequently seen in antique shops and are expensive. Candle making is an aspect of beekeeping that many people do without ever owning a hive.

### The Candle Wick

Clearly, a wick is required for a candle to burn. The wick absorbs the wax in a liquid form and burns the molten beeswax absorbed by the wick. Too large a wick and the candle sides burn out from excessive heat, while too small a wick results in a hole burning down the center of the candle until the flame is extinguished. All wicking today is braided. When burned, braided wicking curls to one side and does not require frequent trimming (snuffing). Wicking can be purchased from candle supply stores or from craft shops. Specify the diameter candle to be made when you purchase wicking.

### Hand-Dipped Beeswax Candles

Again, always remember that beeswax is highly flammable. When making simple hand-dipped candles, liquefy enough beeswax to yield the length of candle desired in a non-ferrous container. Attach a weight to the end of the wicking and dip the weighted wick into the molten wax to the depth desired. Pull the wick from the molten wax and wait a few seconds for the hot wax to solidify. Then dip and wait, dip and wait until the desired size candle is produced. This procedure does not guarantee a perfect candle, but a functional candle will be dipped.

### Poured Candles

Depending on the mold, either tin or rubber, thread the wicking through the mold and pour the molten wax into the mold. Craft stores sell a candle release compound so the wax will not stick to the mold. After thoroughly cooling, open the mold and remove the candles. In many cases, poured candles will be attached by the wicking and will require cutting the wick to get two separate candles.

### Beeswax Foundation Candles

Beeswax foundation, as is used in frames, can be rolled around a wick to produce a beeswax candle. This candle will burn more quickly than either a hand-dipped or poured



**Figure 3. A box of slumgum and spent filter papers.**



candle but does not require any heat or molten wax. Candle sheets come in a variety of colors and are easy to make.

### The End of the Year

Finishing the wax crop and pouring a few candles really is the end of the past beekeeping year. Life in the hive goes on. Next year will be more of the same, but with continual improvements. Next year, healthier bees, more honey, fewer swarms, and more stories. I'm planning already.

### Some rogue beeswax thoughts

Beeswax is always an ancillary hive product. I have never known of a beekeeper who kept bees strictly to produce wax. Think about it...a colony only produces new wax under the stimulus of incoming nectar. By default, the colony will only produce the wax it needs to store converted nectar. You can't really get much beeswax without that stimulus. True, there is some wax in the brood comb, but it would be nonsensical to destroy brood combs simply for the wax.

What follows is a Jim Tew conversation about beeswax and mead. I have no science to confirm my speculation, but early bee people would wash wax to remove the residual honey before processing into wax cakes. I wonder if that washed wax water was part of the reason that a long-forgotten person noticed that the sugar/wax water fermented into a product that later became mead? I wonder, once that was noted, mead makers went straight to honey dilution for mead production. I'm only speculating.

Though wax has always had many uses, one of the early primary uses was for evening light – a candle. Ironical isn't it that modern beekeepers are still desiring beeswax for candle production.

At all three of my daughters' weddings, I produced beeswax candles for their ceremonies. They were high quality, dripless candles that were pricey for me to produce. All through the ensuing years, these wedding candles had a second life as emergency lighting when electrical power supplies failed.

Another short conversation, also without literature citations, is why beekeepers have never found practical uses for slumgum. I know that it makes a great fire starter but



Figure 4. Beeswax candles from molds.

Figure 5. A shop-built jig for dipping eight candle tapers at once.







Honey Bee Obscura

Figure 6. Pouring molded Christmas ornaments.

other than that, it seems to serve no purpose. This wax waste contains a significant amount of propolis along with spent cocoons, and maybe some pollen. Yet, we just burn it up. Come on beekeepers, there must be something that can be done with this waste product. Has it never found purpose simple because it so visually unappealing?

Though I have never done it, I wonder if could I gather the wax scales that were dropped to the bottom board along with all the other colony detritus and dump it into water? Would not the wax scales float to the top while the residue sank. What remains would be a very small of amount of high-quality virgin beeswax that would be brilliant yellow when processed. I just always dump it on the ground as I scrape the bottom board. I wonder...?

There are hundreds of uses for beeswax. I did not even try to list them but one of the interesting ones was that beeswax was used as a waterproofing product in both world wars and for lubricating bores of big guns. During both wars, beeswax became strategically valuable. Many countries ran collection drives or

encouraged beekeeping to meet the demand. In the U.S. and U.K., civilians were urged to turn in surplus beeswax for the war effort, much like scrap metal and rubber.

All-natural beeswax will develop a crystalline "bloom." That's actually a good sign if one is needing pure beeswax. Briskly wipe the grayed wax with a cloth to polish the wax back to a bright shine. This wax characteristic is harmless.

Finally, I came up with a beeswax use that I have never heard before – I use small chips of beeswax to lubricate the hinges on my Case 3-bladed Stockman pocket knife. After laying a small chip on the hinge, using gloves, I use a heat gun to melt the wax into the knife's hinge mechanism. The blades open smoothly for about a year and does not collect pocket lint the way a drop of lubricating oil does. Don't burn your hand.

### I'm done.

I like beeswax as a unique hive product. Nearly anything can be done with this limited hive product. It's use makes a great Winter distraction. Thank you so much for reading to this point. **BC**

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# DIY Honey Nut Puffed Cereal

This Recipe is from the *National Honey Board*

<https://honey.com/recipe/diy-honey-nut-puffed-cereal>

## *A Healthy Way to Start Out the New Year!*

**Yield:** Makes about 2.5 quarts of cereal clusters

### **Ingredients**

- 4½ C - Puffed Rice
- 1 C - Sliced Almonds
- 1¼ tsp. - Ground Turmeric
- ½ tsp. - Cinnamon
- ⅓ tsp - Kosher Salt
- ¼ C - Light Brown Sugar, Lightly Packed
- 2 T + 1 tsp. (32g) - Unsalted Butter
- ⅓ C - Honey
- ½ tsp. - Baking Soda
- 1 T - Raw Sesame Seeds

### **Directions**

- Heat the oven to 325°F.
- Line a rimmed baking sheet with parchment and set aside.
- In a large heatproof bowl, combine the puffed

rice, almonds, turmeric, cinnamon and salt.

-In a small pot, stirring occasionally, heat the brown sugar, butter and honey, until they have been simmering in slow, steady large bubbles for 1-2 minutes (roughly 250°F).

-Remove from heat and whisk in the baking soda.

Immediately pour the mixture over the dry ingredients. Stir well with a wood spoon, making sure to mix in all the spices and seeds that have fallen to the bottom of the bowl, and then spread the mixture on the prepared baking sheet.

-Bake for 15 minutes, stirring halfway through. Allow to cool completely at room temperature. Break the pieces and place into an airtight container to store.

-Serve with your milk of choice, which will become "Golden Milk" when mixed with the cereal!

### *Tip*

-Instead of puffed rice, you can substitute other puffed grains like millet. **BC**

Photo By: Victor Plop from @victor-plops-images via [Canva.com](https://www.canva.com).



# CALENDAR

## ILLINOIS

**The Sweet Life: A Buzz-Worthy Look into the World of the Honey Bees**, a short nontechnical online discussion about our friends, the honey bees, will be held January 16, 2026 at 9:00 AM at McHenry County College, Crystal Lake, IL. Join us for a delightful journey into the fascinating world of honey bees! We'll explore the secret lives of these industrious little creatures, uncovering how they create the delicious honey we all love. From the Queen Bee's royal duties to the amazing teamwork of the worker bees, we'll learn about their incredible communication, their vital role in our ecosystem, and simple ways we can help them thrive. This presentation is full of fun facts and amazing stories about bees. This course is available only online and McHenry County College registration is found at: [https://mchenry.augusoft.net/index.cfm?method=ClassInfo.ClassInformation&int\\_class\\_id=13501&int\\_category\\_id=0&int\\_sub\\_category\\_id=0&int\\_catalog\\_id=0](https://mchenry.augusoft.net/index.cfm?method=ClassInfo.ClassInformation&int_class_id=13501&int_category_id=0&int_sub_category_id=0&int_catalog_id=0)

**Beekeeping 101 Returns to McHenry County College, Crystal Lake, Illinois** beginning February 4, 2026. This class in the basics of keeping bees is offered in person or online and is followed in March by more short classes on special beekeeping related topics. Beekeeping 101 meets four Wednesday evenings in February from 6:30 PM - 9:00 PM. For more information or to enroll, visit: [https://mchenry.augusoft.net/index.cfm?method=ClassInfo.ClassInformation&int\\_class\\_id=12873&int\\_category\\_id=0&int\\_sub\\_category\\_id=0&int\\_catalog\\_id=0](https://mchenry.augusoft.net/index.cfm?method=ClassInfo.ClassInformation&int_class_id=12873&int_category_id=0&int_sub_category_id=0&int_catalog_id=0)

## INDIANA

**Indiana Bee School XXIV** will be held February 28, 2026 at 502 East Event Center in Carmel, Indiana. Keynote speakers include: Dr. James Tew and Dr. Cameron Jack. There will be educational breakout sessions, a raffle, a live and silent auction. The cost to attend is \$50 for members, \$65 for non-members and all registrations include a buffet lunch. All children 15 and under are only \$30. There will be an all-day Beginner Class. It will be held in conjunction with the conference. The cost for the Beginner Class is \$55 for members and \$80 for non-members and includes the buffet lunch. Pre-registration is required for either school. For information about location, speakers, topics, vendors, hotels and how to register, visit: <https://thebeekeepersofindiana.com/upcomingevents/>

## MICHIGAN

**Kalamazoo Bee School** will be held Saturday, February 21 at the Kalamazoo Valley Community College 6767 West O Ave., Kalamazoo, MI courtesy of the Kalamazoo Bee Club. Among the many benefits of attending Bee School are:

- Tracks for both beginners and experienced beekeepers
- Vendors & beekeeping supplies
- Hands-on workshops
- Networking opportunities
- Giveaways
- Fun!

For more information, visit: <https://kalamazoobeeclub.com/bee-school-info/>

## MISSOURI

**The 2026 Beekeeping Workshop & Honey Show, hosted by the Eastern MO Beekeepers Association (EMBA)** will be held February 20 and 21, 2026 at the Holiday Inn, St. Louis SW, MO, Route 66.

This two-day event offers a variety of hands-on learning opportunities for beekeepers of all experience levels—from beginners to advanced.

On **Friday, February 20**, intermediate beekeepers can join a special add-on course from 10:30 AM to 5:00 PM, which includes lunch, snacks, and early access to the vendor show for just \$40. EMBA will also host the **American Honey Show Training Council (AHSTC)** for a full-day certification training, and the day will wrap up with the **EMBA Beekeeping Banquet** at 6:00 PM—an evening of delicious food and bee-themed entertainment (\$48 per person, sold separately).

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**Contact Jen Manis to place an ad: [Jen@BeeCulture.com](mailto:Jen@BeeCulture.com)**

On **Saturday, February 21**, the main workshop kicks off with all-day programming (8:00 AM to 6:00 PM) for **Beginners and Experienced Beekeepers**. Both tracks include expert instruction, meals, and materials for \$99 (early bird pricing). Saturday also features the **Honey Show Competition & Vendor Show**, our best yet, both included in the cost of your ticket.

Guest speakers include Greg Rogers, Kent Williams, Bryan Zavada, Jim Masucci, Frank Rinkevich, Lewis Bartlett, Ken Heitkamp, and John Pashia. Whether you're just starting out or looking to advance your beekeeping skills, this weekend has something for everyone! Plus, an amazing raffle.

For more info about vendors, topics, hotel rates and to buy tickets visit: [easternmobeekeepers.com](http://easternmobeekeepers.com).



## NEW YORK

**Southern Adirondack Beekeepers Association (SABA) Spring Seminar** will be held Saturday, March 28, 2026 from 8:15 AM - 5:00 PM at Hudson Valley Community College TEC-SMART, 345 Hermes Road, Malta, NY, USA 12020. Expert guest speakers, raffle, vendors and more! For information, updates and registration, please visit: [sababees.org](http://sababees.org)

## PENNSYLVANIA

**2026 Western PA Beekeeping Seminar** will be held February 6 and 7, 2026 at Gateway High School, 3000 Gateway Campus Blvd, Monroeville, PA. Guest speakers include: Jerry Hayes, Karen Roccasecca, Grant Stiles, Cici Sweeney, and Herman Danenhow. Industry leading vendors, games, raffles, and more! For more information please visit: <https://www.zefly.com/en-US/ticketing/2026-western-pennsylvania-beekeeping-seminar>



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## SOUTH DAKOTA

**Buzz in the Black Hills Conference 2026** will be held Friday, February 20, 6-9 pm and Saturday, February 21, 8 am - 4 pm., at the Western Dakota Technical College, 800 Mickelson Drive Rapid City, SD 57703.

For more information please visit: <https://www.eventbrite.com/e/buzz-in-the-black-hills-conference-tickets-1685730117159?aff=oddtcreator>

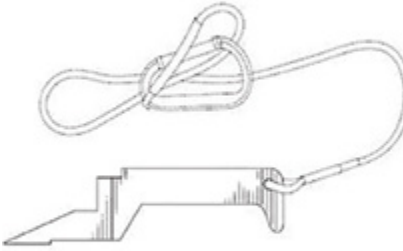


## VERMONT

**Vermont Beekeepers Association Winter Meeting** will be held January 31, 2026, from 8:30 AM - 4:30 PM at Middlebury Union High School, 73 Charles Ave, Middlebury, VT. This meeting is free for members. Non-members may sign up in advance for \$15 or sign up at the door. This year's meeting will feature keynote speaker Landi Simone. Landi is a certified Master Beekeeper who teaches beekeeping classes and is a sought-after speaker both in and out of New Jersey. We will also be hosting numerous concurrent workshops for all skill levels, our annual honey show, many vendors & a comeback of the beloved potluck. You won't want to miss it! More more information, please visit: <https://www.vermontbees.com/>.

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## Image Contest – Spring is Coming... What Are Your Goals?

We've started an image gallery! This month, we want to see any and all pictures you have of **Spring is Coming... What Are Your Goals?** Please make sure that your image is nice and big! We may pick your image for the gallery, or you have the chance to get on the cover! So get creative.

### If your image is chosen:

*For the Gallery:*

You will get three months added to your current subscription.

*For the Cover:*

You will get twelve months added to your current subscription.

### How To Submit:

Email your images to [Stephanie@BeeCulture.com](mailto:Stephanie@BeeCulture.com)

Use the subject **"Image Gallery"**

Please include in your email:

- The image as an attachment (we will not consider it if it is embedded)
- Your First and Last name
- Your mailing address
- Your renewal code (if you know it)

**T**hat gal Marilyn invited me to a hootenanny this weekend, and I knew better than to graciously decline. So we're off to the Moab Folk Festival.

You never heard of a hootenanny? Wildly popular in the sixties and maybe seventies, a hootenanny is or was a gathering of folk singers — like Pete Seeger and Judy Collins and Joan Baez. They'd belt out tunes like "Kumbaya" and "Where have all the flowers gone?"

When I was a teenager I could play a few guitar chords. So when I heard popular girls Christie and Bunny were looking for someone to strum along while they sang at a high school hootenanny, I jumped at the opportunity.

The huge auditorium was packed to the rafters. We were terrified, or at least I was. Blinded by the stage lights we still managed a credible rendition of "Michael rowed the boat ashore."

*The river is deep and the river is wide, hallelujah!*

*Milk and honey on the other side, hallelujah!*

It was our first and only performance. In its aftermath I developed a relentless crush on Christie. I'd spend a couple of hours working up my courage before I called her. Then I'd invite her to the movies or to some dance. My plan was that afterwards we'd park and make out. But in the sweetest way Christie always turned me down. She inevitably had a really good excuse, like "My cousin is visiting from Texas," or "I have to babysit." She's always wind up with "Call me again!" because in those days the guy did the calling. Girls, never. Meanwhile, I happily played the fool.

Bunny went on to make a splash in Hollywood. I have no idea what happened to Christie. All I know is I never did get a date with her.

Now let's talk about *Varroa* mite control. You're supposed to remove some treatments after a certain period. The idea is that if you leave them in longer, the dose becomes weaker, and subsequent generations of mites survive the lower dose, resulting in mites that pass on some resistance to the chemical. In the case of Varroxxsan oxalic acid strips you should take them out after a couple of months.

To apply Varroxxsan you fold long cardboard-like strips in half and drape them over the top bars. I learned the hard way that if you don't remove them when you're supposed to, they can get propolized onto the top bars. Then when you try to take them out, the already deteriorating strips break and want to fall down between the frames. The only effective way to remove them when they're propolized is to completely remove the frame they're draped over. A full treatment is eight strips, so this becomes a project. Try this in the Fall when the honey flow is long past and your little darling Russians only want to be left alone while they prep for Winter. In beekeeping timing is everything. I never should have let myself get behind.

I left a lot of honey on my hives this Fall, because I don't like feeding sugar syrup, and colonies dead-heavy with honey seem to winter better. Plus I don't have the vim, vigor or vitality I once did, so now I take every shortcut I can dream up.

Getting ready for Winter, that boils down to keeping my mites in check and assuring adequate food stores. I don't fret about hive insulation here in western Colorado. The strong thrive and the weak perish. That's the way it is, or has been for me. I lose more colonies in the Summer than I do in the Winter. I no longer send bees to the almonds. They don't get a lot of pesticide exposure. I consider myself lucky in that respect.

Our rural neighbor is a young back-to-the-Earth mother with young ones. They've got a big garden, fruit trees, ducks, geese, chickens, the full catastrophe. They sell eggs and produce on the honor system, or they simply give it away. When I dropped off some goslings a year ago, Whitney had a pen all set up for them in the living room. You get the idea.

She's occasionally helped me out with my bees, along with dabbling in beekeeping herself. She doesn't have any bees right now. When she inquired if her kids could take a look inside a hive, I told her they'd need bee suits. You don't want to open up the wrong hive and wreck some kid's day.

So now they have the suits, and I said no problem, they can come along, just let me catch up with some stuff first. That was six weeks ago. And of course I forgot, but then I remembered, and now we have a bee date, day after tomorrow, Nov. 12. We're looking at a sunny day with a high of 62. It turns cold this weekend, so this could be our last good chance. Of course these days you never know. Santa might give up those furry red and white boots and start wearing flip-flops.

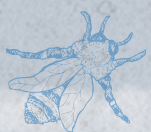
At a "Popeyes" Louisiana-style fast food joint (no apostrophe in "Popeyes" you notice) Marilyn got a corn bread biscuit along with her red beans and rice. It came with a packet of "Honey Sauce." Ingredients: corn syrup, honey, sugar, water, natural flavor, caramelized sugar syrup. She wouldn't open her packet, so I did. I tried it on a bite of biscuit. It was sweet enough, all right. I'd say "Corn syrup sauce" would be a better description. Granted it was easier on the palette than some packets of imported honey I've tasted.

But the biscuit was delicious. **BC**

## A Hootenanny

Ed Colby





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