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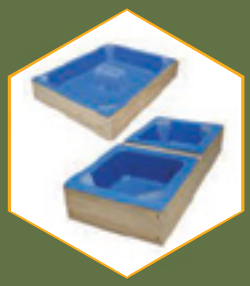

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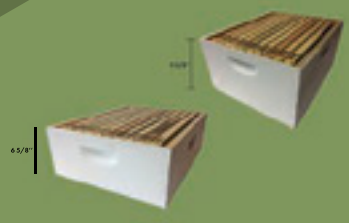

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Cover Photo by Charlotte Hubbard with the caption "Love watching honey collect..." as part of our Image Gallery Photo Contest. Find details about the current contest images on page 95!

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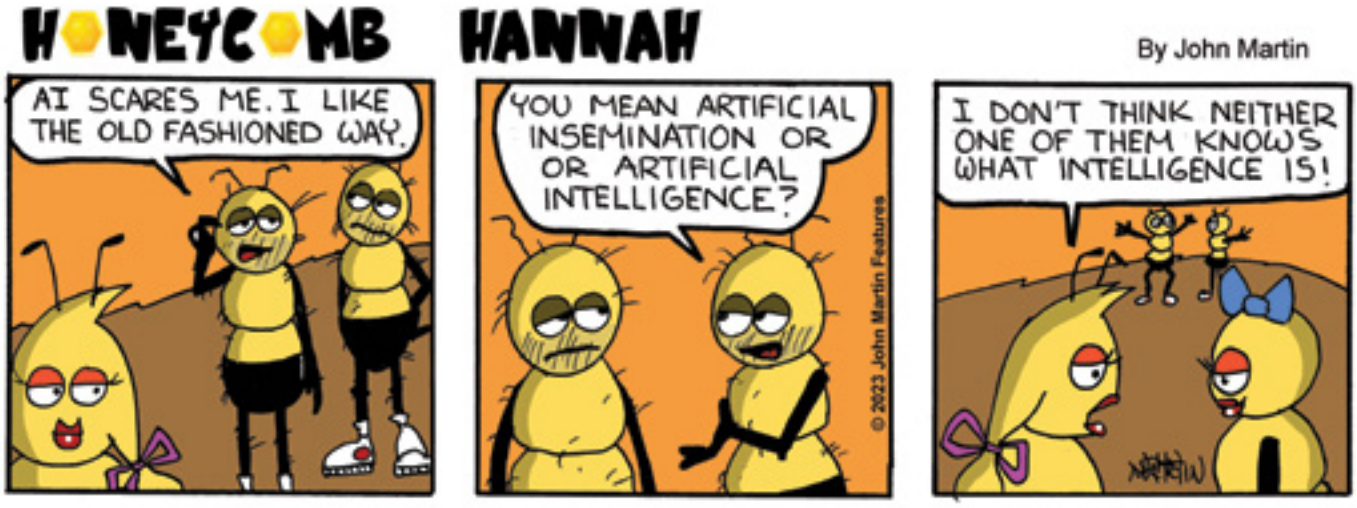

NEXT MONTH

Region 1
- Feed, feed, feed
- *Tools for* Varroa *Management Guide*
- Sample, treat, sample for *Varroa*
- Why are some colonies weak? Check and combine
- Install mouse guards
- Reduce to two deeps
- Store supers for next year
- Take queen excluders off

Region 2
- Check honey stores
- Feed if necessary
- Mite count time
- Fall flow management
- Split time?
- Check for queens
- Feed for Winter

Region 3
- Harvest honey
- Check for adequate honey stores
- Check for mites, treat if three (3) per 100 bees
- Combine weak hives
- Bees still foraging goldenrod and aster
- Check for queen(s)
- Prepare wind breaks
- Mouse guard time

Region 4
- Follow HBHC's *Tools for* Varroa *Management Guide*
- Feed as needed
- Install mouse guards
- *Varroa*... Sample, treat, sample again
- Leave some honey on for Winter
- Start insulation wrapping
- Get wind block up

Region 5
- Feed 2:1 sugar syrup
- Mouse closures
- Winter wraps
- Move to protected site for Winter
- Feed and then feed some more
- Move bees to California orchards
- Combine the weak

Region 6
- Feed if needed
- Mite check
- Finish *Varroa* treatments then sample again
- Inspect colonies
- Remove strips from August treatment
- Check Winter stores

Region 7
- Check hive weight for Winter stores
- Wrap for Winter
- Be pro-active in *Varroa* management
- Put on insulated covers
- Protect from Winter winds
- Final feeding with 2:1 syrup
- Reduce colonies to one brood box for Winter

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 **Emma@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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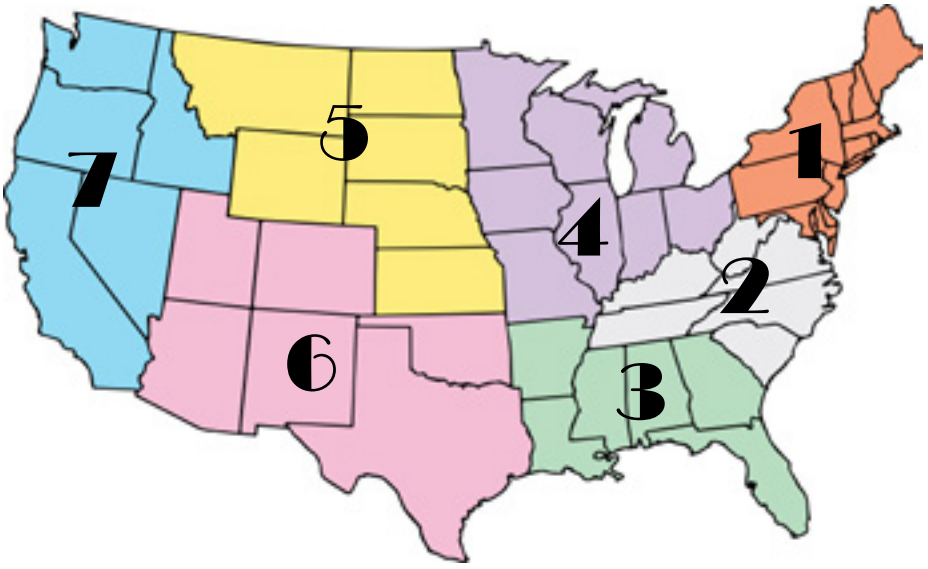

SEPTEMBER – REGIONAL HONEY PRICE REPORT

	REPORTING REGIONS										History	
	1	2	3	4	5	6	7	Range	Avg.	$/lb	Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS												
55 Gal. Drum, Light	2.59	2.63	3.23	2.93	2.69	2.73	3.48	2.15-4.00	2.91	2.91	2.93	2.75
55 Gal. Drum, Ambr	2.40	2.93	3.13	2.93	2.61	2.58	3.38	2.05-4.00	2.89	2.89	2.98	2.60
60# Light (retail)	244.04	275.83	249.75	224.83	240.00	227.02	310.00	180.00-390.00	248.44	4.14	249.77	211.88
60# Amber (retail)	244.03	282.80	257.25	218.17	250.00	229.87	248.33	150.00-384.00	245.45	4.09	241.49	218.12
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	104.30	106.72	114.00	95.10	87.36	129.00	-	67.00-180.00	105.53	8.79	101.57	106.17
1# 24/case	170.16	189.17	181.14	135.75	181.42	135.12	144.00	96.00-336.00	164.80	6.87	162.76	162.53
2# 12/case	154.13	192.00	142.60	118.56	173.76	151.50	156.00	84.00-264.00	148.35	6.18	147.69	152.44
12.oz. Plas. 24/cs	141.20	155.10	125.99	104.17	108.88	122.99	117.60	72.00-240.00	127.53	7.08	122.04	124.25
5# 6/case	166.70	240.00	194.46	140.49	153.24	136.00	-	96.00-330.00	165.31	5.51	149.72	164.41
Quarts 12/case	206.80	209.67	173.00	171.00	200.40	194.94	205.50	119.88-276.00	194.93	5.41	203.82	192.37
Pints 12/case	109.00	129.60	104.25	106.01	120.00	135.00	115.20	72.00-180.00	115.24	6.40	128.68	121.54
RETAIL SHELF PRICES												
1/2#	5.86	7.75	5.34	5.36	5.45	5.00	8.50	3.00-11.00	6.03	12.06	6.37	6.25
12 oz. Plastic	7.71	8.46	7.31	7.10	6.91	6.43	7.63	3.25-14.00	7.54	10.05	7.72	7.52
1# Glass/Plastic	10.27	11.27	10.43	8.75	10.53	10.83	12.20	4.33-25.00	10.38	10.38	10.38	10.00
2# Glass/Plastic	17.00	20.69	17.15	16.46	14.82	14.33	20.67	7.50-30.00	17.39	8.70	17.96	17.25
Pint	11.84	14.72	10.89	13.10	13.12	15.00	13.67	4.50-25.00	12.97	8.64	13.12	11.84
Quart	23.71	23.75	20.56	21.38	22.31	18.66	23.21	10.60-42.00	22.38	7.46	22.31	21.54
5# Glass/Plastic	34.90	46.90	42.10	28.86	38.85	29.25	-	18.99-65.00	35.56	7.11	37.25	34.91
1# Cream	12.60	12.70	14.21	10.64	9.96	17.50	16.00	7.00-25.00	12.77	12.77	12.46	11.35
1# Cut Comb	15.08	18.40	18.00	13.67	11.48	25.00	17.00	8.00-25.00	15.78	15.78	16.11	14.86
Ross Round	12.33	17.25	8.00	11.00	-	-	15.08	8.00-24.00	13.55	18.07	14.55	13.82
Wholesale Wax (Lt)	7.37	8.28	9.38	7.99	7.33	6.00	5.27	3.50-10.00	7.44	-	7.03	8.41
Wholesale Wax (Dk)	5.03	7.48	8.38	5.78	8.00	4.00	7.50	2.25-10.00	6.26	-	6.15	6.69
Pollination Fee/Col.	98.33	79.60	88.75	123.00	212.50	-	91.25	50.00-225.00	104.93	-	103.71	94.57
Price of Nucs	182.24	181.67	170.45	174.00	172.50	225.00	187.38	125.00-299.00	180.64	-	178.11	-
Price of Packages	158.31	135.75	118.33	159.67	156.50	184.50	187.00	75.00-227.50	152.67	-	156.03	-

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 June/July 2023.

Average Honey Flow Time and Amount per Region

Region 1:
Timing of Flow: Late
Amount of Flow: Average

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: Average

Region 5:
Timing of Flow: Late
Amount of Flow: Equally average and late

Region 6:
Timing of Flow: Normal
Amount of Flow: Average

Region 7:
Timing of Flow: Normal
Amount of Flow: Light

Mite Treatment per Region

Region 1: Most used a Formic product.
Region 2: Most used either an unspecified Oxalic Acid product or no mite treatment due to honey flow.
Region 3: Most used no mite treatment due to honey flow.
Region 4: Most used no mite treatment due to honey flow.
Region 5: Most used a Formic product.
Region 6: Most used either a Formic product or no mite treatment due to honey flow.
Region 7: Most used an unspecified Oxalic Acid product.

Top Blossoming Plants per Region

Region 1: Clover, Basswood, Milkweed, Sumac, Goldenrod, Knapweed, White Clover
Region 2: Clover, Sourwood, Sumac, Mimosa
Region 3: Cotton, Crepe Myrtle, Sourwood, Sumac, White Clover, Wildflowers
Region 4: Clover, Soybean, Basswood, Milkweed, Alfalfa, Bird's-Foot Trefoil, Butterfly Weed, Raspberry, White Clover, Yellow Sweet Clover
Region 5: Alfalfa, Clover, Dandelion
Region 6: Sunflower
Region 7: Clover, Blackberry, Alfalfa

Overall Top Blossoming Plants

Clover, Alfalfa, Sumac, Basswood, Milkweed, White Clover, Sourwood, Soybean, Wildflowers, Blackberry

STUDY HALL

From the Editor, Jerry Hayes

JERRY'S TWO-QUEEN COLONY

More bees during bloom is better than less bees to make a honey crop. This is where two-queen colonies can *sometimes* make a difference, since you have two queens laying 4,000 eggs a day instead of a single queen laying half that number.

There are several ways to produce two-queen colonies and all of them will work, but they require a fair amount of manipulation to get queens together in a small-ish space. Here is one way to do it that is relatively easy and removes some of the "oops" moments in introducing queens into a shared space. And this method has been around for a long time but few use it for some reason. You do have to build two separate tops for sure.

Take two happy queenright colonies, place them side by side with one entrance on one side and the other entrance on the other, not sharing entrances. Where the two colonies meet, place a queen excluder right in the middle. On top of that add your supers. Put your half tops on either side of the supers and a regular lid on top of the supers and voila you have a two-queen colony that will collect more nectar and make significantly more honey.

The bees do not fight and are non-aggressive as they are not sharing a brood raising colony. The foragers are simply looking for honey storage area and everybody likes foragers in both colonies.

DEAD BEES & SYRUP

QUESTION

When I add syrup to the internal feeder, there are always a lot of dead bees in the remaining syrup. Are these dead bees a health hazard or are they just pickled by the syrup?

Ben Smith

ANSWER

I guess the first thing I would like to ask is what kind of feeder are you using? Most feeders are designed to not allow honey bees access to 'swimming' in the feeder.

And to the broader question if you were out in the wilderness and looking for food and water and came upon a small water filled pond with dead raccoons in it would you take a big drink? Dead bees have organisms on them that can be suspended in the syrup and consumed by other bees. Will it cause health issues? If the bees immune systems are already compromised, it doesn't help.

Reply from Ben

I am feeding sugar syrup with a plastic internal feeder. The feeder has rough sides and I put some wood chips in it, but there are always drowned bees.

So, I guess you are saying the sugar syrup does not preserve dead bees?

Reply from Jerry

They should be able, theoretically, to cling to and walk up the rough sides after they clean themselves off. But, I guess some can't.

Sugar syrup is not a preservative, it is a bacterial soup.

WHERE ARE VIRUSES?

QUESTION

I was diving into my July issue of *Bee Culture Magazine* yesterday, when I read something you wrote in the *Study Hall* section that confused me. You wrote that the viruses given to bees by *Varroa* mites will be present in their honey as well. Are you saying that bees can spread viruses through their honey? This claim runs counter to most everything else I have read about the properties of honey, including from trusted sources like the NIH and CDC. Perhaps you can clarify what you meant?

Many thanks,
Zeb Lamp

ANSWER

Glad you are enjoying *Bee Culture*.

Viruses are everywhere Zeb, in the air, on the shopping cart at the big box store, on you and in you as you breathe them in all day and all night, on trees, chickens, honey bees, etc. I just looked it up and there are as a 'guesstimate' 380 trillion viruses inside us and outside on our skin and hair. About 10 times more than bacteria. So, yes viruses in and on honey bees as they travel from flower to flower are of course going to find their way into nectar (which has viruses in it) as it is turned into honey. Viruses cannot reproduce unless they get inside and invade a specific cell in an organism that has an immune system that cannot stop them. They can't reproduce in honey just like bacteria cannot. But, yes, like all viruses they could be shared or spread as honey bees eat stored honey.

But, just like you and I, our immune systems can stop or minimize the effect from most viruses that want to reproduce in our cells. Honey bee health is impacted negatively by *Varroa* and the vectoring of viruses as they feed on honey bees and the individual honey bees shallow immune system. Our problem isn't *Varroa* if it was only a sterile parasite. It is the *Varroa* Virus legacy. Control *Varroa* safely and sanely and you slow the dozens of viruses associated with them and keep your honey bees healthier longer.

I hope this helps.

PS: Google this article up... *Honey Bee Virus Transmission via Hive Products,* **Dominik Schittny**, **Orlando Yañez**, and **Peter Neumann**.

Reply from Zeb

I appreciate your rapid response, and your thorough answer. I learned something today, even if it is a bit troubling!

Thanks again,
Zeb

BLUE PROPOLIS

QUESTION

Hello, my name is Bill Layne and I am a beekeeper in Ona, WV. While doing a colony inspection in an outyard Sunday, I found one colony lining the top bars of my upper deep box and the inside of the migratory cover with a blue propolis. It was the only hive with this and I was wondering if you would have any idea what it's from.

ANSWER

Who within a mile radius just painted their house or shed or porch blue?

Honey bees will collect all sorts of sticky stuff like window caulking, asphalt, asphalt patch, construction adhesive, spackle and anything that is easier to collect than tree sap.

All that to say, the blue is a very nice color.

DISCOLORED

QUESTION

Hi Jerry, a couple of quick questions... one, when Spring cleaning my woodenware, I occasionally run across older foundation that is perfectly formed and in great shape but is super brittle; it usually falls apart upon handling. I assume the bees won't utilize this foundation, but is there another use for it?

Question number two, I always rotate out older, black foundation, for all the usual reasons, but what about wooden frames and the insides of the boxes? Even relatively new frames and boxes often have areas of black here and there (not stuck, black foundation, it's just that the wood has turned black or black-ish). It doesn't appear to be an accumulation of propolis. Anything to be concerned about?

As always, thanks for your help.
Dan in SoCal

ANSWER

1. I am assuming when you say "black foundation" you actually mean black drawn comb. Foundation is the beginning processed beeswax 'sheet' hexagonal blueprint for the bees to build, expand and produce individual and communal hexagonal cells which makes colony survival possible by brood production, honey storage, beebread storage, etc.
   a. Dark comb is dark because the individual cells are now layer upon layer of larva 'skins' shed during bee development. They represent a collection of these shed 'skins', propolis and a variety of potential disease organisms. The bees will utilize it if necessary, but get rid of any dark comb older than three years to remove this left over 'trash'.
2. You could use a small propane torch to quickly, gently and lightly scorch the surface of the inside of 'boxes' and/or a strong solution of household bleach coating as a method to further sterilize the cavity the bees will live in. Then, stack outside to left them 'air out'. With frames, I would just do the bleach option as well.
   a. The bees generally coat all wooden surfaces in a layer of propolis which has antiseptic properties and covers and seals anything underneath the coating.

Reply from Dan

Thanks Jerry! I'll wash and dry blackened, not propolized woodenware as you suggest, and I'll also try lightly roughing up the interior of the boxes with my neighbors saws. Tom Sealy seems to think roughing up the insides is a good thing, do you agree?

Reply from Jerry

All it does is encourage bees to smooth the surface out using propolis. It works well to get a propolis coating.

But propolis is like any other antimicrobial, it doesn't last forever. BC

FOUND IN TRANSLATION

Sweet and Sour Honey

Jay Evans, USDA Beltsville Bee Lab

Listen along here!

There are many ways that honey bees improve our diets but honey consumption was an early reason to wrangle this species. The taste for honey persists today around the world, sustaining sideliners, families and large corporations in many parts of the world. It is also widely known to soothe and improve relations with neighbors, in-laws and bosses. With any high-value product, there is a risk of inadvertent or purposeful false advertising.

One honey quality trait that is easy to control is water content. Small-scale beekeepers routinely put their honey crops and relationships at risk by bottling honey that hasn't been fully processed by bees to a net water percentage under 19%. Watery honey both feels weird and is prone to unintended fermentation. Choosing properly capped frames goes a long way to eliminating this problem. If you live in a humid place like Maryland, there is also some risk that open honey will dehumidify some of the local air, pushing water content back above dangerous levels. Truly dry honey can be achieved by technique and awareness, but if you are curious and want to directly assess the water content of your crop, Hanna Bäckmo gives a nice review of the styles and costs of refractometers used by beekeepers in this magazine (**https://www.beeculture.com/refractometer/**). Certainly, steady honey producers would benefit from investing in, and calibrating, these things.

A bit out of reach for most of us, but essential for the industry, are lab-based assays aimed at confirming honey purity. The methods used for this continue to improve, putting clumsy or sneaky honey producers on notice. Notably, honey yields can be stretched by a variety of refined or expelled sugars. This might be inadvertent, when syrup fed by beekeepers in the Fall for Winter survival lingers, capped until Spring. There is no easy answer to this, certainly not from me, but step one is to get bees through Winter safely, and then assess any remaining capped stores to see if these stores are *bona fide* honey or syrup that bees dried down but didn't gobble up as it came in. Ask a beekeeper near you for help.

More insidiously, producers or packers might outright add less expensive fillers to their honey, increasing yields but losing some of the magic of honey. The technology used to detect such adulteration is improving, and several techniques are now used by regulators, producers and packers to make sure honey is pure. The International Honey Commission described forensic methods for honey purity nearly 30 years ago and updated these methods in 2009 (**https://www.bee-hexagon.net/english/network/publications-by-the-ihc/**). The U.S. Food and Drug Administration, keeping honest folks honest across the industry, regularly tests new methods against imported and domestic honey to identify so-called 'economically motivated adulteration'. Using a well-established technique, Stable Carbon Isotope Ratio Analysis (SCIRA), the FDA recently screened bulk and bottled honey samples from eight countries whose honey is imported into the U.S. (**https://www.fda.gov/food/economically-motivated-adulteration-food-fraud/fy2122-sample-collection-and-analysis-imported-honey-economically-motivated-adulteration**). This test distinguishes 'C4' plant sources (largely grasses and grains) from 'C3' sources (all the plants with prettier, bee-visited, nectar-rich flowers). The test simply asks if the unexpected C4-sugars, often from corn syrup or sugar cane, are over-represented in honey. There is some tolerance of these C4 sugars due to bee management or assay imprecision but that level is quite low, maybe 7% by volume. Each country in the FDA screen had at least one suspicious honey batch, but the overall frequency of such batches was 10%, a level roughly similar to a much larger recent study in Europe and indicative that honey, by and large, is as advertised.

There are several newer techniques in play now for the high-stakes race between regulators and those who might diminish the reputation of honey. Dilpreet Singh Brar and colleagues in *A comprehensive review on unethical honey: Validation by emerging techniques* (*Food Control* 2023, *145*, 109482, **https://doi.org/10.1016/j.foodcont.2022.109482**) describe nearly 50 ways to test your clover. Within the alphabet soup of available methods, they reveal six chromatographic platforms (basically methods to separate parts of a whole by size, electric charge or affinity to some sort of 'bait') with increasing sophistication. These machines should put fear in anyone whose honey is not perfectly sound.

As a geneticist, I am fascinated with so-called environmental DNA (eDNA) screens, whereby a complex soup is scrutinized for the genomes of the diverse organisms floating in it. Many will remember the application

of eDNA screens worldwide to identify levels and variants of the SARS-Cov-2 virus in city and town wastewater systems (poor interns!; **https://www.nih.gov/news-events/nih-research-matters/tracking-sars-cov-2-variants-wastewater**). This same methodology is now widely used to confirm the botanical sources of honey, the genotypes of the bees collecting that honey and the myriad of other organisms from the hive environment. Practically, this method also precisely identifies any honey contaminant with a biological source, from corn syrup to diverse flower sources mixed in accidentally in coveted monofloral honeys. It is also a sensitive assay for honey bee disease agents.

For the past 20 years, genetic analyses of honey from hives have been used to confirm the presence of the bacterium responsible for American Foulbrood, *Paenibacillus larvae.* Federico Lauro and colleagues in *Rapid detection of Paenibacillus larvae from honey and hive samples with a novel nested PCR protocol* (*International Journal of Food Microbiology* 2003, *81*, 195-201, **https://doi.org/10.1016/S0168-1605(02)00257-X**) showed the value of this technique for keeping track of non-symptomatic *P. larvae* populations. More broadly, Leigh Boardman and others have confirmed that this technique can provide a snapshot of the whole range of microbes found in colonies (Boardman, L., P. Marcelino, J. A., Valentin, R. E., Boncristiani, H., Standley, J. M., & Ellis, J. D. *Novel eDNA approaches to monitor Western honey bee (*Apis mellifera *L.) microbial and arthropod communities. Environmental DNA.* 2023; **https://doi.org/10.1002/edn3.419**). Here, colony-collected honey is analogous to the worker-bee samples now used in many disease surveys. Honey collections have the added value of pointing out long-ago arrivals, providing a sort of fossil record for the plants and other organisms a colony might have come into contact with during the past year. The genetic methods behind these screens are astoundingly sensitive (remember, viruses floating alone in tons of sewer sludge) and honey or hive-based screens have promise for anything from virus outbreaks to the detection of newly invasive mites and other pests. It is incredibly hard to pass through an environment without shedding a little DNA, and a little goes a long way for these sensitive methods.

Economically motivated adulteration is detectable with some effort and that's a good thing for all of us. Honey screening, especially with the twist of identifying genetic signals from hive organisms, is also becoming a nice tool for scientists keen on monitoring disease, plant sources and the genes of the bees that did all the work. BC

Photo by Meggyn Pomerleau on Unsplash

Can We See it Coming?

John Miller

About 15 years ago, a new variety of almond tree was introduced: *Independence* – so named because it took a direct swipe at the pollination costs associated with almond production. It was the first of many other varieties since introduced (see *Almond Varieties and Selections*, Published 8.25.20 by Almond Board of California).

Insect-provided pollination costs are viewed by growers of fruits, vegetables, vine crops, pit-fruit crops and almonds, etc. as 'simply an overhead'. An overhead cost is a cost incurred before the first buyer of your crop walks through the door.

Production agriculture industries named prior seek to eliminate variables. One of the biggest considerations for these growers is production capability. In an ideal situation, or crop year, what is the best crop a grower can hope to produce? What is the ideal pollinator stocking rate? What will it cost? What will the return on invested dollar be?

Beekeepers historically chased the big honey crop as a measure of our outfits production capability. That's changed. We now measure our outfit's production capability as a product of pollination services… and everything else. (I admit conditions look pretty good in North Dakota this year; hence, we have nearly 1,000,000 beehives stocked on 83,000 square miles.)

Crucial to pollination services is colony health. Following is a short, incomplete – but you get the idea-list my son Jason shared.

Beekeeping Operations
Overhead Costs
- Queen health analysis
- Three signs of good queen vs. failing queen
- *Varroa*
  - Lifecycle
  - Monitoring
  - Management
  - Viruses vectored and impacts
- Wax Moth, Hive Beetle, Chalkbrood, Foul Brood, Nosema
- Pollen Feeding
  - Timing
  - Feed types
  - Syrup feeding
  - Types of feed and timing of feed
  - Pumps
  - Additives
  - Transport of feed

Transportation
- Pre-trip vehicle inspection
- Securing load and equipment
- Semi-loading
- FMCA livestock rules, IFTA, IRP

Management Practices
- Almond prep
- CA hive registration
- First go through:

Photo by Scott Bauer

- Clean bottom board
- Clean feeder
- Feed pollen/syrup
- Boost the weak with brood, swap box position on pallet
- Swap out bad rims, covers, pallets

- Post bloom:
  - Prevent swarming with manipulation(s)
  - Identify queenless hives and stick eggs
  - Swap bad boxes
  - Selective feed
  - Boost weak with brood or swap locations for equalization
  - Shake bulk bees and always feed after
  - Square up pallets, fill holes
  - Nucing
  - Honey production
  - Queen rearing
  - Indoor wintering
  - Woodenware rotation and management

Misc
- Annual safety trainings
- Pesticide handling training (PPE, MSDS, Label)
- H2A morass including H2A driving rules
- Organizations (Local club, State orgs, BIP, Apis. m)
- Continuing education (Master Beekeeping Programs)

See BIP Commercial Management Field Guide for content.

That list represents overhead. Costs beekeepers absorb before the first jar of honey sells, the first hives arrive in the orchards. Beekeepers, like production agriculture, seek to eliminate variables. If beekeepers could reduce or eliminate untimely queen failure, an overhead cost could be eliminated. Properly prepared colonies, using a properly run indoor storage building can dramatically lower Winter mortality losses, and associated recovery costs the following year. Eliminating variables enhances profit by lowering overhead.

In the opening paragraph, the example of the *Independence* variety almond is referenced. It was the first tremor in an earthquake that will challenge beekeeping.

Plant geneticists are in an all-out race to meet the nutrition needs of an overpopulated planet.

Some project earth's population to exceed this many billion humans by this date, and this many more humans by that date. There is no question the earth's population is growing.

Despite human's quarrelsome nature, the evidence is not in question: humans live longer, healthier, more productive lives than any time in history. Globally, we spend less effort and treasure acquiring our food than any time in history. This abundance model could change – due to some stubborn facts. There is no more arable land on earth. Humans are populating arable lands, as they always have, with bigger homes, more pavement, often eliminating the finest farms for the perfect lawn. See the pocket area of Sacramento, CA for a good example.

Plant geneticists recently introduced an Intermediate Wheatgrass, Kernza (**www.ars.usda.gov**) July 12, 2023. ARS pursues perennial wheat, rice, legumes and oil crops. When Bayer introduces perennial corn – consider the attractions to a farmer. Elimination of variables. Reduction in overhead.

In the world of insect-pollinated production agriculture, the same motives drive research. Eliminate variables. Lower overhead.

The surest way to eliminate the insect from the food is to eliminate the need for an insect to pollinate the food. Self-fruitful berries, self-fruitful vine crops, self-fruitful almonds, self-fruitful pit fruits will eliminate the need, the cost, the uncertainty of finding a bee guy with decent hives, on time. Elimination of variable. Reduction of overhead.

Every year, billions of dollars of private and public sector investing to secure the food supply occurs. It will only increase. Growers dependent on insect pollinated crops are no different than beekeepers. Farmers get buffeted by market conditions they have no control over. Supply chains convulse. Labor is a perpetual issue. The regulatory boot presses on our throat.

Beekeepers will have to figure out where, or if, we have a place in agriculture. We've pollinated crops for a very long time. That part of our business is going to be challenged. BC

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A Closer LOOK

Nestmate Recognition

Clarence Collison

Pheromones are involved in intraspecific chemical communication; however, the glands associated with compounds used in nestmate recognition in honey bees remain elusive. This search is difficult since nestmate cues can arise from both within the colony, and from the environment (Kalmus and Ribbands, 1952). For example, Downs and Ratnieks (1999) found no evidence that honey bee guards used heritable cues; instead, guards appear to rely exclusively on environmental cues to distinguish nestmates from non-nestmates. However, nestmate cues can also be produced by the individual, and thus must be under genetic control (Breed, 1983; Page Jr. et al., 1991). A further factor is that the wax used to build comb in the colony is both produced and manipulated by the bees, which means it may be a medium into which recognition cues are transferred (Breed et al., 1998). Therefore, Breed et al. (1998) stated that no single factor is responsible for nestmate recognition in honey bees; rather, all three factors (genetically determined cuticular signatures, exposure to comb wax, and environmental cues e.g. floral cues) seem to work together (Martin et al., 2018).

Comb wax in honey bee colonies serves as a source and medium for transmission of recognition cues. Worker honey bees learn the identity of their primary nesting material, the wax comb, within an hour of emergence. In an olfactometer, bees discriminate between combs on the basis of odor; they prefer the odors of previously learned combs. Representatives of three of the most common compound classes in bee's wax were surveyed for effects on nestmate discrimination behavior. Hexadecane, octadecane, tetracosanoic acid and methyl docosanoate make worker honey bees less acceptable to their untreated sisters. Other similar compounds did not have this effect. These findings support the hypothesis that nestmate recognition in honey bees is mediated by many different compounds, including some related to those found in comb wax (Breed and Stiller, 1992).

Breed et al. (1998) investigated how kin recognition cues develop and cue differentiation between honey bee colonies. Exposure to the wax comb in colonies is a critical component of the development of kin recognition cues. In this study, they determined how the cues develop under natural conditions (in swarms), whether the genetic source and age of the wax affect cue ontogeny, and whether exposure to wax, as in normal development, affects preferential feeding among bees within social groups. Cue development in swarms coincided with wax production, rather than with the presence of brood or the emergence of new workers; this finding supported previous observations concerning the importance of wax in cue ontogeny. Effective cue development required a match between the genetic source of the workers attempting to enter the hive, the wax to which they were exposed and the guards at the hive entrance. The wax must also have been exposed to the hive environment for some time. Cues gained from wax did not mask or override cues used in preferential feeding interactions; this finding supports the contention that two recognition systems, one for nestmate recognition and the other for intra-colonial recognition, are present.

Recognition of nestmates from aliens is based on olfactory cues, and many studies have demonstrated that such cues are contained within the lipid layer covering the insect cuticle. These lipids are usually a complex mixture of tens of compounds in which aliphatic hydrocarbons are generally the major components. Dani et al. (2005) tested whether artificial changes in the cuticular profile through supplementation of naturally occurring alkanes and alkenes in honey bees affect the behavior of nestmate guards. Compounds were applied to live foragers in microgram quantities and the bees returned to their hive entrance where the behavior of the guard bees was observed. In this fashion, they compared the effect of single alkenes with that of single alkanes; the effect of mixtures of alkenes versus that of mixtures of alkanes and the whole alkane fraction separated from the cuticular lipids versus the alkene fraction. With only one exception (the comparison between n-C19 and (Z)9-C19), in all the experiments bees treated with alkenes were attacked more intensively than bees treated with alkanes. This led them to conclude that modification of the natural chemical profile with the two different classes of compounds has a different effect on acceptance and suggests that this may correspond to a differential importance in the recognition signature.

Cuticular hydrocarbons (CHCs) function as recognition compounds in honey bees. It is not clearly understood where CHCs are stored in the honey bee. Martin et al. (2018) investigated the hydrocarbons and esters

found in five major worker honey bee exocrine glands, at three different developmental stages (newly emerged, nurse and forager) using a high temperature GC analysis. They found the hypopharyngeal gland contained no hydrocarbons nor esters, and the thoracic salivary and mandibular glands only contained trace amounts of n-alkanes. However, the cephalic salivary gland (CSG) contained the greatest number and highest quantity of hydrocarbons relative to the five other glands with many of the hydrocarbons also found in the Dufour's gland, but at much lower levels. They also discovered a series of oleic acid wax esters that lay beyond the detection of standard GC columns. As a bee's activities changed, as it aged, the types of compounds detected in the CSG also changed. For example, newly emerged bees have predominately C_{19}-C_{23}n-alkanes, alkenes and methyl-branched compounds, whereas the nurses' CSG had predominately $C_{31:1}$ and $C_{33:1}$ alkene isomers, which are replaced by a series of oleic acid wax esters in foragers. These changes in the CSG were mirrored by corresponding changes in the adults' CHCs profile. The CSG is a major storage gland of CHCs. As the CSG duct opens into the buccal cavity (mouth), the hydrocarbons can be worked into the comb wax and could help explain the role of comb wax in nestmate recognition experiments.

Worker honey bees are able to discriminate between combs on the basis of genetic similarity to a learned comb. The nestmate recognition cues that they acquire from the comb also have a genetically correlated component. Cues are acquired from comb in very short exposure periods (five minutes or less) and can be transferred among bees that are in physical contact. Gas chromatographic analysis demonstrates that bees with exposure to comb have different chemical surface profiles than bees without such exposure. These results support the hypothesis that comb-derived recognition cues are highly important in honey bee nestmate recognition. These cues are at least in part derived from the wax itself, rather than from floral scents that have been absorbed by the wax (Breed et al., 1995).

Experiments indicated that the most important recognition pheromones are the fatty acids, particularly palmitic acid, palmitoleic acid, oleic acid, linoleic acid, linolenic acid and tetracosanoic acid. These fatty acids are mixed with the wax hydrocarbons from wax glands, molded into comb and then transferred onto the workers as they contact the comb. The result is a colony level signature that varies little among workers in a colony. Newly emerged workers have few external fatty acids or hydrocarbons. Oleic acid is more abundant than the other fatty acids on newly emerged bees, but the amount of oleic acid on the cuticle does not vary significantly among colonies. Newly emerged workers are accepted even though they have no signature yet; the "password" for new bees to be admitted to their colony is apparently the lack of a signal. This conclusion is corroborated by the finding that guards tend to treat sodium hydroxide-washed older bees as if they are newly emerged (Breed, 1998).

The integration of recognition cues is described as follows. Fatty acids and hydrocarbons are components of the wax comb that is produced by the bees. The relative abundances of fatty acids and hydrocarbons in wax varies among colonies, giving them unique chemical signatures. Food odors may also be absorbed by the comb, adding to its uniqueness. Newly emerged bees produce their own hydrocarbon coating, which is modified as they move around the nest by the addition of hydrocarbons and fatty acids from the comb. Of the compounds tested in the laboratory, fatty acids are the most important recognition pheromones, but other, as yet untested compounds may also contribute to the recognition odor. Hydrocarbons have generally been assumed to be the primary recognition pheromones of honey bees. However, none of the major structural hydrocarbons of honey bees (i.e., n-alkanes) yields a positive result in a recognition bioassay, nor do these compounds differ significantly in relative concentration among families of bees (Breed, 1998).

The environmental and genetic components of recognition are difficult to separate even in controlled conditions. Getz and Smith (1983) showed that the honey bee discriminates between full and half-sisters raised in the same hive, on the same brood comb in neighboring cells, thus demonstrating a significant genetic component to the recognition process.

Nestmate recognition information can come from either contact chemoreception or olfaction. Mann and Breed (1997) investigated what role airborne olfactory cues play in nestmate recognition by honey bee colony guards, and how do these signals affect guard orientation and behavior? They demonstrated that airborne cues play a significant role in guard bee recognition of nestmates and non-nestmates. Exposure of a guard bee to the scent of a non-nestmate resulted in increased locomotory rate and changes in the directional orientation of guard bees. Exposure to scent of a non-nestmate did not, however, increase the likelihood that a second non-nestmate would be attacked when placed with the guard. Observations of guard behavior at colony entrances indicate that guards discriminate nestmates from non-nestmates with high efficiency.

Floral oils are an important component of the honey bee's olfactory environment. Bowden et al. (1998) used laboratory and field tests to determine whether floral oils affect nestmate recognition in honey bees. In the laboratory, newly emerged worker bees, that have not been exposed to comb wax, responded more aggressively to bees that had been exposed to floral oils than unexposed control bees. In the field, guard bees did not respond differently to foragers that had been exposed to floral oils. Floral oils may play a supplementary role in nestmate recognition; however, if they have any effect, it is secondary to cues acquired from comb during development.

Downs et al. (2000) investigated the effect that floral oils (anethole, citronellal, limonene and linalool) have on the probability of nestmates and non-nestmates being accepted by guard bees at nest entrances. Floral oils did not affect the probability of workers, either nestmates or non-nestmates, being accepted by guards. However, the presence of floral oils did increase the time taken for a guard to reject an introduced bee. These data show that guards are sensitive to floral oils but use other recognition cues when assessing colony affiliation.

Honey bees have the ability to distinguish among groups of larvae that are destined to become queens and preferentially rear highly related nestmate larvae over less related larvae that are not nestmates (Page and Erickson, 1984).

Colonies of honey bees from two patrilines (cordovan and dark) were established and observations were made on the behavior shown by the worker bees in rearing queen larvae within their colonies. The relationship among the bees within these colonies was either r = ¾ (super-sisters) or r = ¼ (half sisters). The worker bees showed preferential care to the queen larvae that were of their own patriline. Workers of the cordovan patriline showed a stronger preference for larvae of their own patriline than did the dark workers. Cordovan workers also showed a higher rate of visitation, indicating behavioral differences between the patrilines. These results suggest that kin selection is operating on honey bee behavior used in rearing reproduction (Noonan, 1986).

A honey bee queen is usually attacked if she is placed among the workers of a colony other than her own. This rejection occurs even if environmental sources of odor, such as food, water and genetic origin of the workers, are kept constant in laboratory conditions. The genetic similarity of queens determines how similar their recognition characteristics are; inbred sister queens were accepted in 35% of exchanges, outbred sister queens in 12% and non-sister queens in 0%. Carbon dioxide narcosis (stuper, unconsciousness) results in worker honey bees accepting non-nestmate queens. A learning curve is presented, showing the time after narcosis required by workers to learn to recognize a new queen. In contrast, workers transfer results in only a small percentage of the workers being rejected. The reason for the difference between queens and workers may be because of worker and queen recognition cues having different sources (Breed, 1981).

Boch and Morse (1974, 1979) have shown that honey bee queens can be recognized individually by swarms of bees. They found that marking a queen with shellac-based paint to give her a distinctive odor resulted in workers later exhibiting a preference for any queen marked with that paint. However, their experiments do not show whether the odors used by workers to recognize queens are produced by the queens or are environmentally acquired. In a series of studies concerned with queen introduction into colonies, Szabo (1974, 1977) also found that workers could discriminate among queens, but did not approach the issue of the source of recognition odors directly. It was also found that factors such as the age and weight of an introduced queen could affect worker choice among introduced queens. Yadava and Smith (1971) found that the mandibular gland contents of the queen were important in the release of worker aggression towards an introduced queen (Breed, 1981). BC

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You Might Be A Beekeeper If...

Stephen Bishop

1. You might be a beekeeper if your facial hair serves a defensive purpose.
2. You might be a beekeeper if, while leaving Walmart, the receipt inspector asks you for your moonshine recipe.
3. You might be a beekeeper if, in a moment of inspiration, you strip naked and attempt to best your personal record in the hundred-yard dash.
4. You might be a beekeeper if you were nearly arrested for possession of vaporizing paraphernalia and a white powdery substance.
5. You might be a beekeeper if your only use for balls is to judge swarm sizes.
6. You might be a beekeeper if you tell stories to fishermen about the swarms that got away.
7. You might be a beekeeper if your emergency readiness kit is a fully stocked nuc box.
8. You might be a beekeeper if the habit of scanning roadside trees got you a ticket for distracted driving.
9. You might be a beekeeper if your lecture on virgin queens doesn't include a historical discussion of Elizabeth I.
10. You might be a beekeeper if hippies frequently ask what you've been smoking.
11. You might be a beekeeper if you have revenge fantasies involving formic acid.
12. You might be a beekeeper if the quest for the holy grail doesn't invoke thoughts of Indiana Jones, but Randy Oliver.
13. You might be a beekeeper if the smell of bananas causes post-traumatic stress disorder.
14. You might be a beekeeper if Hobby Lobby doesn't carry your hobby supplies.
15. You might be a beekeeper if you've ever tried tying two ladders together to extend their reach.
16. You might be a beekeeper if, to maintain secrecy, you only confide your deepest secrets to coworkers with a sixty-day lifespan.
17. You might be a beekeeper if you associate the waggle dance with someone other than Beyonce.
18. You might be a beekeeper if, while making small talk about queen mating habits, a SWAT team forcefully enters your conversation to rescue your hostage listener.
19. You might be a beekeeper if duct tape is your number one fashion accessory.
20. You might be a beekeeper if your primary care physician is a chiropractor.
21. You might be a beekeeper if dropping a wooden box on your foot was merely the start of your misery.
22. You might be a beekeeper if you've used lemongrass oil as an aftershave.
23. You might be a beekeeper if your first line of defense from robbers is to board up your front door.
24. You might be a beekeeper if you hope for a long allergy season.
25. You might be a beekeeper if you remember more floral bloom dates than family birth dates.
26. You might be a beekeeper if you've ever critiqued a bride's wedding attire based purely on the practicality of the veil.
27. You might be a beekeeper if, in defense of others, you've ever charged forward so ferociously you caused a grizzly bear to play dead.
28. You might be a beekeeper if your packages cause a commotion at the post office.
29. You might be a beekeeper if you're over the age of eight, yet still belong to a club that has show-and-tell meetings.
30. You might be a beekeeper if even the best fence can't keep your livestock from foraging your neighbor's shrubbery.
31. You might be a beekeeper if you have a fond appreciation for the smell of dirty gym socks.
32. You might be a beekeeper if you've ever confused the phrase "low-hanging fruit" with "low-hanging swarm."
33. You might be a beekeeper if 911 calls you to respond to an emergency.
34. You might be a beekeeper if you've ever been interrogated by the FBI for suspicious activities involving the Russian nuc trade. BC

WHY DIDN'T YOU LISTEN TO YOUR MENTOR Part 3

Ed Simon

The three parts of this collection are subsets of the 263 hints, definitions and informational tidbits gathered in over twenty years of beekeeping. I hope they are helpful.

Selling Honey – Let the bees draw customers in.

When selling honey at an event, take along a portable observation hive. It's best without a queen, but with capped brood. The lure of bees is a direct eye catcher by kids and their parents who want their kids to experience something they will probably never be able to see anywhere else. There is always the additional possibility you can give the customers a unique experience of watching a worker bee chew her way out of a cell. Once you have delivered your bee spiel, the parents will buy something 60% of the time.

Slumgum

Slumgum is the residue of the beeswax rendering process. When the beeswax from brood comb is rendered to produce clean wax, it leaves behind the pupa casings, skins shed by molting larvae, excrement from larvae, wax moth cocoons and other residual debris included in the original material.

Skunks – They will find a good meal.

Carpet tack strips nailed to the bottom board will stop most skunks. Face the sharp tacks toward the opening.

Smoker – Lighting.

Use a propane or MAP torch to start your smoker. This is probably the easiest way to start a smoker. Get a torch that has a self-starting trigger. It will ignite when you squeeze the trigger and extinguish when the trigger is released.

Smoker – Embers, use grass as a filter.

After your smoker is lit, stuff the chimney with green grass or weeds. This filters the embers from the smoke and at the same time cools it a little bit.

Smoker – Opening.

After your smoker is lit, you need to add more fuel and it is hot. If you cannot open it by pulling the top tab, then place your thumb under the tab and encircle the top with your fingers. Gloves are required for this operation.

Note: Emptying the smoker for storage and leaving the top open is recommended. Once the creosote cools it is exceedingly difficult to get the top open the next time you want to use it.

Smoker – Cleaning

Your lid never goes on or opens easily due to soot and creosote build-up. Remove the bottom grate and clean. Don't forget the holes in the bottom grate.

Burn it out – use a MAP or propane torch to start the residual creosote on fire. Then use a scraper or screwdriver to chip the rest away. After cleaning the big chunks out of the smoker, use a wire brush on an electric drill to remove the remaining soot and creosote.

You'll probably never get it completely clean but, at least you can close the top.

Smoker – Extinguishing.

Save fuel by smothering the fire when you are finished. Putting a

cork in it is one way. Another way is to lay the smoker on its side. The air flow will then be above the fuel and not through the fuel. Make sure you place the smoker on something non-combustible. Laying the smoker on its side was described to me by the U of MN bee squad member during a queen rearing class.

Note: Emptying the smoker and leaving the top open is recommended. Once the creosote cools it is exceedingly difficult to get the top open the next time you want to use it.

Sororicide – When a sibling kills their sister.

Usually, the first queen emerging from her cell locates and kills her sister rivals. If she can locate a rival queen cell, she will open a hole in the side of the cell and kill her before she can emerge.

Super Stacking – Seven feet of problems.

Don't do this even though it is tempting for bragging purposes.

At some height, a stack of honey supers can become dangerous. First is the possibility of the complete hive tipping over. Second is the effort required to remove the supers when pulling honey. This hive needed the bed of a pickup and a ladder to remove the top three supers. Propolis added to the problem. In addition to the two-hundred forty pounds of honey this hive produced, it also produced a lot of awfully bad words. When confronted with this situation, you can always move some of the supers to a less energetic hive to wait for extraction.

Note: This picture is of Sister Alice, a Franciscan nun who is 5' 2" tall. The hive produced 240 lbs. of honey for her.

Swarms – It will happen – be prepared!

Be ready. Have an extra brood box or a nuc available to store the swarm. A cardboard box will do in a pinch. But it helps to have prepared a site and brood box to house the swarm. It doesn't hurt to have that extra hive leveled and ready to go. Who knows, a swarm may take up residency without any help from you.

Swarms – Use a funneled pail lid.

Build a five-gallon pail with an ⅛ inch hardware cloth top. In the top, add a six-inch funnel. Place the swarm in the pail (hopefully including the queen) and put the top the pail. If you have the queen, the swarm will enter the pail through the funnel.

Swarms – Some swarms abscond.

Reduce the likelihood of having a newly captured swarm absconding by adding a frame with brood to the receiving hive.

Swarms – Did you catch the queen?

After hiving a swarm, you can usually tell if you have captured the queen. Bees outside of the target hive will be migrating toward the hive entrance. At the entrance, you can often see bees "scenting". They have their butts in the air and may be moving their wings. They are releasing a homing pheromone. It is a signal to the remaining bees that the colony is here, and the queen is in residence.

Syrup – What proportions?

In the Fall, feed 2:1, sugar to water syrup. In the Spring, feed 1:1 sugar to water syrup. The chart below shows the resulting volume when the two are completely mixed and their relative costs.

Temperature Requirements – Thermometers get sticky.

One handy tool I have in my toolbox is an infrared thermometer with a laser. It will allow you to take the temperature of honey, wax or anything else without having to clean it afterwards. To take a temperature, you just aim it and pull the trigger. Three seconds later the temperature is displayed on a screen. No mess, no fuss.

Top Feeder – Bees can get into the syrup chamber.

When a top feeder is empty, there is a possibility that the bees can enter the syrup chamber under the hardware cloth or screen. To minimize or eliminate this problem, seal the screen to the feeder with silicone seal.

Veritable Honey

Honey that was collected by the bees during a blooming of a specific tree or flower. It has a high percentage of a single nectar source.

Washboarding – Obsessive behavior?

When bees gather on the landing board and rock back and forth. As of now, there is no purpose or reason for this behavior.

Wax Cleanup

Wax is almost impossible to remove completely from cloth. Use a paper towel and place it between an iron and your clothes with wax on it. Press the cloth through the paper towel. The towel will absorb the wax when it has melted. It may take a couple of passes to remove most of the wax.

Wax Cleanup

A heat gun and cheap paper towels will clean up the sticky wax. First, remove as much wax as you can with a scraper. Then, warm the wax a little bit with the heat gun. Use the scraper to remove more wax once it is loosened. As a final pass, melt all the remaining wax with the heat gun and wipe it with a clean paper towel.

Wax Facts – Basic beeswax information.

Beeswax melts between 143° and 151°F (62-66°C).

The flashpoint is 490°-525°F (254-274°C).

This is the **temperature** at which **beeswax** can flare up and burn fiercely.

The boiling point of water is 212°F (100°C).

Because of the difference in the water boiling point and the wax melting point, wax can be liquified in hot water. When water is available, the evaporation of water will limit the wax temperature to 212°F (100°C). Once the water has boiled off or evaporated, the wax temperature can rise and eventually vaporize and possibly catch on fire.

Because the specific gravity of wax and water are different (wax is lighter than water), when allowed to settle, a melted wax/water mixture will separate. The wax will float on the water. Most impurities usually, although not always, are trapped in a layer between the two. Once the wax solidifies, it can be removed as a large solid cake.

Wax Processing Preparation – Too much honey.

Honey mixed in with the wax you are going to process is a sticky problem. Remove most of the honey before processing it by rinsing it. Place it in a five-gallon pail and add warm water. Mix it around and then drain it before melting it. You won't eliminate all the honey, but it will help.

Sugar Syrup

1:1 – Light Syrup			2:1 – Heavy Syrup				Light	Heavy
Sugar (lbs.)	Water (pints)	Resulting Volume (pints)	Sugar (lbs.)	Water (pints)	Resulting Volume (pints)	Sugar cost per pound	0.60	
10.0	12	16	10.0	6	11.0	Syrup cost per pint	0.34	0.54
5.0	6	8	5.0	3	5.5	Syrup cost per gallon	2.99	4.34
4.0	5	6.5	4.0	2.4	4.4			

Wax Processing – Breaking cakes of wax.

If you have cakes of wax that are too large to fit into your wax melter, place them in a cardboard box and use a hammer and chisel to split them. The cardboard box stops the wax chips from flying all over your workroom.

Wax Processing – Use water to separate crud from wax.

When melting raw cruddy wax, add water while melting it. Water and wax do not mix. When the wax is poured into a container the water/wax mixture will separate into layers. Water will be the bottom layer with a mixture of impurities (crud) above it and then a layer of wax on top. The slower the mixture cools, the longer the crud has time to separate from the wax.

55 – 60 lbs.	Full filled 9-frame medium super
12 – 18 lbs.	Wet 9-frame super (after extraction)
90 – 100 lbs.	Large 10-frame brood box

Weight of Honey – A quick easy way to estimate the weight of honey.

Honey weighs about 1.5 times more than the same volume of water.

A gallon of water weighs about eight pounds. A gallon of honey weighs about twelve pounds.

A good example of this is the standard honey bear. It holds eight ounces of honey or water by volume. But it is considered a twelve-ounce honey bear (by weight).

Weight of Hive Bodies (above chart) A generalized weight for standard bee equipment. BC

A complete list of all the entries collected is published in *Build Beekeeping Equipment*. It is available through **www.LULU.com**. It contains a full set of unabridged entries in a chapter called "What Your Mentor Forgot to Tell You." Under the LULU sales section, search for "Beekeeping" to find this publication.

Painted Hive Body Competition

Ruth Meredith

Note: The photo above was originally submitted as part of the image gallery contest. It was so unique that Jerry reached out for more information.

I was the recipient of the 2022 grant by a local bee club, the **NansemondBeekeepers.com**. They hold an annual Painted Hive Body Competition to raise awareness of honey bees and sell the painted boxes to raise money for bee research (they had an article in the January 2022 issue of *Bee Culture* on page 49).

Since I am a boutique queen producer, I wanted to study the effects of queen bee drifting in mating boxes. My only "open space" for the project in my ⅓ acre residential yard was on top of the shed roof, 10 feet up in the air. One side of the Mann Lake styrene double mating nucs was painted in colorful hues. The other side was the original white. Each nuc entrance was numbered and the virgin queens were painted with a different colored dot prior to their mating flight or a numbered disk was glued to their thorax. Box numbers and colors of the dot on the virgin queen were recorded.

I also did trials with temp queen vs. no temp queen in the mating box. Three full trials of virgin queens were conducted in the boxes with no noticeable drifting on the all white side, which is what I predicted would happen. Temp queen was so beneficial in holding worker bees to these small nucs that it was continued the entire three cycles. I also did not find any detrimental effects to marking a virgin queen prior to mating and this now gives me enough confidence that I pre-mark all of my virgins that emerge in the incubator so that I am certain of the race (Buckfast or Carniolan) that I have in the mating nucs.

Photo 1 is the photo of the white side of the mating nucs for the trial comparison. Photo 2 is loading them up (temp queen is the bundle of bees in the foreground). And yes, I did end up falling off the ladder at one point in the trials. BC

Contact email: **ruthiesbees@yahoo.com**

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97% Efficacy
Apistan: 97% Efficacy *(2014, FNOSAD, France)*

93% Efficacy
Apistan: 93% Efficacy (2015, FNOSAD, France)

91% Efficacy
Apistan: 91% Efficacy (2016, FNOSAD, France)

95% Efficacy
Apistan: 95.22% (2017, FNOSAD, France)

Apistan should be used as part of an Integrated Pest Management Strategy
Pockets of resistance are possible, we recommend trialling Apistan on a couple of colonies before widespread use.

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Minding Your Bees And Cues

Convention Chronicles

Becky Masterman & Bridget Mendel

There's nothing like a great beekeeping meeting. You learn, connect and get inspired. We are still buzzing from the 2023 Tri-State Convention held July 13th-15th with Minnesota, North Dakota and South Dakota Beekeepers and it is not because of the weekend's specialty cocktail (Habitat Honey Hooch). Instead, our elation stems from being a part of a weekend where beekeepers and the beekeeping industry invested in bee health and habitat.

The convention kicked off with our first in-person Habitat Hour, a Minnesota Honey Producers webinar series that explores habitat education and opportunities. We welcomed about 80 attendees from the three states (and beyond). After enjoying dessert, drinks and conversation, everyone settled down for some habitat chat with John Stolle, South Dakota Beekeepers Association President; Mark Sundberg, Minnesota Honey Producers Association President; and Zac Browning, Bee and Butterfly Fund Board Chairman and North Dakota beekeeper. Our questions to this panel included the role habitat plays in their respective operations, goals for the 2023 U.S. Farm Bill and visions for Tri-State honey bee habitat collaborations. The audience learned about their successes with implementing forage installations for their operations, aspirations for a Farm Bill that supports and protects beekeepers, and a consensus that our states would benefit from working together to promote honey bee habitat.

Over two hundred convention attendees were grateful for the 'don't want to miss any of the talks' jam-packed speaker schedule over the day and a half program. Dr. Judy Wu-Smart, head of the University of Nebraska-Lincoln Bee Lab, was the keynote speaker, and her work on pesticides, bee health and the environment was worth the early morning wake up each day. Included in the many presentations: Drs. Marla Spivak and Katie Lee from the University of Minnesota Bee Lab and Minnesota Extension discussed social immunity and breeding for *varroa* resistance and queen economics, respectively, and Dr. Garrett Slater from the USDA-ARS Lab shared his dud drone data.

Upper Left: Bonnie Woodworth received North Dakota Beekeepers' Distinguished Service Award.
Lower Left: MHPA President Mark Sundberg accepted the Beekeeper of the Year Award on behalf of Ike Strohmeyer.
Right: Habitat Hour panel discussing issues and opportunities in honey bee habitat. Pictured from left to right, Becky Masterman, John Stolle, Mark Sundberg and Zac Browning.
Photo credits: Katie Lee, Becky Masterman and Bridget Mendel

The Tri-State Beekeeping Convention raffles included a George Hansen encaustic painting and commemorative quilt made by Gretchen Schroeder.
Photo credits: George Hansen and Liz Schroeder

No one will forget the live auction for honey bee habitat anytime soon. People laughed. People cried. Our goal was to raise money to support Bee and Butterfly Habitat Fund (B&BHF) projects in Minnesota, North Dakota and South Dakota. We were honored by a surprise donation that North Dakota Beekeepers Association president, John Miller, coordinated with Jill Clark of Dutch Gold Honey. Ms. Clark not only shared their generous donation to the B&BHF, but more importantly, shared the impact of how her own property has been transformed by a B&BHF habitat installation. Clark's

A post meeting field trip to MPHA President Mark Sunberg's farm revealed an established Bee and Butterfly Habitat Fund project buzzing with bees and other pollinators. Photo credit: Amanda Allen and Bee and Butterfly Habitat Fund

Becky Masterman led the UMN Bee Squad from 2013-2019. Bridget Mendel joined the Bee Squad in 2013 and has led the program since 2020. Both Masterman and Mendel are members of the Minnesota Honey Producers Association and run their Habitat Hour program. Photos of Bridget (left) and Becky (right) setting up for the first in-person MHPA Habitat Hour. If you would like to contact the authors with your own meeting memories, please send an email to mindingyourbeesandcues@gmail.com.

description of fields alive with pollinators in the daytime and lit up at night by fireflies triggered emotions in the audience.

Our auctioneer was beekeeper and University of Minnesota Bee Lab favorite, Gary Reuter. The auction item donors and bidders were very generous. Gary put the fun in fundraising and the auction items generated $23,000 for Tri-State habitat projects, including auctioning 50, one pound bags of white Dutch clover that went for $60 each.

The fundraising for flowers did not end with the last bag of clover. Instead, Brent Barkman of Barkman Honey raised his hand and generously matched the $23,000 raised by the live auction for habitat. It is possible that this gesture made one of us shed a tear or two of gratitude.

Raffle tickets were sold throughout the weekend for both a quilt to raise money for the MHPA Ambassador program, and a George Hansen Encaustic Painting donated (by the artist) to support Project *Apis m* (PAm), whose mission is to support research and efforts that improve honey bee health. Convention attendees were not shy with their support of the quilt that was designed and made by Gretchen Schroeder and their generosity totaled over $1,000. Each $100 ticket purchased for the George Hansen encaustic painting raffle came with a sincere desire to own a work that captured the experience of watching bees gather precious colony nutrition including nectar for honey production. No one would argue the importance of PAm's work, but this raffle was personal for many. While the raffle raised over $3,000 for PAm, the meeting's final chapter, drawing the winning ticket, elicited a wave of disappointment in the room and might have been a sad close to a thrilling weekend. Then it was revealed that the raffle winner, Kevin Rader of Beekeeping Insurance Services, had just donated $35,000 in support of Project Apis m and the Bee and Butterfly Habitat Fund (even more flower money!). The room erupted in applause and the warm glow of his generous support for bee health and habitat eased the sting of going home without George's art.

A successful convention requires planners who are relentless in their efforts. Our beekeeping associations were lucky to have MHPA Vice President Liz Schroeder expertly steer the meeting ship with NDBA President John Miller adding speakers and ideas and making sure that every industry issue was represented during the weekend. The attendees were overwhelmed with the excellent trade show and speaker program. Great food and beverages fueled the event and everyone's generosity to support fundraising efforts gave attendees the sense that they were a part of something special. And they were.

A few takeaways to leave you with:

- Multi-state conventions are good for beekeepers, vendors, speakers and the earth. "Tri" it. We think you might like it.
- Beekeepers and the bee industry want to make a difference. Try adding a fundraiser for a program that is improving bee health to your convention agenda.
- Habitat for honey bees is a critical need; we can all contribute to improving and increasing it, and have some fun along the way. BC

Resources

Minnesota Honey Producers Association's Fall Habitat Hour Series **https://minnesotahoneyproducers.com/habitathour/**

Dr. Judy Wu-Smart and the UNL Bee Lab **https://entomology.unl.edu/beelab**

University of Minnesota Bee Lab **https://beelab.umn.edu/**

Project *Apis m* **https://www.projectapism.org/**

Bee and Butterfly Habitat Fund **https://www.beeandbutterflyfund.org/**

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From the University of Florida Honey

January: Overview of the HBREL at UF
February: Honey Bee/Beekeeping Teaching Programs
March: Research on Honey Bees
April: Apiculture Extension (Part 1)
May: Apiculture Extension (Part 2)
June: Roles in a Typical Honey Bee Lab
July: How Labs are Funded
August: The Lab's Physical Infastructure
September: What it Takes to Run a Laboratory Effectively
October: Professional Development in the Lab
November: Members of the HBREL Team and What They Do
December: The HBREL's Most Notable Successes/Contributions to the Beekeeping Industry

UF IFAS UNIVERSITY of FLORIDA

HONEY BEE RESEARCH & EXTENSION LABORATORY

Part 1. What Any Lab Needs

My name is Chris Oster (Figure 1), and I am the Laboratory Manager at the University of Florida Institute of Food and Agricultural Science (UF/IFAS) Honey Bee Research and Extension Laboratory (HBREL). In this article, two of my colleagues and I will report on the day-to-day operation of a honey bee research laboratory. My laboratory colleagues who authored the previous articles in this series have already covered who does what in a research laboratory (June) and how laboratories receive funding (July). Here, we will focus on what is needed, both in materials and labor, to achieve our teaching, research and extension goals.

Figure 1. HBREL lab manager, Chris Oster. Photo credit: Kaylin Kleckner

Figure 2. The David J. Mendes Laboratory. Photo Credit: Chris Oster

As the laboratory manager, my job is to ensure that everyone else at the HBREL can do their jobs. What that task includes is different depending on the team member with whom I am working. The November article in this series will cover the members of our laboratory, but briefly, our laboratory is administered by three faculty members: Dr. Jamie Ellis, Dr. Cameron Jack and Ms. Amy Vu. Dr. Jack and Dr. Ellis both have graduate students who they mentor and technicians who work for them. Amy has a team composed of project coordinators who help her with her extension programs. We also benefit from the small army of UF students and local beekeepers who volunteer at our laboratory. Each faculty member has different programmatic goals, and how each achieves those goals varies widely.

In our laboratory space (Figure 2) alone, we have hundreds of pieces of equipment that all need to be in working order. If a graduate student or technician needs to use a scale, it is my job to ensure that they can choose any scale and that the scale will be in good working order, meaning it is calibrated and will deliver an accurate measurement. This extends to pipettes, microscopes, freezers, refrigerators, incubators, glassware, DNA extraction equipment, fume hoods and so much more. For a scientist to obtain accurate results, they need to be able to trust their equipment, space and test subjects. To achieve this, scales and pipettes need to be calibrated and cleaned regularly. Freezers need to be defrosted and monitored for failure. Bench spaces and tabletops need to be cleaned to avoid contamination or injury. Glassware needs to be cleaned regularly. Chemicals need to be maintained through proper storage and disposal. Personal protective equipment needs to be available and used. All these things, plus about 10,000 others, are what it takes to keep just our laboratory space in working order.

Bee Research and Extension Laboratory

What Does It Take to Run a Honey Bee Laboratory?

Chris Oster, Steven Keith & Devan Rawn

Researchers are the most vital part of any research laboratory. For everyone who is part of the HBREL, including faculty, staff, students and volunteers, training is a major must-have. Especially critical are trainings to deal with hazardous chemicals in the laboratory and dealing with heat and heavy lifting in the field. All personnel must receive proper training. Luckily for us, the University of Florida offers hundreds of online and in-person training courses. As the laboratory manager, it is one of my duties to ensure that everyone is up to date on all their training. Additionally, new technicians, students and volunteers all need to be trained in how to use our equipment and our workflow practices. For example, we maintain a colony of small hive beetles in the laboratory for bioassays or honey bee colonies we call our "mite factories" that can sustain over 10 times the *Varroa destructor* treatment threshold. To conduct our research on the mite and small hive beetles, we need a lot of them. A typical bioassay might require 250 healthy mites or small hive beetles, and we can conduct several of these bioassays each week. Maintaining the colonies that support these pests requires training and dedication from our volunteers and staff.

Aside from the people and the spaces, our laboratory needs materials and supplies. Part of my job is to support HBREL staff to ensure they have all the equipment, materials and supplies necessary to conduct their projects and programs. I keep a spreadsheet of all the purchases I have made for the laboratory with my university procurement card. That list is currently over 500 items long from dozens of vendors in just the last two years. These purchases are anything from chemicals for the laboratory, hive tools and veils for our undergraduate students, to hotels and registration fees for academic conferences. For any laboratory to be successful, it needs to have the means to purchase these items (see our July article for more on this), and the infrastructure to store and use these materials (see our August article for this).

Many of the things I have discussed so far are not unique to our laboratory, but what is unique to us, or at least the laboratories in our field, is our need for honey bees. Not only do we need hundreds of honey bee colonies, we also need colonies of varying sizes, strengths and pest and virus loads on demand. Keeping bees alive and studying them is the subject of the remainder of the article and will be covered by our laboratory beekeeper, Steven, and our lead field technician, Devan.

Part 2. The HBREL Beekeeper

Hello! My name is Steven Keith, (Figure 3) and I am the laboratory beekeeper at the HBREL. I am excited to share some information about my work at the laboratory and explain how it contributes to the extension programs we offer and research that stems from it. You may be asking yourself—why does the laboratory need a beekeeper? Don't all the researchers know how to keep bees? While most of our researchers are indeed experienced beekeepers, there is a lot of work that needs to be done behind the scenes to ensure the colonies are maintained in optimal condition, and the apiaries at the HBREL are equipped with everything our team needs to conduct accurate and efficient research.

Efficiency is something in which I am particularly interested. In my role, I am constantly asking, "how could I make this process faster and easier for beekeepers," "how could we manage more hives with these same processes," and "how would a commercial or backyard beekeeper do this?". I work to ensure that all our beekeeping materials, apiary management tools and apiary facilities are organized in a way that makes it easy for our researchers to initiate and conduct new research projects. In that capacity, I have the pleasure of working closely with the HBREL Laboratory Manager (Chris Oster) and the HBREL Field Technician (Devan Rawn) to shape our apiaries around the needs of individual research projects and furnish healthy, stable bee colonies for our researchers to study. In addition, we need to have hives readily available for groups that tour the laboratory and for all the extension classes we have throughout the year.

Figure 3. HBREL beekeeper, Steven Keith. Photo Credit: Kaylin Kleckner

Figure 4. One of our trucks pulling our tractor. Photo Credit: Steven Keith

I began beekeeping as a hobbyist in 2017 and quickly became obsessed with bees and the beekeeping industry. I have been fortunate enough to work in a variety of beekeeping settings, including managing a sideline apiary, conducting humane bee removals and re-homing feral colonies, and working alongside an experienced honey producer. Those experiences helped inform my work at the HBREL, where I look for opportunities to create systems that will benefit beekeepers of all levels with their apiary management. I enjoy spending time in the field checking colonies and observing the bees, but I also love the tools that we use at the HBREL to increase our efficiency, such as our small fleet of vehicles, heavy machinery, freezers, feeding systems and hive equipment (Figure 4). My goal is to ensure that our HBREL team always has what they need to conduct a new project, teach a class, perform outreach and extension or a hive demonstration for a tour. This especially includes the bees themselves and everything necessary to keep them alive!

My job is focused on the work needed before a project begins to ensure that it can run effectively and yield reliable results. Each year, the HBREL apiaries house between 100 to 300 colonies (Figure 5), some of which are in studies, and some are recouped after a research project or maintained as support colonies. It is imperative that the laboratory have sufficient hives available to conduct a research project; if there are not enough colonies for a project, then research cannot happen. Hive management includes feeding the bees, monitoring for queen cells to reduce swarming, monitoring the parasite loads within the hives and performing splits as colonies grow (Figure 6). During periods where there is an abundance of nectar, bee colonies may attempt to swarm, resulting in colony losses. When a colony displays the signs of imminent swarming, I need to be ready to intervene quickly. To manage the hives optimally, I also need to be aware of the forage available to the colonies at each of our beeyards to ensure that there is sufficient food available for the colonies there. I must also be sure that beekeeping materials such as hive bodies, frames, queen excluders and nucs are readily available to the other HBREL members. When necessary, I re-queen colonies to optimize the genetics of our hives. Lastly, I manage the schedule of pest and disease treatments when they are not in a study.

As much of the HBREL's research involves studying honey bee pests and pathogens, I work to main-

Figure 5. One of the HBREL apiaries. Photo Credit: Steven Keith

Figure 6. New splits. Photo Credit: Steven Keith

tain colonies of those pests so that they are available to our researchers when needed. For example, we are working on a project to determine which miticide is most effective in reducing *Varroa* populations in a colony. Part of my role in this project is to provide my laboratory colleagues with a group of colonies which carry a high mite population, meaning that I need to manage those colonies to keep *Varroa* numbers high, without allowing the colonies to decline. While this type of management may seem counterintuitive, it is important that I maintain a high *Varroa* load in those select colonies so our team can measure the decline of mites caused by each treatment. In this regard, managing bee pests is just as important as managing the bees themselves. Our teams need to be sure that they have sufficient pests available to conduct their research projects. Understanding these pests can eventually allow beekeepers to learn how to alleviate the stress these pests place on their own colonies.

This work requires focused inventory management. Much of my work involves ensuring our beekeeping resources are kept organized and accessible to the people who need them. I manage the large workshop facility within the HBREL campus. The facility houses our walk-in freezer (to hold drawn combs and honey frames), all our unused hive bodies and hive components, our pallet jack, forklift and other warehouse management equipment. This list does not even include many other tools used in our hive management and beekeeping education. I develop efficient systems for producing and distributing feed to our apiaries. I move resources between hives to give colonies what they need to remain healthy until they are used in a new project. I also maintain the seven apiaries located outside of the HBREL facilities. This includes mowing, preparing the yards with stands and pallets, transporting colonies between yards and maintaining equipment in the field.

My work is highly impacted by the season and the flows of nectar and pollen that we experience in the Gainesville and Central Florida area. In our region, Spring blooms lead to sharp increases in nectar and pollen availability, and our hives increase their populations rapidly. To avoid swarming and hive losses, I ensure that every hive in every apiary is checked weekly to remove queen cells and perform splits as needed. In the "slower" times of the year, particularly in Winter, on top of ensuring the colonies are well fed, I can turn my attention to annual maintenance of the beeyards, such as trimming back overgrown areas and making the apiaries more accessible. During this time, I look for new apiaries, as our research sometimes requires different access to forage or proximity to other resources. Winter is perfect for maintaining equipment, cleaning 'dead-out' hive boxes, repairing broken equipment, servicing heavy machinery and organizing the workshop. During a typical year, I work with volunteers who donate their time to help with hive and facilities management. This is one of the most enjoyable parts of my job, as I have the honor of teaching many new beekeepers the basics of apiary management and help them learn some of the 'tricks of the trade.' Twice a year, I have the pleasure of preparing and teaching courses at our bi-annual Bee College event (Figure 7), where I teach the basics of hive construction, beekeeping tools and hive inspections.

Figure 7. Steven Keith teaching at UF/IFAS Bee College in the HBREL workshop. Photo Credit: UF/IFAS Communications

Whenever possible, I work to increase my beekeeping skill set so that I can make the HBREL more resilient and better positioned for future research projects. This year, I have been focusing my efforts on queen rearing and becoming more informed about bee breeding and genetics. My hope is that by constantly improving our management practices and my own beekeeping knowledge, we will be able to conduct high quality honey bee research projects each year and make more of that research available to the community of beekeepers we serve.

As a team member who is in close contact with the HBREL's honey bee colonies every day, I am excited about our future and the excellent research being conducted here. At my core, I am a beekeeper who is passionate about maintaining healthy bee colonies and making beekeeping accessible to anyone. I am grateful for the opportunity to contribute to these efforts through the work of the HBREL. I hope that my efforts to manage our colonies and facilities will eventually result in better, easier beekeeping for everyone. If you find yourself around Gainesville, Florida, I hope you will take the time to stop by and allow me to give you a tour! Bring a veil with you—you never know when we might need to split a colony or check for queen cells, and I would be happy for you to join. Next, my colleague, Devan, will explain what he does as our leading field technician.

Figure 8. Devan Rawn in front of some of our hives. Photo Credit: Pierce Barron

Part 3. Role of a Field Technician

My name is Devan Rawn (Figure 8) and my position at the UF/IFAS HBREL is the lead field technician. My focus is on research projects and data

collection with our bees in the field. I also lead technical management of hives to prepare colonies for trials. I am originally from Ontario, Canada, where I have previously worked as a research technician for our provincial beekeepers' association and other honey bee organizations. I also spent time managing my own colonies for honey production and commercial queen production. I work closely with Dr. Ellis, Dr. Jack and their students to provide input on experimental design and methods that will allow us to meet our research goals. I manage some of our hives as they are used within trials, and I typically work with our beekeeper, Steven, to ensure our colonies are ready to enter a project. Once a new project begins, I maintain it through the duration of the study to completion.

Before a particular research project initiates, hives often need to be prepared in a specific way. This is where the field technician and our laboratory beekeeper really become collaborative. We need to coordinate to understand how many hives are available and in what condition they are. *Varroa* infestation levels are always critical to a research project. Even if the research does not concern *Varroa* control, the colonies must be monitored regularly. If there is a research project involving *Varroa* control, it is helpful if the mite levels are elevated. If we are sampling mites and constantly finding zero or just one mite in our samples, it will be difficult to know how well a treatment works. For this reason, we are often trying to maintain colonies with mite levels around or above the treatment threshold, as Steven previously mentioned.

The overall strength of individual colonies is another key factor that must be addressed before initiating a research project. Sometimes, four to five frame nucs might be the best colony unit to use in a research project. At other times, we may want to observe a colony in double deep brood chambers with a population of twenty frames of bees. Before a trial begins, our team will often manipulate colony strength by moving frames of bees and brood between hives. This is also known as "equalizing," a common job for many beekeepers, to standardize the strengths of colonies in a location. We may do the opposite in some cases and create some colonies that are much stronger than others and divide these amongst our treatment groups. This depends on the goals of the research and the protocols that our principal investigators (the researchers) have established.

A field technician's job often involves some trial and error. If there are established methods that have been used in similar trials in the past, I will review that literature and see if those exact methods will fit the goals of our current research. Often, there are some modifications to previous methods that we hope will make our research more accurate or would make the methods more applicable to our current projects. This is where I will collaborate with and provide feedback to our principal investigators if they cannot be in the field with me. We work as a team to ensure our research goals will be met, and the projects can be done accurately and reliably.

Research projects may require specialized equipment. Screened bottom boards for counting mites could be preferred if we want to measure how effective a treatment is within 72 hours. Conversely, we may choose to put our colonies on four-hive pallets that can be easily picked up with a forklift if the research will involve moving colonies often. Our queen rearing efforts require a substantial amount of unique equipment and the queens we produce may be required for certain experiments. It is helpful for a technician to be familiar and comfortable with a wide range of beekeeping accessories. When the researchers want to design an experiment that will benefit from a new piece of equipment, ideally a field technician can fabricate or re-purpose something to meet the research objective.

Observing colonies and making measurements for data collection can be difficult. Often, field level research involves many colonies, and trying to discern slight differences between groups of colonies. Obviously, it would be ideal if we could always detect significant differences in research trials, but that is not a reality, and we must work hard to observe and record any effects. Over the years, the faculty members at our laboratory have used an amazing number of tools and pieces of equipment to meet their research goals. Recently, I used a grid placed over brood frames, to estimate the area of comb containing pollen or capped brood (Figure 9). Methods like this require more of a technician's time, but they may be critical to measure even the slightest differences between treatment groups. Colony weight is another data point that we often collect. It can be used purely to estimate honey production, or to observe a colony's efficiency during a period of dearth. Either way, weighing colonies can be a tiresome job. Our workshop has scales of all kinds, from ones that a hive sits on permanently, to a mobile tripod that we can hoist hives with and weigh with a hanging scale. The small hive beetle (SHB) is a common pest for us in Florida. We are actively researching SHB but are also forced to deal with it in our hives, as would any other beekeeper. When it comes to unique equipment and gadgets, SHB traps are among the most plentiful. I have tested different methods for monitoring SHBs in Florida. Sometimes we need to collect SHB adults alive to bring them back to the laboratory and provide our technician or other researchers with specimens. In this case, we typically use "aspirators" that allow us to create suction to catch adult beetles in a container and return to the laboratory (Figure 10).

Figure 9. Grid used to estimate area on a frame. Photo Credit: Devan Rawn

Once a research trial has begun, my job is to collect data according to the methods on which we have all agreed. This can involve long days, in variable weather, but it is important to do this reliably and consistently. If something must change or does not go according to the original plan (understandably so with honey bees), the most critical point is to make detailed notes and do

Figure 10. Traps for small hive beetles. These can be used in various research projects. Photo Credit: Devan Rawn

everything I can to document the situation. I am responsible for getting the data backed up at the laboratory so I can then pass it along to Dr. Jack or any other analysts who will interpret the data.

Hopefully, I have provided an understanding of a technician's life here at our bee laboratory. It can be challenging, but that is part of the fun. It is always a collaborative and thought-provoking job that makes me appreciate honey bees more with every project we undertake.

In the same way a honey bee colony has its division of labor, so does the UF/IFAS Honey Bee Research and Extension Laboratory. Seamless coordination, extensive resources and dedication to the team mission are all required to achieve the goals of the superorganism that is our laboratory. Without the individuals filling the roles in each niche of our operation, there would be no HBREL. We strive to be as optimally functioning as the creatures whose lives and health we hope to improve with our efforts. BC

Submitted by Deborah Sasser

Submitted by Lynda Bracken

Image Gallery

Honey Hauls

The girls cleaning up some honey comb.
Submitted by Deborah Sasser

First honey haul. Submitted by Suzy Parn

Submitted by Ann Atkinson

Submitted by Kate Swain

Submitted by Deborah Sasser

American Honey Queen

Rachel Bryson, American Honey Queen Committee

Anyone who attended the American Beekeeping Federation convention and trade show in January in Jacksonville, Florida has already met Selena Rampolla and Allison Hager (they were also featured in the April 2023 issue of *Bee Culture*). These women were selected as the national spokespeople for the organization during this convention. But what does it take to be a national spokesperson? Certainly, good communication skills and knowledge of the industry one represents, but for Rampolla and Hager, it also takes passion, commitment and a desire to use their positions for the betterment of beekeepers and the honey bee.

Wet Suit to Bee Suit

It's not every day you hear someone say that they have been swimming with "nice sharks," but for Selena Rampolla, she can check this off her bucket list.

"I like to scuba dive and I love being in the ocean," said the Tampa, Florida native. "When I was really young, I wanted to be a marine biologist. I've seen a few sharks (while diving), but they are the nice ones."

In recent months, Rampolla has traded in her scuba suit for a bee suit and now serves as the 2023 American Honey Queen. Her fascination with the human brain is what initially led Rampolla to learn more about the honey bee.

"I am drawn toward mystery," said Rampolla. She recently graduated from the University of South Florida with a bachelor's degree in Psychology, saying the unknown is what drew her to this field, and likewise into the bee field. "With psychology, there is still so much we don't know about the human brain and that interests me. This unknown or mystery can also be found in the honey bee."

"I've always been interested in honey bees and I did some research on them in high school. It wasn't really until I took a beekeeping class in Tampa, which was actually a birthday present, that I got serious about learning more," said Rampolla. "We got to go into the hive and it was fascinating. When the class was over, I told the instructor I wanted to do this all day. She said she was looking for help (in her beeyard) and that's how I really got involved."

That was the Summer of 2022. While continuing her research, Rampolla came across the American Beekeeping Federation website and the American Honey Queen program. With recent application changes, Rampolla was eligible to interview for the national position in January 2023 in Jacksonville, Florida, during the Federation's annual convention.

"I hope to reach as many people as I can with new information about honey bees and beekeeping, while developing my communication and networking skills and building connections with the beekeeping community," she said. "I also want to thank our beekeepers for all they do. I'll be working for you this year to spread aware of our industry."

And that scuba suit? It's hanging beside the bee suit.

A Focus on Agriculture

Traveling from the waves in Florida to the waves of corn in Iowa, Allison Hager has been an agriculture advocate since high school.

Growing up in the heartland, Hager was active in 4-H and FFA throughout middle and high school, completing a plethora of projects from poultry, dog and goat showing, photography, nutrition, sewing, natural resources and beekeeping. It wasn't until Hager received a youth scholarship that her love for beekeeping blossomed.

"I saw that the Iowa Honey Producers Association had a youth scholarship through the 4-H newsletter. I looked into it, and it was something I was interested in," said Hager. "I knew honey bees played a role in agriculture and the environment, but I was interested in learning more. I was awarded the scholarship and spent the next year learning and becoming a beekeeper."

This was the start of a journey that would eventually lead Hager to her current role as a national spokesperson.

"Ever since I got my hive, I've had this passion for wanting to know more about honey bees. I wrote about the bees for many papers in high school, and this helped my passion to just keep building," she said. In 2021, Hager said she wanted to do more to educate the public on the honey bee's contribution to agriculture. This led her to apply for and be named the 2022 Iowa Honey Queen.

Now, as the 2023 American Honey Princess, Hager said she is looking forward to sharing the honey bees' impact on agriculture on a national scale.

"It's important for people to understand the role of the honey bee and how they are involved in agriculture. I want to share the message that

and Princess Named

beekeepers, and the bees, are vital for agriculture because of pollination. It's not just the direct pollination, but also the impact our bees make indirectly," said Hager.

As a full-time college student who is looking forward to graduation in May 2023, Hager hopes to use her education in business management, with a focus on human resources, with an agriculture company one day. When she's not focusing on her academics, you can find Hager out in nature focusing her camera. An enthusiastic nature photographer, Hager aims to tell a story through her photos.

Background

Rampolla is the 21-year-old daughter of Faye Turke and Renato Rampolla of Lutz and Tampa, Florida, respectively. She graduated summa cum laude from the University of South Florida with a bachelor's degree in Psychology. Prior to being selected as the American Honey Queen, Rampolla served as the Florida Honey Queen.

Hager is the 22-year-old daughter of Danny and Tracey Hager of Bellevue, Iowa. She is a senior at Iowa State University studying Business Management, minoring in Entrepreneurship. Hager has an A.A.S. degree in Agriculture Business from Kirkwood Community College. She previously served as the Iowa Honey Queen before being selected as the American Honey Princess.

Rampolla and Hager will spend the next year promoting the beekeeping industry throughout the United States in a wide variety of venues, including fairs, festivals, schools, media interviews and virtual presentations. To schedule an appearance or presentation with American Honey Queen Selena Rampolla or American Honey Princess Allison Hager, please contact American Honey Queen Program Chairperson Anna Kettlewell at 414.545.5514 or email **honeyqueen99@hotmail.com**. BC

Beekeeping Critical Thoughts – *Time, Money, Labor, Hives*

Earl Hoffman

What does *Optimize* look like in your apiary?

Please let me share some thoughts and understand some ideas on this topic, if I may.

Your bee operation, your apiary has thousands of inputs and outputs, most of these we do not and can not control (example, the weather is beyond our control).

We do control a few inputs and these are the ones you need to focus on. Please let us list a few inputs and discuss them further:

TIME

How much time do you spend planning and executing and recovering from working your apiary? Every weekend, once a month or maybe a few times per year?

Somehow, you need to acknowledge how many hours you are using. These ideas should spark the idea that some is too much and others are not enough. My rule of thumb has changed over the years. Now I see things as "what percentage of this is good enough?"

My new target is, can I get things 95% complete and move onto the next task? The amount of time and energy to get that last 5% done grows without bounds. So is it good enough?

Examples are, did I get the *varroa* mites under control? Maybe three mites in a hive alcohol wash is good enough. Did all of the hives get enough empty honey supers before the nectar flow? Again, do you have time to analyze each hive and determine the exact number of empty supers each hive needs, or do you use the blanket approach?

I do grant you that some people want their bees to be a science project, while others would rather that their bees would act more like goldfish. Somehow you need to find a balance.

MONEY

How much money do you or can you spend on your bee operation? Can you learn to break even, or better yet can you make some sideline money?

As you all know so well, inflation last year and this year is out of control. I have been working bees for over thirty years, when I started, you could buy a good queen for about six (6) dollars. Last I checked most queens are between thirty and forty dollars each.

So lets talk about optimizing, or in this case minimizing the cost to run your beeyard.

Well, let me very quickly suggest that buying used equipment is the WRONG answer.

I have spent days and weeks trying to help old and new beekeepers with used, old, dirty frames and supers.

Photo by Hansjörg Keller on Unsplash

How many times have I seen pathogens express themselves when bees were installed into old dirty equipment? I do not have enough fingers and toes to count that high. Just do *not* do it !

So, maybe you can make a few more splits or let the bees raise their own queen in a few hives. Trade some of your time helping others, in exchange for queens, drawn comb or new equipment. I know this sounds too easy, but maybe you can sell some of your excess? How about using some of the honey money to buy queens?

At our place, one of our local farmers requested pollination of their organic vegetables. Renting out the bees for a short duration of time was always a good money maker for us.

Think about more ways to sell your honey, beeswax and pollen.

LABOR

How much manual labor, in hours, do we really want to spend in the beeyard?

Complexity is not your friend. If you emulate some of the practices of commercial beekeepers, or even well run sideliners, you will find several key themes.

One

Less is more. Reduce the numbers of gadgets and pieces of equipment in your operation. Notice they use a pallet for hive bottoms and they do not use entrance reducers. Moving from ¾ inch to ⅜ inch hive entrance gives the bees a smaller area to guard. No inner cover, the migratory cover, is one piece.

And many use one size super. My thoughts are every one should at least try eight (8) frame equipment or try running the bees in all medium size supers. Using one size super for both brood and honey is a great labor savor.

Two

The number of hives you run should be back calculated from how much time you have to work the bees. It's not the other way around. At one time, Carol Hoffman and I were running between sixty and eighty beehives each season.

I know you're supposed to work fast and move to the next hive, but we sometimes found ourselves spending ten or more minutes per hive just trying to determine what was the correct course of action to take.

Is it queenright? Did it just swarm? What do we do with this hive that is not performing? Eighty hives times ten minutes is eight hundred minutes. Move that to hours and your looking at over thirteen (13) hours to just work the beeyard. Yikes, how many times have we worked bees by moon light because we ran out of daylight? Or catching and marking queens by flashlight?

In my own humble opinion, if you want to only work for an hour or two, please keep your hive numbers below ten.

Three

Set your hives in a horse shoe shape and either back the truck into the center of the group of hives or leave room for a cart or wagon with all of your stuff to reduce the number of steps you need to move between your supplies and your hives. Do not scatter the hives about willy-nilly.

Again, reduce the number of tasks that need to be performed. Time is money, so plan, plan and plan, and only do what you need to do and which tasks are required.

HIVES

Think about what you want your bees to do. Focus and optimize on the goals that you have set out for the year. Are you trying to raise bees to sell to others? If you are, then please do not focus those bees on honey production. Yes, I know sometimes we get lucky and we split bees and make a great honey crop, but best to stick to the task at hand. Optimize your beeyard to your style and objectives. Do you need fewer hives? Do you need more nucs? Should you split all of your hives? Or should you let some of them run with two or three year old queens? In my humble opinion, killing good queens each year just because someone said to, is not a viable solution.

So I end with my original thoughts, please consider these inputs, time, money, labor and hives the next time you want to make your bee operation a better experience. BC

Respectfully,
EAS Master Beekeeper – Earl Hoffman

New(ish) Beekeeper Column

Off the Wahl Beekeeping

START OR JOIN A DYNAMIC BEEKEEPING CLUB

Richard Wahl

One of the wiser things I did as a beginning beekeeper was find a local beekeeping club. At the time, I was surprised that such a thing even existed. I was even more surprised to find over 80 people participating at the first meeting I attended at a very rural location. It soon became apparent that I could learn a lot from the frequent monthly speakers, the commercial beekeepers in attendance and the other seasoned and beginning beekeepers as they shared ideas and the dynamics of the current state of their hives. Interest in beekeeping increased when the media began to cover the effects of what was known as colony collapse disorder and the seeming disappearance of pollinators.

It would seem that interest has not waned. Recent beekeeping classes in our area have filled to capacity and there seems to be a greater interest in pollinator support as a whole. The area clubs that I am aware of have had increased participation over the past few years. Some of this may have been due to the COVID shut-downs as beekeeping can be a very solitary endeavor and still provide a deeper understanding of nature's wonders and the need to have healthy pollinators to support many of our food sources.

A side benefit beyond learning more about beekeeping is the social aspect of making new friends. The possibility of gaining an outlet to sell excess nucleus (nucs) hives or queens after those spring splits are made from strong overwintered hives, and even the sale of whole productive hives, exists. Other hive by-products such as the sale of wax, following the honey harvest, may be a result of the increased number of contacts in a beekeeping club. Many clubs maintain a Facebook page or other social contact network so that participants can exchange ideas, ask questions or get advice between the monthly meetings.

I have given presentations at several area bee clubs and have visited another one or two. Each of these clubs has several things in common. Some have been in existence in one form or another for over 80 years while others have more recent beginnings, occurring shortly after coverage of our pollinator issues gained media attention. In each case, there were initially a small number of people interested in learning more about beekeeping and willing to share their experiences with others. As numbers grew, it became obvious that a regular meeting schedule and a location at which to meet became a necessity.

Leadership Options

Some clubs started to meet in private family homes and began to formalize a leadership structure. When room in the host's garage or living room became too crowded other meeting locations were selected for the increasing attendance. If the initial host did not become the primary contact for meeting arrangements some sort of governing body was elected. This may have been as simple as President/Secretary, Vice President/Treasurer combos and possibly one or more trustees or members at large to form a board of directors. The leadership positions do not need to be complex, but should entail someone willing to coordinate meetings and events and act as a contact point to spread any bee news from outside sources to the beekeeping participants.

The Seven Ponds Bee Club, which is the primary club I associate with, has the positions of President, Treasurer and a board member at large elected for two year terms every even year, while the Vice President, Secretary and another board member at large are selected for two year terms on every odd year. This provides continuity as not all leadership positions are changing at the same time. It also allows for board members at large to gain leadership experience and often later run for election to the more defined positions. Each position can have specifically defined roles and responsibilities or be left somewhat loose provided the requirements of the club are met. The decision whether to have a more formal organizational structure or one that is a bit more minimalist in nature is up to the organizers and membership to decide. The key is to not be afraid to make changes if the current structure is not working or meeting the needs of the membership.

Location, Location, Location

Another consideration is when and where to hold meetings. The clubs I am aware of all conduct a monthly meeting held the same day and time each month while some hold additional board meetings two weeks prior to monthly club meetings to determine future agendas or guest speaker invites. Intervening board meetings are held in the "Zoom or Discord" computer social media formats that became popular for group meetings during

The Seven Ponds Nature Center has several assembly rooms used for meetings, lectures and school demonstrations.

the COVID lock downs. All club members are invited to attend board meetings where future agendas and guest speaker invites are discussed, but more often than not, only elected board members and one or two interested parties with an input or request bother to sign in.

Clubs meet in a variety of locations. A common meeting place is at an area conservation district facility or park site that has a suitable meeting hall or room to hold the anticipated audience.

Others meet in veterans, legion or church assembly halls that have adequate capacity. Any agency nice enough to allow utilization by a beekeeping organization with a sufficiently sized lecture room or two is acceptable. If the space is not donated there are several easy ways to cover the once a month utility costs. Most clubs charge a meager $10.00 or $20.00 annual membership fee while others pass the hat for donations during their meetings.

I know a more creative method used by some clubs is to hold monthly raffles. Members are asked to bring in any bee related items as donations. A quick list of donated items is recorded and shared with members just prior to the monthly meeting. Raffle tickets are sold at a rate of six tickets for $5.00 before the meeting and the first ticket drawn gets to choose which donated item they wish to take. Tickets are drawn and items selected until all donated items have been disbursed. Donated items vary greatly, and at my Seven Ponds Club have included mugs, pictures, honey jars, fresh eggs, jars of honey, jellies or canned goods, pollen producing bare root trees or plants, embroidered aprons or towels, candles and anything one can imagine that might be bee related with nearly all surpassing the $5.00 cost of a few tickets. The Seven Ponds Club will often bring in $250.00 to $300.00 in an evening. These funds are then used to make an annual donation to cover costs of the use of the facility, or to bring in more prominent guest speakers. When funds allow, some raffle prizes may consist of slightly more expensive items previously purchased by the board from bee catalogues such as refractometers, cartons of honey jars or hive equipment and bee clothing items. The possibilities are endless and this seems to add to the fun of the meeting while not taking up too much time.

Club members Dawn Gialanella and Lisa Stinson, man the Seven Ponds raffle table where donated items are raffled off prior to each monthly meeting.

Generalized Meeting Scenarios

During the course of the year, meetings will usually follow a set pattern. In clubs I am familiar with, the raffle followed by general announcements and any brief business is taken care of first. After the business portion, not lasting more than five or ten minutes, the membership is split into two groups during the first three monthly meetings. One group portion led by an experienced beekeeper or two consists of the new beekeepers with little or no experience, where all the necessary beginner aspects and purchasing requirements can be covered. The second group consists of more experienced beekeepers who may be more interested in splits, queen rearing, nucs or hive increases or ongoing sustainability. After those first three, January through March, split sessions are complete, meetings are no longer split and key guest speakers are invited to attend. Topics may vary greatly and can be coordinated with the timing of the beekeeping season. Pollination sources and how to best monitor for mites are often Spring and early Summer topics, while the Fall agenda may include honey extraction, other products of the hive or winterization preparations. The possibilities are limitless and may be suggested by the invited guest speaker whose travel expenses as a minimum are covered by the club.

Another aspect of some clubs that adds fun to meeting nights is to ask members to donate pre-meeting snacks and/or make available drinks such as water, soft drinks, coffee or tea. Snacks often consist of some new baked good consisting of a strong honey recipe component and result in unique recipes made available to the membership. If there is enough interest in pre-meeting edible treats a member volunteer can be solicited to organize each meeting's "treats".

A nice addition to the monthly meetings is to hold a Summer picnic in conjunction with the June or July meeting and a December Christmas party when not much beekeeping work is in effect. When funds allow, the club will often provide the key meat or main course dish while members are asked to bring a favorite dish to pass. A

Mike Connor, arborist and beekeeper at far left, instructs club members on the proper way to plant tree saplings. Five linden saplings were purchased and planted on Seven Ponds property by the club as a memorial to a generous, commercial, recently passed beekeeper. Mike was the guest speaker that evening speaking about pollinator plant selection and care.

"honey recipe" dish and/or dessert dish contest where members vote for the "best" can be held at these social events to make the evening even more entertaining. Along with the best dish contests, my club also holds other bee related contests. A smoker lighting contest consists of whose smoker puts out the best cool white smoke, with a three to five minute interlude to see whose smoker is still doing the best after sitting for a few minutes. Prizes for the dirtiest bee suit or a queen spotting contest using poster pictures to spot queens have also been suggested. Summer picnic prizes often consist of complete nucs with bees, queens, hive components or hive equipment. These prizes, if not donated by a participating commercial beekeeper, are at times purchased by the club elected board in advance. At the December party, an ugly sweater contest along with recipe contests and a white elephant gift exchange keep things interesting. Covering the cost of prizes for these contests comes from funds raised during the monthly raffles and adds a great deal of interest to these semi-annual social gatherings.

On-site Hives

Another advantage to belonging to a club is that many have nearby access to or on-site hives that can be used as a teaching or observation tool. The several area clubs I am familiar with have three to four hives that are maintained by a club member beekeeper that can be observed by the club membership. An hour or two before the start of monthly meetings (weather permitting), the managing beekeeper invites club members to come and observe the opening or inspection of the club hives. Additionally, the club hive manager may notify the membership of any intervening inspections or modifications that are being made to the hives outside of meeting nights. Interested members can then come and assist or simply observe the necessary action being taken. Occasionally, a hive with an errant characteristic such as laying workers or a missing queen may be left to persist for a bit longer so as to provide a learning experience for club members. The managing beekeeper will assess whether timely critical action is necessary so as to not jeopardize other nearby hives or those in the club apiary. Mite assessment techniques as well as treatment options being used can easily be demonstrated during on-site hive inspections. In each case, a "state of the hives" report is presented to the club at the next monthly meeting.

Club Equipment Use

New beekeepers often find the costs for the "getting started in beekeeping" to be prohibitive. To help minimize some of the start-up costs, many clubs may source bulk buys of bee equipment, mite treatments or other supplies at slightly reduced rates that are then split into smaller user quantities and resold to club members. The Seven Ponds club maintains several extractors, refractometers and honey harvesting equipment that can be checked out by club members for a short period of time which is then cleaned and returned for others to use. This provides a great benefit to the new beekeeper who can hold off on buying all the necessary harvesting equipment and perhaps buy other items from the club in smaller quantities. After a season or two of using club equipment, they can then decide whether or not to buy their own, having become familiar with different styles or brands. There are often other club members willing to rent out or allow their personal beekeeping equipment to be borrowed. Naturally, this requires a member to be in charge of tracking the loaned equipment, collecting any misuse or damage fees and the scheduling of usage times. A thorough understanding of expectations by the user should be established by the club or club board officers before any club cooperative equipment program is set in place.

Seven Ponds club hives used for demonstration purposes.

Other Club Considerations

Before starting a beekeeping club, check to see if there are already existing clubs in the serviceable area. In Michigan, there are over 30 clubs located throughout the state, while Wisconsin lists over 25, with Ohio listing over 50 clubs or beekeeping associations. Most are affiliated or fall under the umbrella of larger state organizations such as the Michigan Beekeeper Association (MBA). Local clubs can tap into the larger benefits of the state associations which may provide reduced insurance coverage for planned "open to the public" conferences or events. As a result of the larger organizations normally having 501c3 status, seed money may be available for smaller clubs sponsoring local public events. State associations are often coupled with university research departments that can provide speakers and the latest developments in efficient beekeeping techniques which allow member clubs to stay at the forefront of the ever changing world of beekeeping. If a club is considering 501c3 status, I suggest reading the January 26, 2016 *Bee Culture Magazine* article on "How to Start a Nonprofit Bee Club" before any further 501c3 action is taken. This article can still be found on an internet, search under the article and magazine titles, or go to **https://www.beeculture.com/how-to-start-a-nonprofit-bee-club-part-1/**.

If you subscribe to this magazine, there is a good chance that you already belong to a bee club or association. If not, consider a search in your area to see if one exists and if not, consider starting a club with like-minded beekeeper aficionados. I do not think you will be disappointed sharing and gaining knowledge with others interested in the art of beekeeping. I hope I have provided some new ideas to enliven your beekeeping club experience or convinced you of the benefits of joining or starting a club. Your perceptions are sure to vary depending on your club dynamics, leadership styles and use of supporting assets. Keep the goal in mind that the objective is to become a better beekeeper while learning from others, and this should make for a very enlightening and enjoyable experience. BC

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Pure Honey?
Probably Not So Much

Most widely known as components of Teflon coated cookware and firefighting foams, PFAS are extremely persistent in the environment. Researchers don't really have a very good handle on how long it takes for them to actually break down, if they ever do, which is why they are sometimes referred to as forever chemicals.

PFAS Everywhere

Due to their unique properties, these chemicals are used in an extremely wide range of commercial, industrial and consumer products, including adhesives, building and construction materials, cleaning products, paints, varnishes and inks, cosmetics and personal care, dry cleaning, flea and tick products, electronics, explosives and ammunitions, the oil and gas industries, and the medical industry, among others (Gaines, 2021). A huge number of PFAS chemicals have been produced and distributed through the global supply chain, with over 9,000 PFAS related chemicals recorded dating back to before 1950 according to the Environmental Protection Agency Master list of PFAS substances (EPA).

High Level of Toxicity

Peer reviewed studies have connected exposure to certain PFAS chemicals to a host of human health problems including reproductive effects such as decreased fertility or increased high blood pressure in pregnant women, developmental effects or delays in children, increased risk of some cancers, suppression of the body's immune system and interference with the body's natural hormones, along with increased cholesterol levels and/or risk of obesity (EPA, 2023). Some of these chemicals are so toxic that in 2022, EPA released a lifetime drinking water health advisory for four PFAS substances – not in the amounts of parts per million, or parts per billion, but in the fractions of parts per trillion range (U.S. Gov., 2022).

Health effects associated with exposure to PFAS are difficult to nail down for many reasons. Although there are thousands of PFAS with potentially varying effects and toxicity levels, most studies have focused on a limited number of better known PFAS compounds. Meanwhile, people can be exposed to PFAS in different ways and at different stages of their life, and the types and uses of PFAS change over time. All of this makes it challenging to track and assess how exposure to these chemicals occurs and how they will affect human health.

Honey Bee Exposure

In the June issue of *Bee Culture,* I note that PFAS used in plastic manufacturing (most notably in high density and low density polyethylene – HDPE & LDPE) has the potential to leach out of plastic hive components and impact bees and honey. Well, it turns out there is yet another avenue for PFAS to potentially make its way into our hives: pesticides (Lasee et al., 2022).

PFAS chemicals are being found in a wide variety of pesticides. Sometimes, the PFAS is the active ingredient or added as an adjuvant, or so called "inert" ingredient included in the pesticide formulation to enhance the effectiveness of the active ingredient. Other times, the levels of PFAS found in a particular pesticide is so small it is likely a result of the chemical leaching out of plastic packaging and into the pesticide or its components prior or during manufacture. Since pesticides are applied to our food crops, researchers are documenting PFAS chemical build up (bioaccumulation) in fish, animals and people.

Officials in the state of Maine found that more than 1,400 pesticides contain active ingredients that meet the state's definition of PFAS (EWG, 2023). Researchers have also documented the migration of toxic pesticides from the surrounding environment into honey bee colonies.

The common presence of PFAS in pesticides, potentially including those many beekeepers place in their hives, is concerning not just from a human perspective but also from the bee's. A small but growing body of research reveals the potential for adverse impacts of PFAS exposure in honey bee colonies. One researcher found that a honey bee's oral exposure to PFOS resulted in a 72-hour oral median lethal dose (LD50) of 0.40 mg per bee (Wilkins, 2001). Meanwhile, a correlation between the bioaccumulation of fluorinated pesticides in honey bees, along with other types of pesticides, and mass mortality events of honey bee colonies has been documented (Martinello et al., 2019). Another study found that not only do PFAS have the potential to adversely impact honey bees, they can migrate into honey, the primary source of carbohydrate and energy for honey bees and one of the primary hive products produced by beekeepers (Sonter et al., 2021). Given the well-established fact that pesticides are commonly found in honey samples, it should come as no surprise if further testing uncovers widespread PFAS contamination in honey sold for human consumption.

States Taking the Lead

PFAS contamination presents a mostly unexamined problem for farmers all across the country. Prior to the recent revelation of PFAS contamination of pesticides, farmland has historically been contaminated with PFAS through the spreading of waste water treatment plant sewage sludge

as an agricultural fertilizer. Another acknowledged source of contamination is the leaching of PFAS chemicals off military bases onto nearby farms and water supplies.

As part of the effort to get a handle on this situation, Maine has become the first state to enact a comprehensive ban on pesticides that include intentionally added PFAS, as well as pesticides contaminated with PFAS. The ban is currently set to take effect in 2030.

A second state to move to ban PFAS is Minnesota. Scientist's understanding and ability to detect PFAS in the environment has evolved greatly since the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Health (MDH) began investigating them back in 2002. Laboratories at that time had only identified two PFAS and extremely low concentrations were undetectable given the existing technology at that time. Today, we are able to measure extremely small amounts (parts per trillion) of several PFAS. As noted before, studies have linked long-term exposure to PFAS in this range to negative outcomes especially for the most vulnerable members of our population: children, the elderly, pregnant women and those with compromised immune systems.

The writing is on the wall when it comes to PFAS compounds. One of the world's primary PFAS manufacturing companies, 3M, has agreed to pay more than $10 billion to settle lawsuits claiming it knowingly used "forever chemicals" in its products despite being aware of risks to human health. Additionally, 3M says it's phasing out two common compounds – PFOS and PFOA – and has announced that they will discontinue all types of the chemicals by 2026. Unfortunately, history has shown that companies usually only phase out a toxic compound when they have a replacement ready for market. Typically, the replacement is just as harmful as the compound it replaces, but it takes decades to accumulate the data showing harm and require the replacement chemical to also be withdrawn. Of course by then, yet another toxic replacement is found.

Varroa Treatments

The commonly used beekeeping pesticide Amitraz (sold as Apivar) was not found to contain any fluorinated chemicals that would meet the state of Maine's definition of PFAS. However, Fluvalinate, the active ingredient in Apistan does meet the state's definition.

I spoke with pesticide toxicologist, Pam Bryer of the Maine Board of Pesticide Control who pointed out that the PFAS problem could easily

Regularly rotating old comb out of hives is one way beekeepers can reduce toxic chemical loads on bee colonies. The color of the comb is not a reliable indication of the age of the comb, since combs that are only used by the bees or food storage take much longer than brood combs to darken.

have been avoided if all chemicals were treated like pesticides which are regularly tested for their persistence in the environment. According to Bryer, "for most of the PFAS out there, there is almost no data." Bryer assured me that unlike PFOS and PFOA which are long chain fluorinated compounds, fluvalinate is not nearly as toxic since it contains a short chain fluorinated methyl group. She did express concern, however what can happen should the fluorinated methyl group in fluvalinate combine with other chemicals potentially forming more toxic compounds or potent green-house gases.

Better Safe Than Sorry

In my mind, the safest treatments available to beekeepers today are those that utilize organic acids. By definition, the acids are not toxic, though they are corrosive. All of the organic acids (formic, oxalic and hop beta) that are approved for use to control *varroa* mites become neutralized over time and leave behind no harmful residue from the acid. Unfortunately, we now know that PFAS have the potential to make their way into such otherwise relatively safe products and contaminate our colonies despite our best efforts.

Beekeepers don't have to wait for regulatory action and should consider increasing their reliance on natural and organic approaches, or when possible, treatment-free management techniques to control mites. As beekeepers, we can reduce or even eliminate toxic chemical use in our hives starting today by incorporating organic practices into our hive management. One way is to regularly rotate old combs out of hives and allow colonies to build new comb so the level of residue buildup in wax remains relatively low. Another approach discussed in my book, *Natural Beekeeping*, includes the use of screened bottom boards, culling capped drone brood, forcing a brood break in the hive, and propagating strains of bees that show some resistance to mites and diseases. A trial that ran between 2016-2019 found that combining all five of these physical and biological treatment-free management approaches can control mite-related hive mortality and ensure survivability on par with commercially available pesticide treatments (Conrad, 2021).

Recently, researchers Robyn Underwood, Margarita López-Uribe and their team from Penn State and Virginia Tech published a study on organic beekeeping in which they "… found that the organic management system-which uses organic-approved chemicals for mite control-supports healthy and productive colonies, and can be incorporated as a sustainable approach for stationary honey-producing beekeeping operations." (Underwood et al., 2023).

As Rachel Carson noted over 60 years ago: "The most alarming of all man's assaults upon the environment is the contamination of air, earth, rivers and sea with dangerous and even lethal, materials. This pollution is for the most part irrecoverable; the chain of evil it initiates not only in the world that must support life, but in living tissues is, for the most part, irreversible." (Carson, 1962). Given that we now have effective low toxic and non-toxic alternatives to dangerous chemicals, why continue to play Russian roulette with pesticides? BC

Ross Conrad is author of Natural Beekeeping, Revised and Expanded 2nd edition, *and co-author of* The Land of Milk and Honey: A history of beekeeping in Vermont.

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I Got Some Bees If You Want 'Em

Brian Carlton

I got a voicemail the other day and a voice rang out in a slow Southern drawl, "I got some bees if you want 'em. They're coming out of this hole here in the side of the house, you're more than welcome to them."

Oh boy, if only bees were so scarce that a beekeeper would be willing to come extract them from a house for free.

Bees can come in all different varieties (races). They can be mean as fire or they can be gentle, and they can be healthy or disease/parasite ridden. A package of bees (bees shaken into a box with a new caged queen) can cost $90-$125 or so, and you know what you are getting – a brand new queen with desirable traits, having been bred for honey production, gentleness and mite/disease resistance. Beekeepers are always on the lookout for a bee that can resist the number one killer of bees (*Varroa destructor* mite). So, there is always a chance those feral bees you're cutting out of your wall could be that, but the chances are slim.

Most bees cannot survive long without a beekeeper's care. But think of all the honey you're going to get: It takes a young queen and 50-80,000 bees to produce honey. Bees only produce honey here in NC for about six weeks of the year. You have to keep them in unnatural circumstances to get them to reach such a population in order to make surplus honey. It's a fine line to walk to keep them from swarming away and keep them in the box long enough to reach the nectar flow at peak population. Any beekeeper with any skill probably has more bees than they want due to this fine line. You have to make lots of splits to keep them from splitting themselves. Once you do receive a new colony of bees (that can potentially live for years), the beekeeper has to provide a hive, feed and combs/foundation, which isn't cheap. When I started beekeeping in 2019, I spent $15,000 starting up. There are also fuel costs and beekeeper time involved. I am a construction professional with 30+ years of remodeling experience, a licensed general contractor with general liability and workers comp, plus a Journeyman beekeeper with the NC State Beekeepers Association. I also held a home inspector license for some time.

Now we've established that only someone desperate for bees would be willing to go to the lengths required for the extraction process, more often than not, they will not have any construction experience, so what happens when they cut that pipe? Or wire? Or destroy your roof trying to cut out the bees? Or cause more damage than a professional's entire fee?

Well, why don't you call the exterminator? You would have to spray them every day for a month to kill them all. Once they were dead, the small hive beetle and wax moth larvae would take over, and thousands of maggots would crawl out, trying to find their way to the ground to pupate. With no bees to regulate the temperature, the wax will melt and honey will start dripping out of the walls, enticing more vermin and flies to the nest. Plus, one out of every three bites of food you take is thanks to a bee; without bees we would have four years left on the Earth, according to Albert Einstein.

Removing the nest is often difficult. We use a heat-sensing laser app on an iPad to locate the nest. Then using our understanding of the building's framework, we cut into the wall, from the inside usually, and start the laborious task of removing the hive. Thousands of not so happy worker bees and pounds of sticky honey are dripping everywhere. We use a special bee vacuum that stores the bees unharmed in a bucket until we can get them back to a hive. We have to quarantine them away from our main apiaries to insure no spread of disease. We cut out their combs and reuse them by rubber banding them into a hive frame.

During the Summer, nine out of 10 calls out are due to wasp's nests or yellow jackets, so the beekeeper may not want to just run out and get those bees, they will want some pictures first to try and identify the culprit. Honey bees are big and brown and slow, yellow jackets dart around erratically, you can barely see them and hornets are huge, no mistaking those. The majority of beekeepers are over 50, so they are not going to want to work off high ladders. There might be scaffold or boom lift costs incurred. The best approach is to be proactive and seal up any holes/empty cavities that might entice a bee scout to move in.

Happy cutting out! BC

Brian Carlton is a NCSBA Journeyman Beekeeper with The Davidson County Beekeepers. **https://www.backyard-beesnc.com/**

Tina Sebestyen

Why Do Beekeepers Give Up?

The bottom line answer to the question, "Why do beekeepers give up?" is: because their bees die, usually over and over. They discover how hard it is to keep bees alive. Someone in my beginning beekeeping class always pipes up to ask why I say that it is hard to keep bees alive, when they live just fine all alone, on their own, out in the woods. That is not the only misconception new beeks start out with. Unfortunately, bees do not live just fine on their own without human help. In fact, they are never on their own, they are sickened and harmed by *Varroa destructor* constantly and thus 97.5% of colonies cannot live long without human help to control this honey bee predator.

It follows that new beekeepers who think that bees live fine on their own also don't have any idea how much time they are going to need to take care of their bees. They don't spend enough time getting comfortable handling the bees, so they're unable to see and recognize when there is a problem. They aren't doing good inspections. One of the leading indicators of bee survival is beekeeper experience. Every new beekeeper starts out with no experience, but getting in that hive every week and exploring, observing and manipulating (mite counts, anyone?) are where one can gain that valuable experience.

Once a beekeeper gets over their romanticized idea of beekeeping, decides to get serious and puts on their big kid pants, they often go to the internet to learn how to keep bees. Don't get me wrong, not everything on the internet is bad or wrong... *neither is it all good or right*, and new beekeepers have no way of knowing which is which. Even if all of the information found on YouTube was correct, so much of beekeeping is local. It is dictated by whether or not water falls from the sky (I hear that is called rain, we don't know it here in CO), temperature swings, timing and bounty of forage, the presence of small hive beetles and so many other things.

One of the things new beekeepers are looking for online is a recipe for beekeeping. Something like: feed until May 15th, add boxes on June 12th, split on X date. Unfortunately, beekeeping is not like baking cookies. You need to be able to observe what is happening, extrapolate what is about to happen and come up with a plan to help the bees do what they want to do. It also is not like owning a puppy or kitten, which you can run to the vet if something mysterious happens to their health.

Beekeeping is a lot more like owning livestock, maybe a herd of cattle. As such, their health needs to be safe-guarded in advance of trouble. They need water, adequate and varied forage, and protection from wind and predators. After trouble comes, it is harder to rectify than it would be with a pet.

Happily, there are solutions to these situations. One of the best, most fun, and most fruitful is to join a local bee club. Here you will find beekeepers who know what works in your area, starting with what sub-species of bee is right for you. These seasoned beeks love to share what they've learned the hard way, if you can just be humble enough to take them seriously, instead of thinking you'll be able to make what wouldn't work for them be successful for you.

One reason people don't take the advice they are given is because they don't understand the bee biology and behavior that is the reason behind the management or the timing of the decision. Our best beekeepers are those who read a lot about beekeeping. And, there is a lot out there. It has been said that more has been written about beekeeping than anything else besides religion. Again, what you find on the internet may have been written by a (notoriously over-confident) third year beekeeper. Books that have been published on paper by a real publisher, rather than a vanity, do-it-yourself publisher, have gone through at least some kind of vetting process. Bee journals do great reviews of such books, to help you know what will be readable and what is worthwhile information. Those journals themselves are a great source of current, vetted, information.

New (and old) beekeepers need to learn bee math, bee biology and management. These topics sound like what you wanted to avoid in high school, but they are a lot more fun in the real world, with real application in beekeeping. Once you get started, you'll fall in love even more deeply with beekeeping. There is so much to discover and learn still!

And now to the brass tacks... beekeepers give up because bees die, and we need to learn about why they die and help them manage their challenges in advance. Bees have trouble with the five **P**roblems. **P**ests, **P**athogens, **P**oor forage, **P**esticides and **P**olitics. Every beekeeper

has chosen one **P,** THE one that they think is THE problem, that if we just solved that one problem, everything would be great. Paying attention to one **P**roblem without watching out for the others is another recipe for dead bees.

The most famous of the **P**ests is *Varroa destructor*, and undoubtedly, if we could solve that one, beekeeping would be a whole different proposition. But even without *varroa*, bees still need weeds which are in short supply in our world today, and varied sources of nectar and pollen throughout the collecting year. And, they still need a clean world to live in, one not poisoned by **P**esticides. They need pro-active maintenance to be strong enough to overcome the **P**athogens: viruses, bacteria and fungi. And they need us to have laws that are beneficial to their world and their keeping.

To sum it all up, if you want to continue to keep bees and have them live, so that you don't get so frustrated with them dying all the time that you quit, here is what you need to do.

1) Join a bee club and attend meetings in person. Get a mentor if you can.
2) Read a lot about beekeeping, about bee biology and behavior, from books and magazines.
3) Do what your mentor or local bee club advises, even if you don't understand why right now.
4) Learn to do an effective hive inspection. Plan to spend at least one hour per week on a pair of hives (one hive alone is a recipe for doom) for your first year, and at least one hour every other week thereafter.

Good luck, and happy beekeeping! BC

One great reason to join a bee club is that most have teaching apiaries. This time, we were having a potluck, and our host allowed us to go play with his bees. We often seek volunteers for apiary visits, which allows us to see surprising things, and gives a variety of situations to discuss, besides planned events at club hives.

Some of the Problems in Judging Honey

Jim Thompson

I have been a honey judge for more years than many of you have been alive. During that time, I have seen many changes. There are three basic systems in judging honey: British National, Welsh Honey Judging and the America Honey Judging System. My comments will pertain mostly to the American Honey Judging System.

Color

Most shows will have different color classes and soon you discover that the color of the honey is only a way to separate the honey into similar color groups. However it never used to be that way. Back in the 1880's, honey was graded as number one, two and fancy, with the darker honey left as an unsaleable or bakers grade item. In some shows today, honey is placed in a certain class by the people in charge of the show, while other shows allow the entry to be moved by the judge into the proper class. A problem can occur when a honey is allowed to be in the wrong class.

From about 1919 to 1922, the A.I. Root Company sold a color grader which had color standards for four colors. Then there was the Munsell color grader which had the seven color grades. In 1950, the Munsell color grader became the USDA color comparator with two rakes instead of three. To use these graders, you would have to fill a special vial with honey and move it around to see what class the honey would be in.

The Pfund color grader is a device that uses a wedge shaped cell to place honey in and then you would align it with a colored glass to see the best match. There are seven grades: Water White, which is less than nine mm; Extra White, nine mm to 17 mm; White, 18 mm to 34 mm; Extra Light Amber, 35 mm to 50 mm; Light Amber, 51 mm to 85 mm; Amber, 86 mm to 114 mm; and Dark Amber, which is over 114mm. The Pfund color grader has been replaced by larger machines that read the optical density of the honey. Although the early color graders are no longer available, the color divisions are still used.

The Lovibond honey color grader was made in 10 mm and 33 mm models. This device consists of a special vial that you would fill with honey and then you would turn the color wheel until you see a close match (somewhat like a view master). Some judges use the 33 mm wheel to hold up against the honey jars to get an approximate reading. This technique is not really that accurate because the show jars measure about 48 mm in thickness.

The Hanna color comparator was also made in two models, a desktop model and an individual portable model. Again, they use a special vial to hold the honey and it scans the sample to get its optical density. The problem with this machine is that many vials are needed and one must zero the machine between each reading. Thus it can be very time consuming. Since I have the desktop model, I have no problem with the electricity but I can see that the portable model might have battery issues.

The Jacks scale is a color grading device that is currently available and consists of several color tabs with spaces to place the "crutch tip". The instructions tell you to fill the white container and move it around to find the best match. The problems: How full do you fill the container? Do you have the proper lighting? Is your scale printed in the proper colors or has it faded? I missed my chance as I didn't buy one of the very first Jacks scale that was printed incorrectly.

The color jars that I mentioned in my book *can be* an accurate way to determine the color of honey. It consists of six jars of corn oil or corn starch. The problems: The jars were not measured or mixed correctly. Using different brands than what was recommended. Adjusting the mixtures to "look right"; remember that the scale is not equally split up and so some of the jars will look similar. Can you carry all this around to the show and do you have enough room to use

it? However, the jars can be used for one pound testing and turned sideways for five pound testing. If you are going to use the jars for judging a large show, were the jars checked by the Pfund, Lovibond or Hanna Color graders? The reason you can't use honey as the standard is that honey darkens with age and heat.

For those that have completed their apprenticeship training with me, I have a transparency that I give them so they can hold it up against the jars.

Jars

Most shows will specify that glass Queenline or Gamber Classic jars are to be used for the extracted honey. This is an attempt to get jars that are similar to each other and with no designs or figures to distort the view of the contents. Even though the Queenline jar has a 48 mm lid and the Classic jar has a 36 mm lid the thickness of the centers of the jars are within .5 mm if each other.

Jars should be checked for manufacturing faults such as surface scratches or air bubbles in the glass. Sometimes you may have to go through many cases of jars to find the perfect jars. If the entry rules require three jars, find six or more because errors happen or you may want to enter in multiple classes. Some bee suppliers sell show jars but expect to pay more for them.

Let me draw your attention to the jars and point out the neck ring. This ring is not a stop for the lid but is a unit of measure. Thus the proper filling should be in the *middle* of the neck ring to allow for expansion or contraction of the honey. If you fill it above the neck ring, you are giving honey away. Below the neck ring, you are cheating the potential customer. You could fill sixty, one pound jars from a five gallon container or twelve jars from a gallon container. There is about 1⅓ cups of honey to the one pound jar, so the measure is in weight. If you have an accurate scale, you could determine when it is full by subtracting the tare weight.

Never sell a show jar. After the show, transfer the honey to an imperfect jar and sell it. However some shows specify that the jars are to be sold. Another reason to not sell the show jars are that many glass companies quit making glass containers in 1995.

Polariscope

The polariscope is used to look for debris in the honey such as pollen, beeswax, granulation and foreign matter. Originally, the polariscope used natural light, but the later models use incandescent, fluorescent or LED lighting. A new idea is to use battery powered lighting to avoid long extension cords. The polariscope has two plastic polarizing lenses rotated 90 degrees to each other. Therefore a plastic honey jar, if used, would yield weird views when placed in a polariscope. In another judging system, a flashlight (torch) is use to shine up from the bottom of the jar. Why? Because when honey granulates, it usually starts from the bottom.

Pollen can be seen as particles floating throughout and is an indication that the honey was not filtered with a small enough mesh straining cloth.

Beeswax pieces are usually larger than pollen and also tell the judge that the honey was not filtered as well or that the entry was processed at the last moment.

Air bubbles usually appear toward the top of the jar and indicate that the jar was not processed soon enough. I recommend that the jars be over filled to allow the debris to rise and then spoon out the excess honey and debris down to the neck ring.

Refractometer

There are two major types of handheld honey refractometers used by honey judges, analog and digital.

The analog refractometer has a place for one or two drops of honey and then a "lid" to cover the sample. Aim the refractometer toward the light and the results can seen on a scale that will be in Brix, % water or both. The cheaper refractometers have a scale that reads in one percent segments. Thus you are looking for honey that is between 16.0% to 18.6% water, the scale is very short. The better honey refractometers have a scale that allows one to read the moisture to 0.2% with the ability to approximate to the nearest 0.1%. Most of the refractometers nowadays have the automatic temperature control feature and they zero or calibrate by using water. One thing that I find nice about the analog refractometers is that with light colored honey the background color is blue. If you see an orange background color, it is possibly adulterated honey. However, if you are reading a darker honey, you might see the orange background color due to more minerals being in the honey.

The digital refractometer has an

indentation in which you place the sample honey. Then, an internal light shines through the honey and gives you a reading. I have found that these instruments are very accurate, as long as the batteries are good. However, I have found that sometimes the battery level indicator does not work. In very large honey shows, I have had to replace the batteries three times. The instructions tell you that no calibration fluid is necessary, but there is a special calibration fluid required to set the high end adjustment (called Spam). Be careful to get the proper calibration fluid as some of the fluids can destroy the viewing stage of the refractometer. A nice feature of the digital refractometer is that it can read the moisture of a granulated honey.

Taste

Now we will get to a subject that could cause disagreement. With the American System of Judging, the taste is judged to get the maximum amount of points if there are no unpleasantries such as fermentation, toxic floral sources, or adulterations. I was once at a honey show and tasted honey that was a toxic honey and for a minute or so, I couldn't breathe. At another show, I tasted a honey that everyone bragged was wonderful, until I told them that it was in the first stage of fermentation. It was very sweet, before the alcohol was apparent and had a high moisture content.

There is a movement to judge honey strictly on flavor. I feel that this movement is wrong as everyone has their own taste preferences. Honey should be judged objectively rather than subjectively. The person that has entered the competition needs to know what items were docked. With the Welsh System of Judging, it is fast because no judging sheets are written.

The taste in honey can vary due to the weather conditions, soil conditions, different cultivars, inclusion of chemicals that may have been misused, time of harvest with some uncapped cells, and most important, the species of plants.

Honey

Honey is hygroscopic and thus it could give fits to a small beekeeper by drawing in moisture. The bees cap the honey cells when the honey is 18% moisture, thus a beekeeper should only remove frames that are fully capped. The beekeeper should think of processing the frames to get the moisture to a more respectable moisture level. The best way is to pass warm, dry air through a heated super that is heated by a light bulb or another heat source. Remember that once the frame is uncapped, the beekeeper is fighting the hygroscopic nature of the honey.

There are two major sugars in most honeys. I learned them as levulose and dextrose. You may know them as glucose and fructose. There could be up to 22 different sugars in honeys and not all honeys are the same, as the percentages are different. Glucose (Levulose) tends to allow granulation and fructose (Dextrose) resists granulation. Therefore, we have honeys like Avocado, Black Locust, Black Sage, Gallberry, Sourwood, Tupelo, etc. that take a long time to granulate. On the other hand, we have honeys that granulate very quickly such as Aster, Alfalfa, Blueberry, Canola, Clover, Cotton, Star Thistle, etc. Don't forget those honeys that are or could be toxic to humans. The internet lists Rhododendron, Mountain Laurel and Honeysuckle Azalea, but there could be many more such as Larkspur, Purple Loosestrife, Yellow Jasmine, etc.

Most of us do not have fields and fields of one type of flower or do not have time to extract after each honey flow. Thus we must label our honey as: Spring Harvest, Summer Harvest, Fall Harvest or Wild Flower honey.

When you store honey for some time you might see a division between two different colors in the jar. That division is caused by the dextrose settling to the bottom of the jar and yielding some moisture to the levulose. If the original moisture was high, you could see fermentation. If the original moisture was within limits, you will notice granulation starting. However, this granulation usually has course crystals.

Granulated Honey

Granulated honey is usually made from a mixture of honeys selected for taste, color and low moisture. The judge is looking for a honey that is firmly set, has fine crystals and looks and tastes good. Beekeepers usually use the Dyce method in granulation that has the adding of a sample of granulated honey. The sample is around 10% of the mixture and the ideal temperature is 57° Fahrenheit. Before adding the sample, the beekeeper must warm the original batch of honey to eliminate its granulating properties. When the honey is cooled, the sample is added. The granulated honey should be placed in a wide mouthed container and the beekeeper should try to avoid air bubbles or foam in the container.

The other method in making granulated honey involves taking honey that has already crystallized and grind the honey to make finer crystals. The instructions on granulated honey state that if the honey is too runny, put it in the refrigerator. However, it should not be kept in the refrigerator. Some shows allow additives such as fruit, vanilla beans or cinnamon while other shows state that only plain granulated honey is to be shown.

Beeswax

Beeswax has many possible categories: Small Chunk, Large Chunk, Molded Candles, Dipped Candles, Carved Beeswax, etc. When pouring a beeswax mold, be sure to have enough wax to fill the mold as it will shrink and make an indentation. You may have to make a secondary

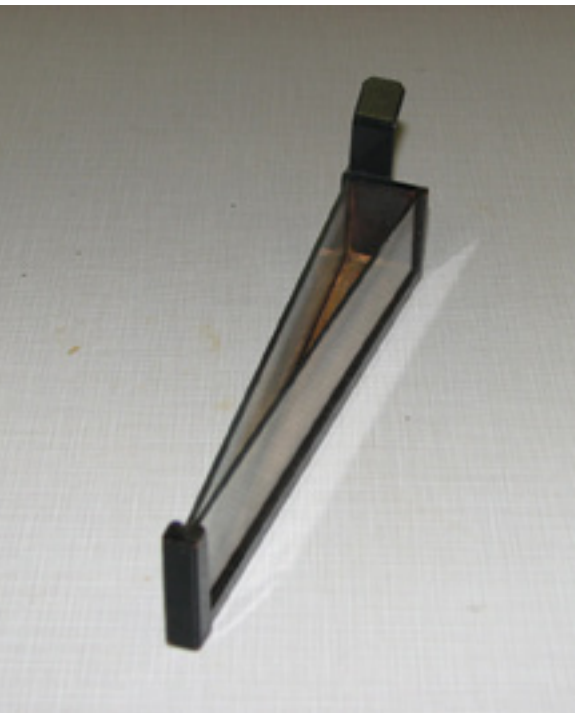
pour to fill the indentation. If you make several pours, striations can develop from the differences in wax temperatures or the coldness of the mold. It is important to read the rules of the show to see which categories you can enter and if people from the same family are allowed to enter in the same category. With chunk beeswax, be sure to get the proper weight for the category. Some shows allow decoration of the entry with paint. Dipped candles should be straight and smooth and still hooked in pairs. Wicks for candles should be of the proper size.

Beeswax cappings are usually preferred over darkened wax. Beeswax should be rendered in a hot water bath. The melting point is 147° Fahrenheit. Over that temperature, beeswax may darken.

Beeswax that has been cast a few years ago may develop a white coating called bloom and tells the judge that this is old beeswax. Some judges will mark an entry with their fingernail to be able to tell if the entry has been used before.

Baked Goods

Baked goods usually mean breads, cakes, cookies, granola, pies and rolls. Lately, I have noticed even more classes and each of the previously mentioned classes have divisions. However, you need to read the rules as they change in the amount of honey used, the number of pieces in the entry, whether the product needs to be in a special container and if the recipe and directions need to be attached.



I prefer to see entries that contain 100% honey, but have seen several people cheat by adding a frosting or glaze, fruit, chocolate or cinnamon, raisins, or other sweeteners. It takes a lot of searching to find a recipe that is 100% honey and several people will take a recipe and convert it by removing the sugar and removing some of the liquid. They soon realize that removing all of the sugar changes the taste of the original to where they don't care for the result. A baked honey product cooks at a lower temperature and in a shorter period of time so you need to watch it carefully. Most judges will cut their test piece from the center of the item to check for proper baking and no large air bubbles.

I was at a show where the person that entered had forgotten an ingredient. So I decided to call her over and have her taste the item. Immediately, she knew what was wrong and said that she had seen the recipe in a magazine and just had to try it. That should tell you that before starting a recipe, set all the ingredients out and secondly, taste the product along the way and make two items so you can choose which one to enter. At another show the entrant forgot to add the directions, but found in her purse a sheet of paper to add the ingredients. However on the back of the paper where she had written the ingredients were the directions to Kennywood. Thus I wrote, "Wrong directions."

When the rules state six pieces, there should be six pieces not five, seven or any other number. Be sure to make the pieces similar because you don't want to hear, "Her piece is bigger than mine."

You will always learn something. I was at a show where an angel food cake was entered. The recipe stated that you should use so many cups of eggs and when talking to the individual, he told me that chicken eggs come in different sizes and goose eggs are usually larger so the unit of measurement should be in volume. Just imagine how many eggs you would use if you had access to ostrich eggs.

Other Items and Considerations

There are other items that could be mentioned, but usually they are mentioned in the judging class. But some of them are: honey dishes, jewelry, belt buckles, honey plates, photographs, gadgets, bees and more. Many times the judge will be asked if there entries that should be added. But remember that to add something, it usually means that something else should be dropped. Likewise, the judge is often asked what changes in the rules should be made.

Spelling on posters and items should be neat, spelled correctly and large enough to be read from eight to 10 feet away.

The apprenticeship is the most beneficial period in the training system as it allows you to learn how to assign the points and figure out the winners.

Be leery if no judging sheets are available or to be used, for it may mean that a fraud is being planned or the show wants a different type of judging system. If the score sheet has an item such as "Total Weight of Entry" or similar wording, it could mean that is a fudge factor for the judge to make it so his friends could win. I stress that the judge should fill out the judging sheet when points are deducted and do not make any corrections. Corrections could show a sign of fraud or cheating, so it is best to fill out a new judging sheet.

I once went to a show and judged the honey and kept a separate record of what I judged. Later the individual in charge of the whole fair called me and asked what I judged. Thus he caught the superintendent of the show in a scam to collect money from the fair.

Entry Rules or the Registration Book

Be sure to check the entry book to check on the rules for the show. See what jars or bottles are acceptable and what categories are available. I have been at shows where unspecified items are disqualified in a heartbeat, while at other shows the entries are placed into classes that they did not belong. See if the entries are to be sold and when you may pick up the items that are not sold. Is there a requirement on whether a display could be used year after year? Remember that the rules are the final word for that show.

I wrote this article as I can see that the judging of honey is headed in the wrong direction. Honey should be judged objectively and not left to personal preferences of an individual. BC

Honey bees in the Spring and Summer typically have a relatively short existence of around forty-five days. Their days are filled with tireless activities such as constructing comb, collecting nectar and nurturing young bees. This remarkable dedication often leads them to work ceaselessly, pushing themselves to the brink of an early demise. However, during this period, the queen reaches the pinnacle of her egg-laying capacity, laying up to two thousand eggs a day, rapidly replacing the aging workforce. But what happens in the Fall and Winter? How do these diligent bees, with their fleeting forty-five-day lifespans, manage to survive the unforgiving grip of a long, cold, harsh Winter?

If you already find this tiny creator amazing, there's more! When a colony senses a dearth, a period when nectar is no longer available, they begin to raise bees of a unique physiology, often referred to as bees of Winter physiology.

To better understand bees of Winter physiology, it is like what happens where I live when a Winter snow storm is predicted. We rush out to buy bread and toilet paper. Even though we know we probably won't be snowed in, we are prepared, nonetheless. This ceremonial pursuit is a testament to our collective desire to be self-reliant and resilient in the face of nature's whims. It is a nod to our shared history of weathering storms and emerging stronger on the other side.

Honey bees are able to raise a unique generation of long-lived bees in the Fall, enabling them to endure the frigid temperatures and scarcity of resources during Winter for four to eight months.

David Burns

Ready or

This special cohort of bees known as bees of Winter physiology are brought about through a modified nutritional environment and pheromone signals in the hive.

Winter bees possess distinct physiological traits that set them apart from their short-lived sisters. These adaptations enable them to endure the harsh conditions of Winter and sustain the colony until the return of Spring. Some notable characteristics of Winter bees include:

Extended Lifespan: Winter bees are capable of living four to eight months, thanks to physiological adjustments and enhanced resilience.

Efficient Energy Storage: In preparation for Winter's scarcity, these exceptional bees prioritize the accumulation of vital reserves in their fat bodies, a strategic stockpile that will fuel them through the barren months when sustenance is scarce.

Enhanced Cold Tolerance: Winter bees exhibit an impressive ability to withstand low temperatures.

Reduced Metabolic Rate: To conserve energy, Winter bees lower their metabolic rate, allowing them to stretch their limited energy resources over an extended period.

Enough of the science behind it. How can we take this knowledge and greatly enhance our colonies' ability to survive Winter? Years ago, I began to experiment as a citizen scientist because I noticed so much of my young developing brood was perishing in the Fall and drying up in the base of cells. After years of research, I realized the nurse bees were few in number and were deprived of the resources they needed to produce enough royal jelly to feed the newly developing bees of Winter physiology. I armed myself with the passion of feeding my bees a mixture of sugar water with additives in the Fall that would not only prompt the queen to lay more but allow the nurse bees to produce sufficient amounts of royal jelly to feed and raise the much-needed Winter workforce. It worked!

I've documented my findings on my YouTube channel for many years, so let me explain what works for me. When the nectar flow ends in my area, I make note and wait two to three weeks. This is to allow time for the colony to sense and shift gears to raise bees of Winter physiology. Then, to support this Winter shift of brood, I begin feeding my colonies one to one sugar water with protein powder, and other additives. This seems to trigger my queen to lay more brood and allows my nurse bees to raise several frames of Fall bees. Bees of Winter physiology.

Beekeepers often make the mistake of assessing their hives as being heavily populated in late Summer and are ready for Winter. However, in the north, this is deceptive. Every bee we see in late Summer will be dead by the first day of Winter. Instead, we should be looking for frames and frames of capped over brood in September and October. Those will be the bees that we will see again in the Spring.

Another amazing aspect of bees of Winter physiology is that they seem not to be restricted by age-progressive work. They are able to almost stay suspended in time, waiting for Spring when they can resume their work in raising more brood.

The survival of honey bee colonies through Winter is a testament to the intricate strategies and adaptations they employ. The cultivation of bees of Winter physiology exemplifies the colony's resilience and ability to adapt to challenging environments. As the days grow shorter and temperatures drop, honey bees expertly raise a specialized generation of long-lived Winter bees, equipping their colony with the endurance and strength needed to overcome the frigid months ahead. Their remarkable ability to sustain themselves during this time is a testament to the awe-inspiring complexity of nature's design.

If you'd like to watch my video on how to raise bees of Winter physiology, visit: **https://www.honeybeesonline.com/davids-youtube-channel** BC

Not, Winter!

Success for All Means Accessible Information for All

Julia McGuire

What is the best way to teach beekeeping to adults? Julia McGuire, a beekeeper instructor living in West Des Moines, believes that teaching is best done when it suits a student's learning style.

"In my experience, beekeeping knowledge has been transferred by oral tradition and conventional lecture-demonstration classes with textbooks," states McGuire. "In my search for reference materials to serve new beekeepers, I found that we needed new reference materials. Learning styles stay with you after you graduate from school." Long paragraphs in a textbook aren't accessible to many learners, and the rise of audio and video content prove that. Yet, there are times when beekeepers need to refer to a guide, and a tangible hard copy is preferable. McGuire's solution to that is a large, one page calendar called A Beekeeper's Year.

A Beekeeper's Year is a unique, graphic reference calendar based on crowd-sourced phenological data, and relates beekeeping chores to bloom periods. "This calendar has been requested numerous times since I began teaching in 2014. After I had participants across the state get involved in 2021, my confidence rose in creating both a planner and a calendar," states McGuire. "Everyone responds to different materials in their own way, and I want to help everyone be successful in their beekeeping."

McGuire's Phenology Planner for Beekeepers was published in 2021 and distributed in 2022. Her calendar, A Beekeeper's Year, is a large double-sided card with a low-text format that shows her background as an education minor, in which she learned about tailoring teaching materials to suit different learning styles. The reverse side contains the same information for students who prefer a text-only format.

The Planner and Calendar are both free thanks to grant funding from North Central SARE. Instructors who would like to share the Planner and/or the Calendar with their students can pay shipping for packs of ten (10). Individual beekeepers are also welcome to order A Beekeeper's Year for $6 through the website **juliecache.com**. Preview the calendar to the right and the text-only format on the following pages.

North Central SARE offers competitive grants and educational opportunities in the Midwest. The Planner and Calendar outreach materials mentioned here are based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under agreement number 2020-38640-31522 through the North Central Region SARE program under project number FNC21-1289. USDA is an equal opportunity employer and service provider. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

Julia McGuire inherited two beehives when her daughter left for college in 2012. Her beekeeping courses are held in person and online. Visit **juliecache.com**.

Honey bees work with what nature gives them. Flowering trees and plants end up in the bees' hexagonal combs in the form of pollen and nectar. What nature is lacking also shows up in the combs, for example, as a lack of royal jelly for developing larval bees or as aggression from malnutrition and starvation. Beekeepers who pay attention to their hives can take those signs on the combs, combined with the Phenology Planner and/or A Beekeepers Phenology Calendar, and create a better nature, thereby preventing a canary in the coal mine situation.

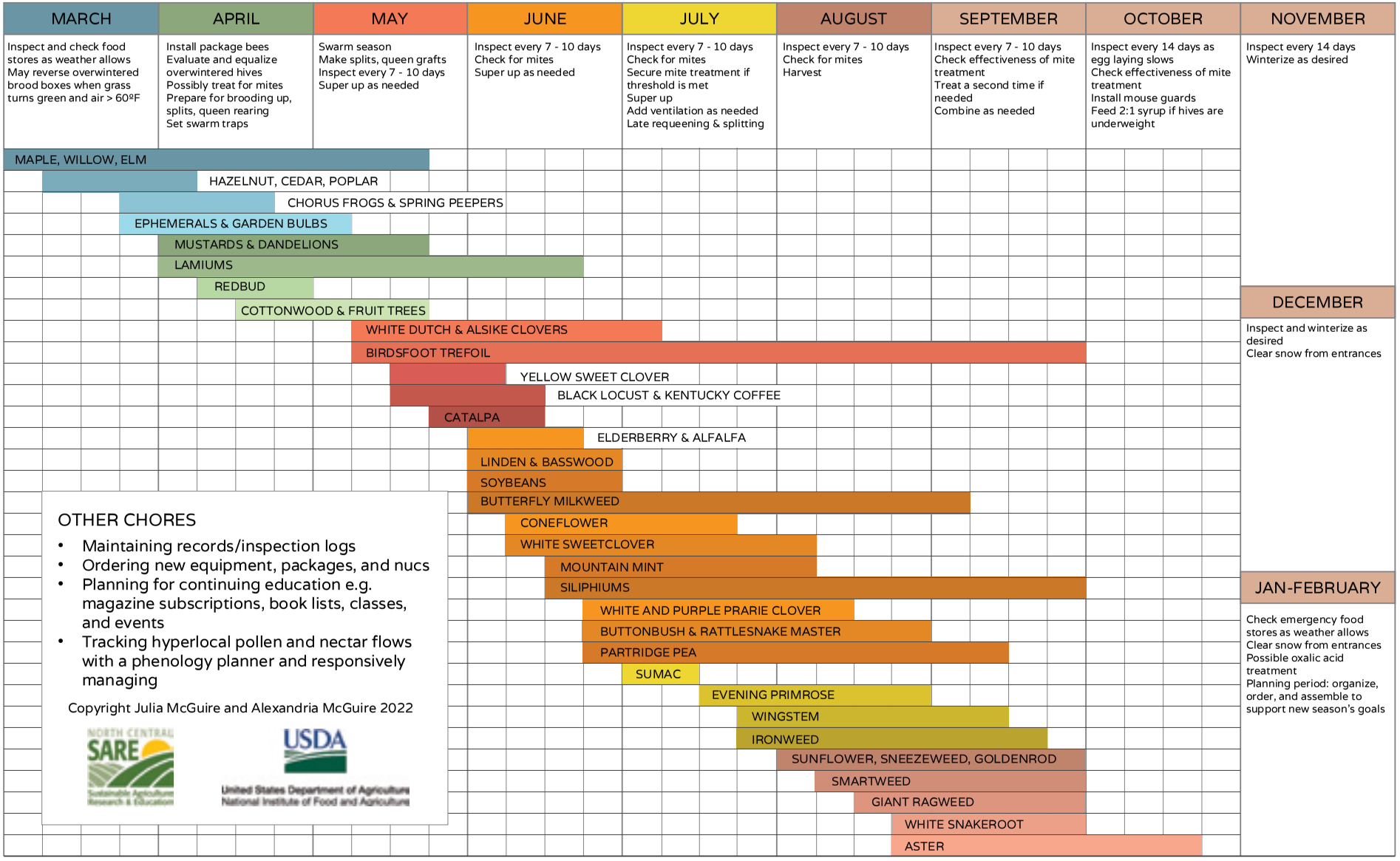
All of the surveyed users of the Phenology Planner for Beekeepers stated that one season with the planner encouraged them to get more beneficial native trees and plants in the ground for improved natural forage (as opposed to sugar syrup as artificial feed) in future seasons. Doing this would benefit the bees' nutrition needs as well as increase the quality of our soil, water and air. Beekeepers' mental health would also benefit because happy bees mean happy beekeepers. BC

Honey bees in their hive are today's canary in the coal mine.

A Beekeeper's Year

The Prairie Edition

While dates of phenological events may vary according to your bee yard's geographical location and microclimate, the order of events will be the same.



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Phenological Events To Look For

It is recommended to verify all species with a reliable field guide (digital or paper)

JANUARY & FEBRUARY	No phenological events
MARCH	Maple, Willow, Elm, Hazelnut, Cedar, Poplar, Chorus Frogs And Spring Peepers, Ephemerals And Garden Bulbs
APRIL	Maple, Willow, Elm, Hazelnuts, Cedar, Poplar, Chorus Frogs And Spring Peepers, Ephemerals And Garden Bulbs, Mustards & Dandelions, Lamiums, Redbud, Cottonwood & Fruit Trees
MAY	Maple, Willow, Elm, Ephemerals, Garden Bulbs, Mustards & Dandelions, Lamiums, Cottonwood & Fruit Trees, Birdsfoot Trefoil, White Dutch And Alsike Clover, Black Locust, Kentucky Coffee Trees, Yellow Sweetclover, Catalpa
JUNE	Mustards & Dandelions, Birdsfoot Trefoil, White Dutch And Alsike Clover, Black Locusts, Kentucky Coffee Trees, Yellow Sweetclover, Catalpa, Linden & Basswood, Soybeans, Elderberry & Alfalfa, Butterfly Milkweed, White Sweetclover, Coneflower, Mountain Mint, Silphiums, White And Purple Prairie Clover, Buttonbush, Rattlesnake Master, Partridge Pea
JULY	Birdsfoot Trefoil, White Dutch And Alsike Clovers, Butterfly Milkweed, White Sweetclover, Coneflower, Mountain Mint, Silphiums, White And Purple Prairie Clover, Buttonbush, Rattlesnake Master, Partridge Pea, Sumac, Evening Primrose, Ironweed, Wingstem
AUGUST	Birdsfoot Trefoil, Butterfly Milkweed, White Sweetclover, Mountain Mint, Silphiums, White And Purple Prairie Clover, Buttonbush, Rattlesnake Master, Partridge Pea, Evening Primrose, Ironweed, Wingstem, Sunflower, Sneezeweed, Goldenrod, Smartweed, Giant Ragweed, White Snakeroot, Aster
SEPTEMBER	Birdsfoot Trefoil , Butterfly Milkweed , Silphiums, Partridge Pea, Ironweed, Wingstem, Sunflower, Sneezeweed, Goldenrod, Smartweed, Giant Ragweed, White Snakeroot, Aster
OCTOBER	Aster
NOVEMBER & DECEMBER	No phenological events

Beekeeping Chores

JANUARY & FEBRUARY	Check emergency food stores as weather allows Clear snow from entrances Possible oxalic acid treatment Planning period: organize, order, and assemble to support new season's goals
MARCH	Inspect and check food stores as weather allows May reverse overwintered brood boxes when grass turns green and air temperature over 60ºF
APRIL	Install package bees Evaluate and equalize overwintered hives Possibly treat for mites. Prepare for brooding up, splits, queen rearing Set swarm traps
MAY	Swarm season Make splits Queen grafts Inspect every 7 - 10 days Super up as needed
JUNE	Inspect every 7 - 10 days Check for mites Super up as needed
JULY	Inspect every 7 - 10 days Check for mites - secure mite treatment if threshold is met Super up, add ventilation as needed Late requeening and splitting
AUGUST	Inspect every 7 - 10 days Check for mites Harvest
SEPTEMBER	Inspect every 7 - 10 days Check effectiveness of mite treatment Treat a second time if needed Evaluate hives; combine as needed
OCTOBER	Inspect every 14 days as egg laying slows Check effectiveness of mite treatment Install mouseguards Feed 2:1 syrup if hives are underweight
NOVEMBER	Inspect every 14 days Winterize as desired
DECEMBER	Inspect and winterize as desired Clear snow from entrances

Beekeeping and the EPA

The Problems We Face as an Industry

Charles Linder

This article is written with the intention of being shared as widely as possible. Any reporters, politicians or interested parties need to be informed. Email me for a copy in any format you like. Information was added to help people who are not aware, understand the impacts of where we stand.

Note: All information and views expressed in this article are the author's. They may not reflect the views of Bee Culture. *Please contact the author with all comments, questions and concerns related to this article.*

I am sure by now all of us are well aware of *varroa* mites, and many of the various methods of treatments. What many are not aware of is where we actually stand legally vis a vie, the EPA.

As it stands, the industry faces serious problems and restrictions. While on one hand, it seems we have several new things in the works, like extended-release oxalic acid (OA), vaporizing and various other methods. Very few of us understand the legality of these developments. I will endeavor to explain where we are and our roadblocks.

As it stands now, there are several EPA approved treatments. Formic Pro, Apivar, Api-Bioxal OA, and Hopguard are the main players. All of these have been through the EPA approval process, and have been granted approvals. Api-Bioxal was actually pushed through via the USDA, which then transferred the rights to a private company (why not a U.S. company is a whole other discussion).

What's key to understand is that all of them are contingent on you purchasing the product and following the label to the letter. Any variation in application process other than what is specifically spelled out is a violation of pesticide application. For example, if you vaporize OA, which is pretty common these days, you MUST purchase Api-Bioxal and buying any other brand of OA is prohibited. Any "wood bleach" or other OA, even lab grade, unless sourced through Api-Bioxal, is not legal.

The directions are spelled out, at one gram per brood chamber. Many of us already know that this dosage has been proven to be insufficient, any increase is not approved, although there do not seem to be restrictions on time intervals at the moment.

These rules apply to all of the "approved" products. You are not allowed to use "extra" or modify the application from what is printed on the label. This regulation is the same type of regulation we ask our farmers to comply with. The EPA guidelines specifically prohibit any off-label usages for everyone. We in particular, as the group who complains when farmers freelance, should be especially aware of the situation and the hypocrisy of our position.

Many of us think and act like the rules do not apply to us, and no one really will bother us, but be careful in that thinking. There are federal groups calling for enforcement actions of beekeepers in general, and I am aware that two larger beekeepers have been fined, as well as jail time for people smuggling treatments in from Mexico. Up until a year ago, you could buy many unapproved treatments via the internet. The Federal Trade Commission has already put a stop to that.

Impact Statement:
Is is key to really comprehend the impact of the current situation. As beekeepers, we know annual losses of hives have been hovering around 45-50% for at least a decade. So far, our commercial side has managed to keep up with losses, but at a price of seriously reduced honey production and great expense. Without effective *LEGAL* treatments, we are at serious risk of not being able to continue supplying pollination to the nation's farmers. As proof, just look at the almond pollination in California. We have been short bees every year, and pollination prices have continued to rise because of it.

"Honey bees pollinate $15 billion worth of crops in the United States each year, including more than 130 types of fruits, nuts and vegetables."

—USDA website

**This does not include the billions of dollars in pollination fees and honey sales in the U.S., nor does it include the ~400 million dollar a year business of bee sales in queens, nucs and packages.*

I believe strongly we are very close to a tipping point. Demand will out strip supply. If you look closely at Bee Informed Partnership's numbers, you will see losses continue to rise, as virus and *varroa* loads get harder to manage. I myself run fairly high losses, and viral checks clearly show *varroa* vectored virus loads are to blame.

At the same time, demand has continued to rise, small scale beekeepers want to be more involved and an additional huge factor only a few of us

are aware of is that the demand for pollination keeps rising. The number of hives per acre on most crops has risen in the last five to eight years. Blueberries have risen dramatically as they want the berries ripe at the same time. In my operation, which is mostly watermelons and pumpkins, growers have doubled the hives per acre as we show them more harvestable fruits per acre are a benefit, and it costs more to farm per acre. When I started, most melons were one hive per four acres. The same growers are at one hive per acre now. As the arable land decreases and the demand for produce increases, I suspect we'll approach a tipping point faster than most realize.

Every factor of bees cost has at least doubled in the last 15 years due to supply issues, from packages to nucs to pollination fees and honey cost.

So How Did We Get Here?

A little history is in order. The below is taken directly from Randy Oliver,

The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) was signed into law by President Harry S. Truman in 1947 to regulate the distribution, sale and use of pesticides. In 1972, power was transferred to the Environmental Protection Agency (EPA) (which had been established by President Richard Nixon in 1970). The first iterations of the law focused on labeling and ensuring that chemicals were not adulterated, but did not focus on the environmental and public health effects of pesticide use; this did not come until 1972. Congress has passed amendments to FIFRA numerous times since then.

FIFRA now contains 284,623 words and is enforced by the Office of Pesticide Programs (OPP). ***Unless specifically exempted,*** *all pesticides distributed, sold or used in the United States must be registered by the EPA and regulated by the Office of Pesticide Programs (OPP). In order to gain registration, a manufacturer must show that the pesticide will generally cause no unreasonable risk to man or the environment, while taking into consideration the economic, social and environmental costs and benefits of use of the pesticide, dietary risk from residues, as well as not endangering agricultural workers during their application.*

So, what exactly does this mean? If you want to sell, give away, share or use anything you *claim is intended for pesticidal use*, you need EPA approval. Approval may be granted via a lengthy and expensive process. In most cases, a basic, simple pesticide will take about four years. You will be informed the approval is mere months, but it's very deceptive, that means approved from the point they consider your application is complete. Most pesticides will require submission of quite a bit of data on both mode of action and chemistry of the active ingredient. You will need to prove your active ingredient is pure, and certify a supplier. This is part of the submission packet. Label design and requirements also need to be included. Again, this is prior to actual submission. Many things require months or years of data collected and organized, prior to that submission. That's part of what's not included in their calculations of time. They also don't include any of the delays you will encounter just getting the ball moving, or if they don't like your data.

Last year, Randy and I were working on getting an extended-release project approved. We were told it would be a simple "cite all" process where we could show we were doing what the USDA had already approved. It seemed to be an easy process, just submit a "cite all form" and what's known as a "me too" application, a sample label and your formulation, in this case a cellulose pad and glycerin as a carrier.

Just to get what is called a "pre-submission" meeting took four months to get accomplished. In that discussion we learned a bit. The tentative answers were fair in that they would probably accept the new formulation (glycerin and cellulose) without requiring a new data packet. Approval time once the forms are submitted is 13 months. Okay, so I spent a week or better trying to noodle through it, did well I believe, but then we hit a snag. Turns out there is only one source listed for OA as an active ingredient (listing sources is a requirement). That source is a lab grade supplier (in the end there may actually be three possible) but lab grade OA is in the $60 a pound range from that supplier. We argued that OA is all 99.6% pure by the very nature of the process of making it, it's actually a worldwide commodity. Doesn't matter.

I am told then, that we can go to the list of suppliers approved by the EPA. It's some 17,000 companies. I searched and crossed referenced it for three days trying to find a supplier of bulk OA who's on the list, turns out that answer is zero. Many lab grade suppliers are at a very high cost, but none of the bulk suppliers are.

We have to accept and admit as industry leaders the current methods of legal mite control are failing the industry. This is the basis for the huge losses we continue to see.

After all that digging, I also come to learn, it doesn't matter, we will still have to resubmit purity specs from the new supplier, even if they are on the list. This is a small detail but, another delay.

So now we are told we have to file a "me too" unregistered supplier application. Approval time is now 23 months, AFTER we pull together all the data they want. The trick is, no one I talked to was interested in being an EPA supplier for just a few tons. The market is way too small.

So where does that leave us? We could do a "me too", but we have to buy the product from the Api-Bioxal source. Now they are a fine company, but a bit of common sense will tell you it would not be economically viable to market a product where we have to buy it from another retailer first, when as beekeepers, many are self trained to use eBay as their supplier of cheap product.

Oh, and the last detail, they are going to need data on the new application method, they won't accept it as a slight variation, but in fact a new method.

What started out as a way to legitimize the extended release and provide a reasonably priced prepackaged pad, slowly turned into a rude awakening of the industry problems.

The Irony

Please understand, this is not to pick on the EPA. The system is slow and deliberate for some good reasons. I would also say everyone we have dealt with has been fair and open, but the system is not flexible at all, even with

a very simple natural organic acid, that is, get this, on the EPA list as a generally recognized as safe (GRAS) list of commodities. In other words, if you want to add OA to any pesticide, but don't list it as ***the*** active ingredient, its legal to purchase, from any source you like!

There is just no system in place to be forgiving or understanding at all. Even with something as simple as already proven organic naturally occurring chemicals, even the choice of supplier has to be checked and approved long before any product is distributed or used.

This is a problem that is particularly ugly due to the ever-changing landscape of application methods in regards to OA at this point, but it's also a huge problem overall when our livestock life is measured in weeks, and any methods to use take years to be approved. In details, OA and formic as well as thymol are still being tweaked and changed in how we apply them to get best efficacy. Not just here in the U.S., but worldwide. Many researchers and beekeepers are working on improved delivery, all of which fall under experimental. The learning is going lightning fast.

So, what this means is that beekeepers, to stay ahead, are reading printed articles and research papers, swapping stories and scouring social media, and then trying to interpret that and apply what they think they learned. Not only is this not legal, it's not in our best interest. Many of us have trouble with the formulas, or think we can substitute the mix, or that we know better. So many applications are misunderstood, and it's not legal to provide clear and concise instructions with and distribute with an active ingredient. We are, in effect with the current status, making many beekeepers manufacturers of pesticides, with zero control. This is not a good plan in any shape or form, and please, keep in mind I did not even discuss personal safety. Vaporizing OA is potentially dangerous, and I myself have sustained two separate serious formic injuries despite proper PPE.

We should also be very clear, with the current system bringing new products to market is a huge obstacle. Hats off to those who have navigated the system, but it is also why off the shelf treatments are a bit pricey. While it seems the five to eight dollar a hive sounds like a great profit, that's a few million a year, right? Keep in mind, a simple package of a cellulose pad wrapped and shipped works out to close to three dollars in materials and packaging alone. Profit margins are actually very slim on these things.

As of right now, I am aware of at least two potential treatments that show great promise, but will most likely never be seriously considered due to this approval obstacle. It's disheartening knowing many researchers who might be able to help will never see the projects as they have so little profit potential. This is a huge problem with *varroa*, tracheal mites and small hive beetles. I cannot even begin to imagine what will happen when and if *tropilaelaps* ever reaches us. Make no mistake, a good portion of the lack of progress on *varroa* is due to the small size and lack of profit potential in our industry.

That's a fairly complete summary of where we are currently, so let's talk about options. At this point, there are not many. One is obviously to continue as we are. One might argue this system is working. Don't rock the boat, you're only bringing attention to us, has been stated. Unfortunately, that is inaccurate. I have seen documents that show some federal agencies are already calling for enforcement, I know some states are looking into having inspectors start looking into it and we know some fines have already been levied. Status Quo is not a plan.

I seriously believe at some point there will start to be more enforcement and that is a problem. It will either end in less beekeeping, a real shortage of bees and/or making beekeepers even more likely to use illegal treatments with no supervision.

Exemptions: In the last couple of years, state groups have pushed for local and state exemptions, otherwise known as a 2ee exemption. This, in general, allows the state Ag dept to make a special exception in pesticide usage. Generally used for something like a local outbreak, like say spotted lantern flies, and a serious need for a quick short-term fix.

There were three issued last year that I know of, Vermont , Delaware and New York. The EPA took the extraordinary step this March, of what can only be called a WWE style smackdown. They not only denied the petition for 2ee, they went into great detail about how they had zero intention of allowing ANY variation in the current approved application methods, and this was just for OA, something that most everyone considers safe and harmless.

Skirting the rules: It is quite clear by the wording that EPA rules only apply if you claim pesticidal actions. For example, we have even been advised that selling top bar cleaning pads would be legitimate and perfectly legal way to distribute OA glycerin pads. As long as they make no claims of effectiveness as a pesticide! The same would go with formic or thymol, for example. We can use thymol to enhance the aroma of the hive all day long, or OA to clean and brighten the interior of the hive. On the commercial side, with only at best a couple thousand beekeepers, one could, with a wink and a nod, advise the best way to clean those top bars and pesky odors. But that leaves out the almost 150K "backyarders" and hobbyists, most of which participate very little in meetings and reading things like this. It also requires that researchers or people working on this disseminate their information, strictly on goodwill. Right now, we have some who are doing that, but it's not a way to move an industry forward. It puts that person at the risk of the wrath of the EPA, for nothing more than a goodwill gesture. It puts many people at the mercy of the latest Facebook chemistry wizard, who may swear to things that can cause serious bodily harm while telling you how to kill mites. Zero accountability is not a good plan as I see it. Fogging mineral oil is one that quickly comes to mind. This would also never help us should there be some sort of chemical solution. Things such as amitraz, which has to be formulated, would never work under this method.

Last but not least, changing the rules. For the last few months, Randy and I have been exploring options as best as we can. We have had several meetings with the key players and have prodded all the edges. Here is a summary of where I believe we are.

We talked about FDA and allowing veterinarians to get involved, that idea is not popular with beekeepers as the FDA can be even slower and more cumbersome to deal with, and it seems the veterinarians are not keen on helping us either.

We talked to the USDA about taking us under their wing. The USDA has bee experts (EPA and FDA do not have any experts on bees and defer to USDA anyway). The USDA currently does no regulation of pesticides and are not interested at all in the idea, and EPA is not keen on it either. This one would be an impossible task as no one at all is in favor of it, and would be a monumental undertaking.

We, of course, have asked the EPA for considerations, and there is zero chance of any special considerations without them being written into law. At the moment, EPA is also unwilling to support any changes as that was where we headed next.

So, where we are now as I write this, while we received no help, we did get the understanding that legislative change may be possible. We, as beekeepers, are well received as most are aware of our value to food. From that, we were advised the best bet would be some legislative changes in the Farm Bill. 2023 is a Farm Bill year, and although time is short, the ABF has a great lobbyist, and with his help we drafted a plan. There are actually two forms of the plan, and I will detail those out in a moment

The Plan Submitted Was/Is as Follows

First, have beekeeping officially designated as a "minimal use crop". While we are livestock, and livestock is our crop, that is slightly different from normal thinking. Currently, the EPA allows for this by accepting us unofficially as minor use. But, the ONLY perk is reduced fees. There is no change in the paperwork requirements. So, one may ask, why bother? Simple, in the future no one would be required to prove there is no money in it, which saves time, and potential companies would be told so up front. And secondly, and most importantly, we would now be a special group. As such, we in the future can ask for things that apply only to us. This is important.

The reason this is important is the next step, and that is the key for now, that OA, thymol and formic be listed as "Minimal Risk Pesticides" for use only on this crop. Most of the exemptions and such are crop specific, such as potatoes. Being referred to as a crop officially makes us a category.

Its easy to conflate "minor use crop" and "minimal risk pesticide" but they are separate and distinct categories. "Minor use crop" means it's applied to such a small area, EPA is not concerned. They recognize there is little profit in them and will reduce fees. Generally, this would apply to anything less than 300,000 acres. Believe it or not, if you packed every beehive together it's actually less than 200 acres (that's packed tightly) so we are well within this restriction.

"Minimal risk pesticide" (know as the 25B list) is the second category. This list is fairly small, while I didn't count, it's around 200 things. The key is the EPA has only added to this list just once in recent history. The reason for this is simple, they need to be sure that there is literally no way you could misuse it. Trying to predict ways people may want to use something as a pesticide and making sure it's always safe, is a big task. It's much easier and less risky to just not add to the list. For example, OA, while they may fully agree it will never be a problem in a beehive, they cannot say that it would be safe to use on everything. It may be a huge problem in other areas.

This is important, because the legislative idea was to require the EPA to recognize OA, formic and thymol, for beehive use only. Which we have already shown as safe. We had hoped they would be more willing to allow us under 25B if it was more restricted to bees only.

The second idea is to copy the New Zealand rules. The NZ government has allowed what it calls a "own use" exemption. They wrote a simple rule allowing beekeepers to formulate their own treatment, and it is very simple and straightforward. We could even copy the verbiage.

As such, both ideas are great. Neither address the elephant in the room which is Amitraz and any future pesticides, but either one does address the gorilla in the room in regards to the organics. We had been led to believe that there may not be a lot of resistance on the topics, as such we picked the first one, suspecting from our conversations, EPA would not be in favor of beekeepers self-formulating.

In June, during Ag week on the hill, the ABF leaders and lobbyist, presented the plan. We were immediately told both ideas were not starters from the legal departments. I do have to say given our prior work and conversations, we did not expect this.

I need to address how this works. For us to slip it into a bill, farm bill or not, we need a sponsor. A Senator or Congressperson who will allow us to ride their coattails. We have a few of those, and as such, would ask one of them to allow their congressional aids to add our request to the bill.

Unfortunately, the very first thing those aides do, is ask the effected agency if it's okay with them. In this case, they ask the EPA, and of course the EPA is going to say no, we do not accept that. To avoid controversy and stalling the bill, the aide then pulls it out and it's done.

So that is where we stand right now. As painful as it is to say, despite months of groundwork, we have nothing. This leaves us with two options.

The first, we can continue with the plan as worded. To do that, we need to find a Senator or Congressman who is well aware of and willing to take on the fight. Which means we need direct contact to and with the legislator so that we can really explain the process and problem. Preferably, we need both one in the House and Senate. A real firebrand who is willing to go to bat for us. Make no mistake, this is a big task to accomplish in the next six months. Anyone who can help, please contact us.

The second is to actually file suit against the EPA. One could make a strong case that in regulation of these three, the EPA is misreading FIFRA and overstepping its bounds. We have been advised EPA does not agree and would fight aggressively. FIFRA does clearly state that its regulation applies only if use of a pesticide creates an "unreasonable risk to man or environment." We could make the case that the use of these natural plant products by beekeepers does not create an unreasonable risk. Such an exemption would apply solely to the private use of these treatments, and would not effect the registration or sale of formulated products.

EPA will claim since it's already regulated it is a risk that needs to be regulated.

In this, the own use rule is key, as FIFRA does. As I read, it gives the power to the EPA to regulate the sale and distribution of anything making the claim of pesticidal action. Either way it's also a tough option. We would need to find legal assistance, and that is not an easy task. The EPA and USDA did provide us with a list of potential law firms who may be willing to help, and suggested we ask for pro bono assistance. Even if we are victorious, it only would cover the organics.

At this point, my personal plan is a public plea to find congressional help. We have a few months to slip into the farm bill, if that fails, then we are only left with ignoring the issue, or hiring lawyers. In the meantime, we should be on the lookout for a test case, and a member of the legal community who can aid our search.

Any thoughts, comments, questions or help you can provide, please feel free to email me, or contact any ABF director. BC

This article is written with the intention of being shared as widely as possible, any reporters, politicians or interested parties need to be informed. Email me for a copy in any format you like.

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Bees and Women

Miss Lillian Love

Nina Bagley

Miss Lillian Love was born into a Quaker family in Marion, Indiana on October 24, 1880. Her family was from Decatur, Indiana. Her father, Granville Love, was born in Indiana. In 1860, he married Nancy J. Gillibrand. Her family came from England and settled in the vicinity of Indianapolis. The two were married on August 11, 1868, in Morgan County, Indiana. Granville was a farmer and ran a huckster wagon, which proved a good business. Mrs. Nancy Love had nine children from 1869 to 1892. She died on January 31, 1936, at eighty-six, in Decatur, Indiana. Lillian's father, Granville Love, died May 7, 1925, in Guilford, Indiana. All the children would be trained in English and piano at Central Normal College in Danville, Indiana.

Lillian had two years of college, became a teacher, and taught in Indiana and Florida. Women still couldn't find jobs other than teaching. Lillian and her youngest sister Flossie were involved in women's rights and equal opportunity for women; they supported women's rights to vote.

In 1904, Lillian moved to Tacoma, Washington, where she taught for several years. Finding her husband in 1907, she married Jay Levant Hill, who was twenty-five years older than her. Lillian's husband, Jay, was an inventor who owned his own lumber business. Lillian said that her husband's "brain was mechanically bent."

Lillian in her sister Flossie's backyard. Her dress is purple and black print. She and her sister Flossie always had a matching rhinestone necklace.

Their home would be Mount Shadow Ranch, a two-hundred-acre farm with a charming yellow California-style bungalow, two and a half miles from Elbe, Washington. Surrounding the farm were the bee's favorite purple hills of fireweed.

Fireweed is a plant that enjoys cool and moist climates and thrives in Pacific Northwest forestlands. It is also considered one of the most prolific plants for honey production, with its nectar having a high sugar concentration. It has a "lightly spicy" or "buttery" flavor.

If you shut your eyes and listen, you can hear the train whistle in the distance as it stops at Park Junction Station in the middle of Mount Shadow Ranch.

"We have some thirty acres under cultivation," said Mrs. Hill; The rest of the farm is logged-off land which we use to pasture our herd of fifty cattle." —*American Bee Journal,* April 1926.

One day in 1913, an old man came peddling bees. "You have a wonderful place here for bees," he said, convincing Mrs. Hill to invest in six swarms. Before the older man came along, she had never seen a swarm of bees before. Her six swarms increased and produced so much honey that in 1914 Lillian Hill invested in twenty more swarms, giving her forty hives. That year she harvested 6,500 pounds of pure honey. Lillian had an entrepreneurial spirit and determination to succeed in a male-dominated industry.

I don't know how she accomplished so much. Mrs. Lillian Hill kept a tidy home, raised beef cattle, Duroc-Jersey hogs, geese and ducks, and grew vegetables in the garden. But it would be the bees she loved the most!

Lillian was part owner of the Ranch and owner of the Mount Shadow Apiary. She had a gentle personality. She was independent and had

a fire in her eyes that you could see demanded respect.

Being a novice beekeeper found her unprepared. In 1915, she encountered her first obstacle, European Foulbrood that would bring havoc to her beeyard. Words that no beekeeper wanted to hear or experience, the only cure, the dreadful burning of the hives. After that horrible experience with "American Foulbrood," she only kept a dozen colonies of bees providing honey for her family and neighbors. (*American Bee Journal,* April 1926.)

"I never camp," confessed Lillian Hill. "On either the trail of my successes or my failures. I go right on." That's her philosophy in a nut-shell.

Although childless, she cared for the children from reform schools, orphan asylums or neighboring farms; she taught the boys and girls everything about beekeeping so they could pay their way through school. She believed that the best and safest way to help any human being is to help him help himself. Particularly, those who needed guidance and education.

1921 – Freddie May with his siblings before they were placed in the Washington Children's Home.

Lillian's parents, Granville and Nancy Love.

In the 1900s, the U.S. was a diverse nation, and its children lived in various circumstances. For years, she had been the leader of the Boys' and Girls' Bee Club of Elbe. One of her boys won nearly $80.00 with his exhibits of bees and honey at the Western Washington Fair.

Lillian increased her hives to twenty-six to help one of her boys and it didn't stop there!

In 1924, to help one of her girls through school, she invested in thirty more hives and loaned them to the girl. The girl lived next door to an abandoned schoolhouse on an acre of ground, which got Mrs. Hill thinking, "I could rent the schoolhouse and land from the school board."

One day in 1924, a young man showed up at the Ranch. His name was Freddie May, and he was born in 1912 in Denver, Colorado. When he was eight years old, he lived in Wenatchee, Washington. His father abandoned the family, and their mother could not care for six children. The children were placed in the Washington Children's Home in Wenatchee, Washington, in 1921.

Freddie somehow got his hands on a newspaper. He came across the ad for a permanent position in beekeeping work. Freddie wanted to learn about the beekeeping business under the leadership of Mrs. Lillian Hill, so he rode on "a bicycle" from Wenatchee, Washington to Elbe, Washington, a hundred and ninety five miles! He was energetic and full of fire and wanted to learn beekeeping.

Lillian took a liking to Freddie and wanted to help him make money to pay his way through school, so she furnished Freddie with plenty of bees on a commission basis of fifty-fifty. In four months, the Colorado cyclist made five hundred dollars for himself.

Miss Lillian Love, taken in Washington State prior to her marriage to J. Levant Hill.

1926 – Lillian Hill at Mt. Rainier Apiary. Image featured in* American Bee Journal *(right)

Freddie would consider Mrs. Lillian Hill his mother and next of kin. Lillian and her husband would become Freddie's foster parents giving him a home with security. He would attend Eatonville High School and work on the Ranch. He would continue beekeeping and eventually marry and have a family.

During the season of 1925, Mrs. Hill was able to establish the Colorado youth in the schoolhouse helping young boys and girls in need teaching them beekeeping.

In 1926, Lillian Hill had over one hundred and fifty hives of Italian bees, eighty-five at the schoolhouse and sixty-five at home. She produced at least 10,000 sections of comb honey. Mrs. Hill would advertise in the newspapers to get workers "Wanted – an experienced farmer for a permanent position."

Most of the marketing she did herself in her Buick car. She supplied the best stores in Tacoma and Seattle. "I don't have to hunt for a market," declared this energetic woman. In one year, Mrs. Hill raised sixty queens. That was the part of her business that she enjoyed most of all. Mrs. Hill was the president of the Pierce County Beekeepers' Association for two years.

Both triumphs and disasters have knocked often at Lillian Hill's door on the Mount Shadow Ranch, but neither one ever fazed her. This woman had grit and plenty of it!

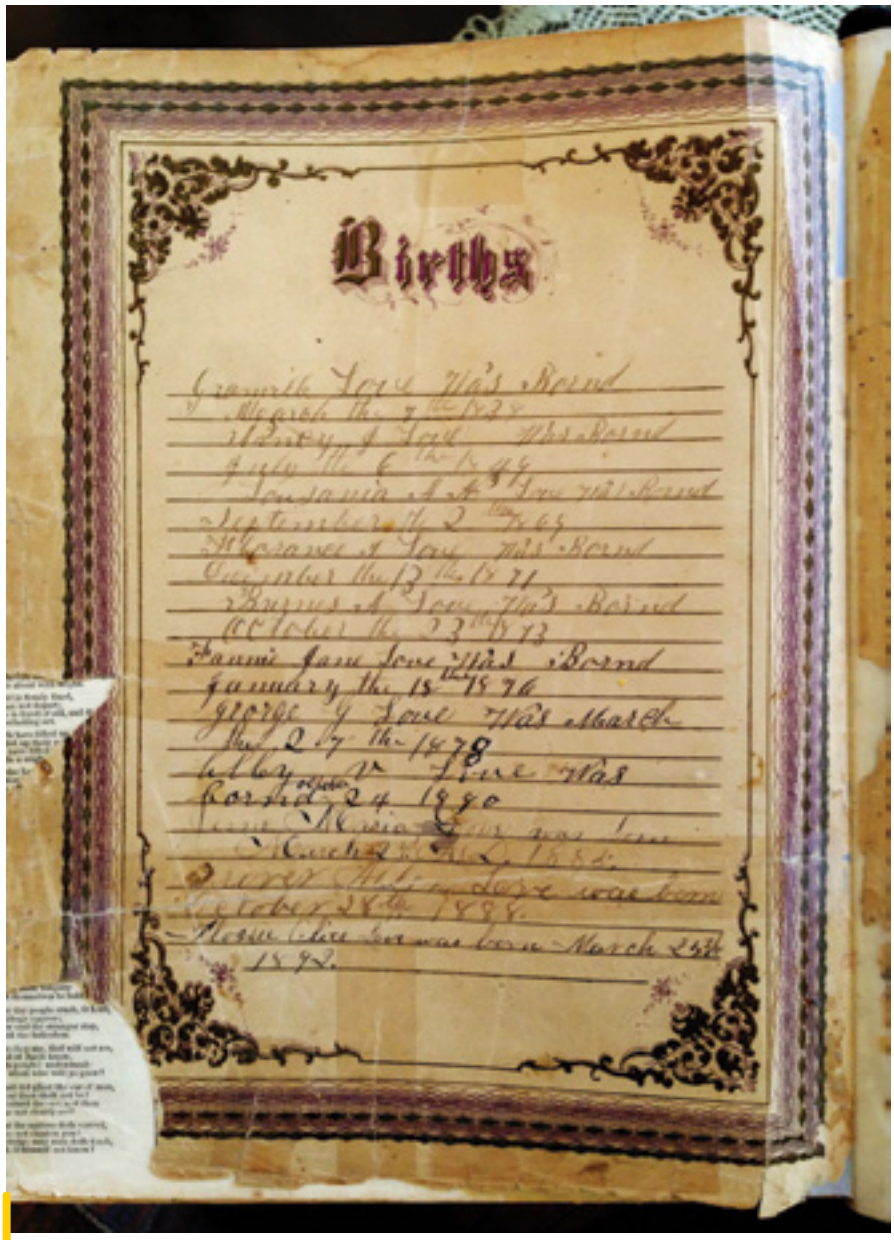
Around 1927, Freddie would accidentally run over Lillian's foot crushing it while she was teaching him how to drive the tractor. An


AMERICAN BEE JOURNAL

The Story of Lillian Hill, Beekeeper of Elbe

Family photo of Albert Cook, first wife Nora and their children.

Mount Rainier Apiary. Freddie May and Mrs. Lillian Hill.



Lillian's family Bible.

unfortunate outcome was that the doctors had to amputate her leg due to blood poisoning. Lillian had a prosthetic leg from the knee down, but that didn't stop her. She took it in stride and persevered. In 1929, unfortunately, her husband died. He was the youngest of five and the last of his siblings. He was seventy-one years old. I will say some lives have more trial or tribulations than others, to be sure, but no life is without events that test and challenge us.

In the 1930 census, Lillian is listed as a widow forty-nine years old, with fifty men aged eighteen to sixty-six listed as boarders at the Mount Shadow Ranch and working for Lillian Hill. That's a lot of men to manage. You would have to have grit and be firm! Among the fifty men working on the farm was Freddie May, the youngest, who was eighteen. His occupation was a Logger.

Not being able to care for the Ranch and losing her husband, not to mention the tractor accident, left her feeling like it would be time to sell the Ranch. Lillian Hill would place the Ranch up for sale.

Advertised in the Tacoma Daily Ledger Sunday, June 23, 1929. "Mountain Shadow Ranch. It is one of the best-stocked Dairy Farms in western Washington, with running water in every field and excellent soil. Forty acres cleared; 120 acres fenced for hogs and cattle; stocked and making money; good seven-room house with school buses to Elbe and Eatonville high school. The farm is a must-see to appreciate it. We will consider small trade—a price of $15,000. Write to Lillian L. Hill for an appointment."

A lot happened in 1930. The Ranch sold, and Lillian Hill married Albert Cook, a widower who worked in the lumber industry. His wife Nora passed away in March of 1929 at the age of fifty-one; they had six children together. Lillian didn't mind an extended family. She was raising her niece Esther who she adopted at a young age and her foster son Freddie May. After all, Lillian loved children and teaching. Her first husband was in the lumber business so she probably knew Albert Cook.

Albert would marry Lillian in 1930, build apartment buildings and

Mount Rainier

retire from the lumber industry. The two would live in Tacoma, Washington. Lillian's beekeeping days came to an end, her new occupation would be owner and landlord of her apartment buildings.

Lillian had a very loving relationship for nineteen years with her husband Albert. In May of 1949, Albert passed away at the age of seventy-three. He was buried beside his first wife, Nora, in Tacoma, Pierce, Washington.

The income from the apartments and other investments would give Lillian a comfortable life for the next sixteen years. She lived to be eighty-eight and passed away August 19, 1969 in Tacoma, Pierce, Washington Lillian was a Sixth Avenue Baptist church member. She was buried next to her first husband, Jay Levant Hill.

Freddie May lived to be eighty-three years old. Freddie kept his surname May. He went by Fred (Cook) May, Sr. "Commander" as best by everyone who loved him.

Lillian's youngest sister Flossie, who she remained close with, lived in California. Flossie had a granddaughter Karla who enjoyed her aunt Lillian's visits. She remembers sitting on her grandmother's hunter green "davenport" with her aunt Lillian. Her grandma Flossie would sit in her desk chair across the room and the two sisters would talk for hours.

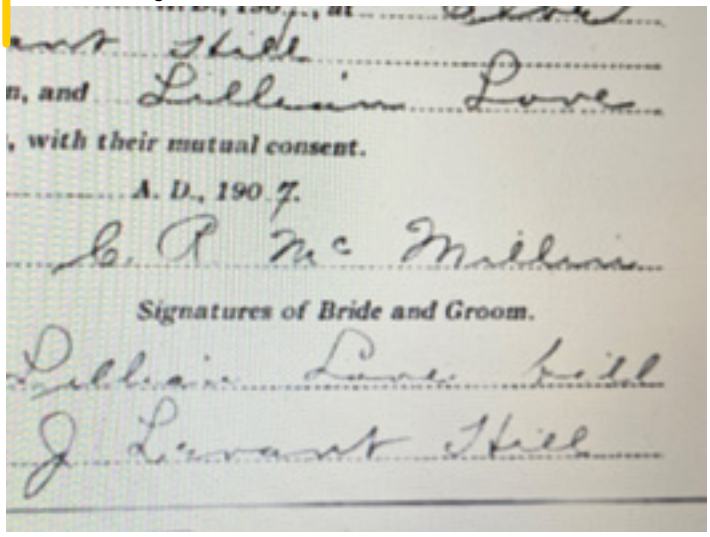
Lillian's great-niece Karla also remembers how "intriguing" her aunt was. Lillian had blue eyes, was fair-haired and had rosy cheeks. She wore her hair in a braid reaching her waist until one day; she cut it off, curled it up, and put it in a small box for keeping. Karla remembers her Aunt Lillian as sweet but at the same time, tough and gutsy!

Marcus Aurelius was a stoic philosopher. His quote reminded me of Mrs. Lillian Love, her struggles as a woman in the 1900's and how she put others before her, passing her knowledge about beekeeping on to so many young boys and girls in need. I would like to thank Lillian's great-niece Karla Babcock for sharing her memories of her Aunt Lillian and grandmother Flossie.

"A life of sacrifice and putting the well being collective first, just like the bees."

—Marcus Aurelius BC

Lillian's marriage to J. Hill.


n, and Lillian Love
, with their mutual consent.
A. D., 190 7.
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Signatures of Bride and Groom.
Lillian Love Hill
J Levant Hill

Ohioqueenbee
Nina M. Bagley
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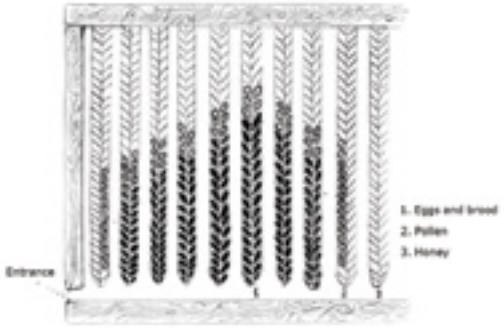


Figure 1. Bee nest

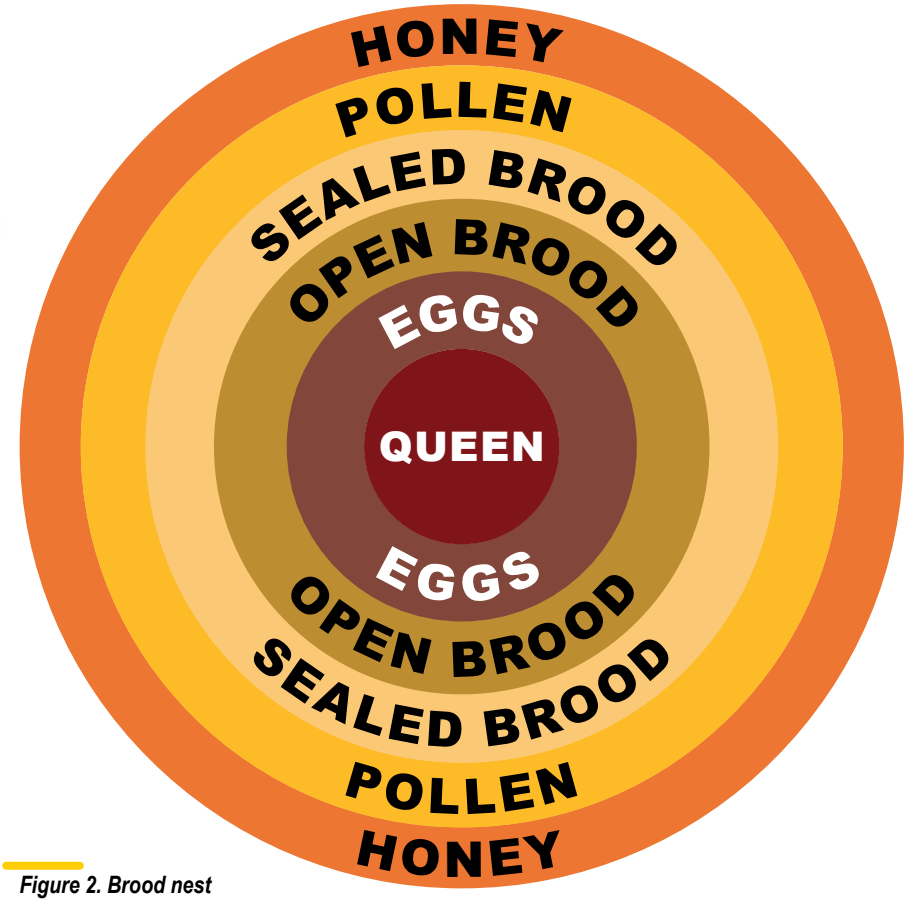


Figure 2. Brood nest

Patterns of the Brood Nest

Pablo Montesinos Arraiz

At a base level, the zootechnical management and the general management of hives depend intrinsically on the development and growth of the brood nest. The brood nest has to do with the quantity, concentration, distribution and location of the eggs, the open brood and the sealed brood that are mainly in the central combs of the bee nest. The lateral and upper combs will be occupied by reserves of pollen and nectar or honey (Figure 1). The brood nest also may extend into the lateral and upper combs of the bee nest, if there is not sufficient space for the queen to lay eggs and/or the amount of pollen and nectar collected by the bees is increasing.

The patterns of the brood nest refer to the presence and/or absence of the elements that constitute the brood nest: the eggs, the open brood and the sealed brood of the workers (Figure 2). Drones are reared in significant numbers only during breeding times of the colony. During the Spring, Summer, Autumn and part of the Winter, the colonies have the pattern X, X, X in the brood nest. The first X indicates the presence of eggs of one, two and three days, the second X of open brood (larvae in the different stages before being sealed); and the third X of sealed brood (larvae that have passed to the pupal stage). This pattern (X, X, X) in quantitative terms, increases from Summer to Autumn, until it reaches its maximum level, in relation to the abundance of nectar and pollen and the physical space that the colony occupies in the hive:

Normal Pattern of the Brood Nest
X, X, X

In temperate regions, at the end of Autumn, the eggs, the open brood, the sealed brood and the bee population begin to decrease because the queen is laying fewer and fewer eggs. The bee population is grouping around the queen to form the Winter cluster. The bees bring less and less nectar and pollen to the hive. The queen, in Winter, stops egg laying completely, and so, there will not be open brood and sealed brood either. The following sequential changes in the pattern of the brood nest have been observed:

O, X, X ↓
O, O, X ↓
O, O, O ↕

The normal pattern of the brood nest, X, X, X resumes as Winter gives way to Spring. This occurs gradually:

X, O, O ↓
X, X, O ↓
X, X, X ↕

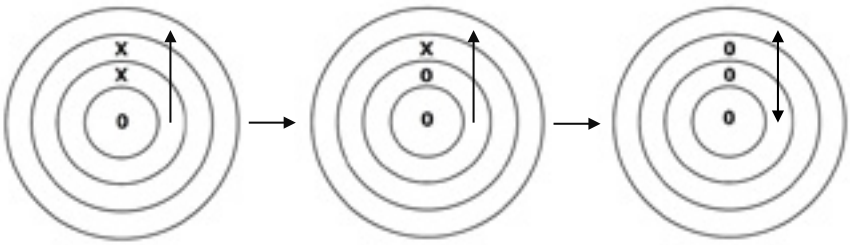
It has become present again, the cycle of quantitative development and growth of the brood nest and bee population. Honey and pollen will also progressively increase in the hive.

However, the queen can die unexpectedly and suddenly, due to a serious injury caused by the beekeeper at the time of inspecting the hive, by a predator or by any disease. The death of the queen will bring with it, while the process of emergency queen rearing is carried out, changes in the sequence of the normal pattern of the brood nest.

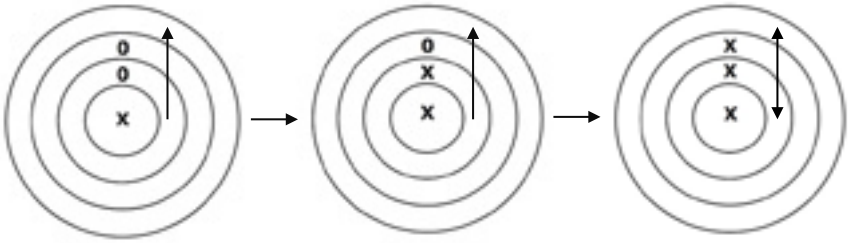
The queen that has died is called the "old queen" because she is the one that the colony had in the last inspection of the hive; and the "new

SUMMARY OF THE PATTERNS OF THE BROOD NEST

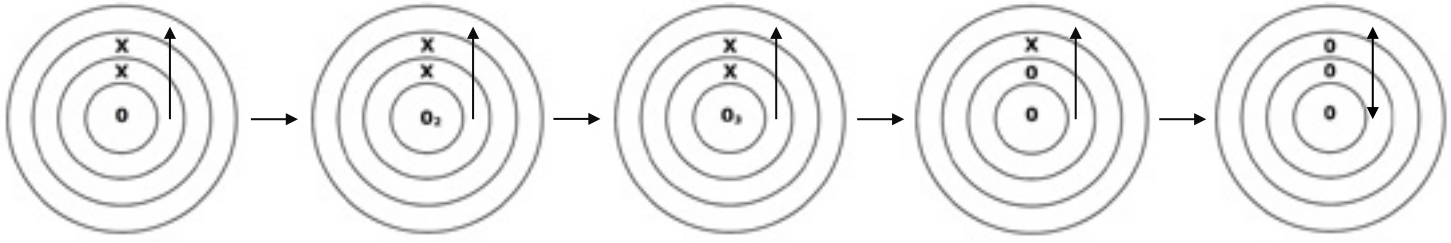
1) Patterns of the brood nest when winter comes



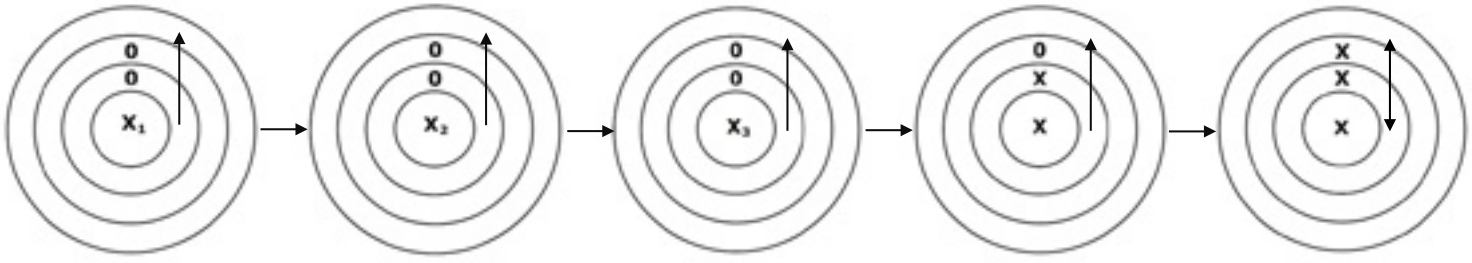
2) Patterns of the brood nest as winter gives way to spring



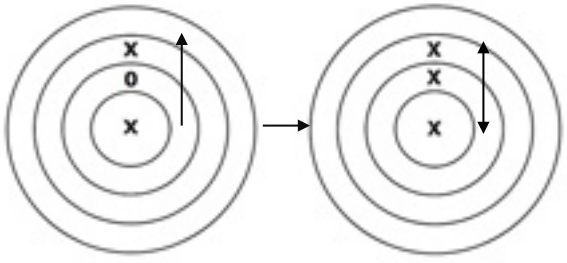
3) Patterns of the brood nest when the old queen dies



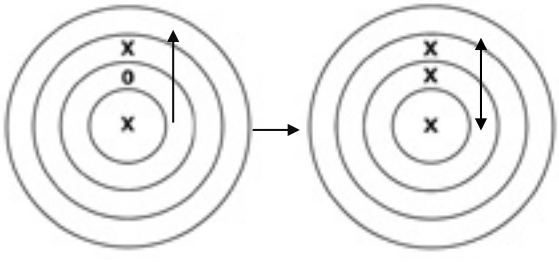
4) Patterns of the brood nest with the new queen



5) Abrupt changes of the normal pattern of the brood nest



6) Pattern of the brood nest in circumstances *per se* of the colony



queen", comes from the emergency queen rearing. Once the new queen has reached sexual maturity and has mated, she will start laying eggs, with the consequent modifications in the patterns of the brood nest. Alterations in the patterns of the brood nest, triggered by queen rearing processes, swarming, supersedure; or queen replacement by the beekeeper are not considered here.

Sequential Changes in the Normal Pattern of the Brood Nest, From the Moment the Old Queen Dies

O, X, X ↓
O_2, X, X ↓
O_3, X, X ↓
O, O, X ↓
O, O, O ↕

The pattern represented by O, X, X, indicates a total absence of eggs. The queen has died three days before. If there are two- and three-day-old eggs, O_2; it means that the queen has not been dead for more than 24 hours. The presence of only three-day-old eggs, O_3; indicates the death of the queen 48 hours ago. For the first X, correspond those eggs that have already completed the incubation period (three days) and have become larvae (open brood). If one-day-old larvae are found; it means that the queen died four days ago; two-day-old larvae, five days ago; three-day-old larvae; six days ago; four-day-old larvae; seven days ago; and with five-day-old larvae;

the queen died eight days ago. The larvae that have completed their development and have been sealed (sealed brood), are represented by the second X.

The pattern O, O, X indicates the absence of eggs of one, two and three days, and also the absence of larvae (open brood), and more than eight days have elapsed and all larvae have been capped; the X represents the sealed brood.

O, O, O is the pattern observed from the third week after the queen death. Besides no eggs and larvae, there is not sealed brood because all pupae have transformed into adult bees and have emerged from their cells. This pattern of the brood nest could continue if the colony is unsuccessful in raising a new queen.

When the old queen dies while the colony is in normal conditions, that is, it has open brood with larvae one to two days old, sealed brood, young bees (nurses) and honey and pollen reserves, the workers begin to rear a new queen in the first five to six hours (as is assumed here) after the death of the queen or from 12 to 48 hours later. To do this, the workers modify one or several worker cells that contain larvae less than two days old and feed them with abundant royal jelly, transforming them into queen cups and then into emergency queen cells, from which the new queen will be born and that will be established after having killed other queens that could have been born.

Sequential Changes in the Normal Pattern of the Brood Nest, From the Moment the New Queen Begins Egg Laying

Five days after birth, the queen reaches sexual maturity and leaves for her mating flights; generally mating on the first flight and laying eggs between the second and fourth day later. Here, it is assumed that the new queen starts egg laying three days after mating or eight days after being born, observing the pattern X_1, O, O, which indicates the presence of eggs of one day, eggs of two days (X_2, O, O) and eggs of three days (X_3, O, O) and absence of open brood and of sealed brood. When the incubation period of the eggs ends (three days), and they become larvae, and are fed by the nurses (such feeding takes an average of 5.5 days); there will be in the brood nest the pattern X, X, O indicating eggs and open brood but absence of sealed brood. Eight days after the new queen has started egg laying, and since the open brood has been sealed, the brood nest will have again the pattern it had before the death of the old queen: X, X, X (eggs, open brood and sealed brood).

Abrupt Change of the Pattern of the Brood Nest

If in an orphaned hive, like the one described above, a fertilized queen is introduced; as long as more than eight but less than 21 days have elapsed in European bees (duration of the development stages of the workers) the sequence of the aforementioned patterns will be modified. It will then show the pattern X, O, X, which shows the presence of egg and sealed brood, but not open brood; since the egg laying comes from the new queen introduced by the beekeeper and the sealed brood from the old queen that was in the hive. Later, the pattern X, O, X will change to X, X, X. With that, the eggs, the open brood and the sealed brood will belong to the new queen introduced.

Circumstances *Per Se* of the Colony

The X, O, X pattern can also be found in those cases in which the queen, for whatever reason (organic or functional disorders, lack of sufficient nurses or lack of food reserves), has stopped laying eggs for eight days and the inspection of the hive is carried out just when the queen is re-establishing the egg laying and all the open brood has already been sealed. BC

MY APIARY ECOSYSTEM

Honey bees are only a part of it.

Listen along here!

There's always going to be something

In my hives or in my life, there is always going to be something – some issue or some problem. I literally just finished a phone call with one of my adult daughters. She had just eliminated a harmless Wolf Spider *(Tigrosa annexa)* because it frightened her young son (my nine-year old grandson). A few weeks ago, she had a problem with ants in her kitchen, but now they are gone. Now, she has Springtails (Collembola) in one of her bath showers. She complained to me that she feels that her home is under constant attack. I tried to tell her that there is always going to be something going awry. Always. Chill out. I don't think she listened to me, but I listened to her.

Since I have spent my adult life studying honey bees, she assumed that I was also an information resource for Springtails. Readers, I don't know anything about these small flea-sized arthropods, but unintentionally, my daughter set me to thinking and exploring. What do I know about Springtails? In all my beekeeping years, I have never asked or thought about the presence of Collembola in bee hives.

Springtails are common in organic materials that are being degraded. On a whim, I keyed in a web search on *Springtails (Collembola) in bee hives*. I immediately got hits. All the citations that I found were from observant beekeepers. Having not found any information from academic or regulatory sources, I went to an AI open-source app and was given the following, undocumented information.

Collembola, commonly known as Springtails, are small arthropods that belong to the class Collembola. They are found in a wide range of habitats, including soil, leaf litter and decaying organic matter. While they are not typically associated with bee hives, it is possible for Springtails to be present in bee hives under certain conditions.

Springtails are detritivores, meaning they feed on decaying organic matter and microorganisms. In a bee hive, there may be small amounts of organic debris, such as pollen, beeswax and other residue, which could provide a food source for Springtails. However, the presence of Springtails in a bee hive is usually considered incidental and not a significant problem for honey bees.

Figure 1. Springtails are about the size of a flea and seemingly cause no harm to bees or beekeeping.

I had no idea

I had no idea that these small animals could occasionally be found in hives, but my conversation with my daughter came at a time that I had been pondering this very concept. What is routinely in my bee hives and in my apiary other than honey bees? I have never found a comprehensive listing of the lifeforms that I could expect to find there.

My apiary is essentially a distinct ecosystem. My apiary is where I keep my bees, but I have long since realized that many other species find that an apiary is home for them, too. These *"unknowns"* can apparently fall into three broad categories: harmful, beneficial or neutral.

Figure 2. Fire ants and my honey bees. Do the ants help or hurt my bees? Ants, of many species, are common in my beeyard.

The Big List

Early in our beekeeping journeys, we are exposed to what I have named the "*Big List.*" Some of the common entries on this list are raccoons, skunks, ants, wax moths, small hive beetles, birds, toads and mice. It is not my intent to discuss these common hive intruders here. Yet, in the hours and hours that I have either sat by my colonies or pawed through them, I routinely see other species and wonder what they're up to as they bum around my hives. Usually, their presence remains a mystery.

Flies

Of course, there are numerous species of flies in and around my hives and colonies. We've all seen them. In fact, the classic book, *Honey Bee Pests, Predators, & Diseases*[1] has

[1]Morse, Roger A. & Kim Flottum. *Honey Bee pests, Predators, & Diseases*. A.I.Root Company, Medina, Ohio. 44691. 718 pp. Chpt 8. P 143-162.

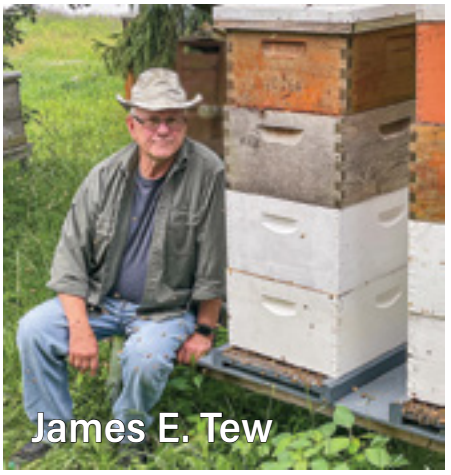


Figure 3. Common Green Bottle Fly (Blow Fly), probably* Lucilia sericata*, parked on the front of one of my active hives.

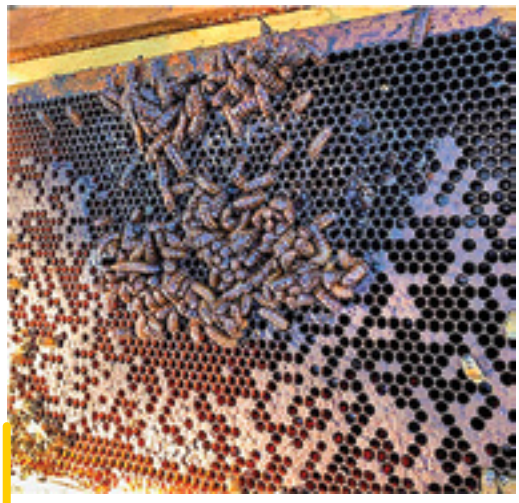


Figure 4. Black Soldier Fly larvae,* H. illucens *larvae, on honey bee frame. (Scott Razee photo)

Figure 6. Adult European earwigs on the inner cover of my hive.

a designated chapter on various fly species and their effects on bee colonies. Essentially, flies and their associated larvae are degraders and generally, do not have a harmful effect on healthy bees.

But, I can't help but notice the occasional Green Bottle Fly nosing around my active hives. They are very flighty and will not allow a close camera shot before taking quick flight. Why are they there? I never see them get inside the hive.

But there are unique encounters between various Dipterous species and honey bees that are rare. Anthony[2] published a scientific note on a Black Soldier Fly (Stratiomyidae: *Hermetia illucens*) infestation within a western honey bee (*Apis mellifera*) colony. In the article abstract, Anthony, et al. reported:

> *Black soldier Fly larvae (*Hermetia illucens*) were discovered in a weak honey bee colony in Hailey, Idaho. The larvae were localized to the brood area and caused the affected comb to putrefy. Further communication with the beekeeper revealed that the colony recently returned from California and that the larvae likely originated there as well. In California,* H. illucens *are common and exist sympatrically with honey bees, yet there have been very few reports of damage. We therefore believe* H. illucens *are unlikely to cause damage to healthy colonies or significantly impact the apiculture industry. This report is the first published observation of* H. illucens *in Idaho and shows conclusively for the first time that* H. illucens *associates with honey bee colonies in North America.*

There are distinct Diptera species that either are outright harmful to bees or other flies that are considered to be minor pests. Examples of damaging species are Phorid Flies (Zombie Flies) while a lesser pest is the bee louse (*Braula caeca*). These pests are documented elsewhere in the beekeeping literature. I will not cover them here.

Earwigs

How bad can earwigs be? In Alabama, earwigs are commonly found in honey bee colonies in significant numbers. No doubt they are found in other states. I have noted that earwigs were not a common hive resident in Ohio, but that all changed a few years ago. I now have earwigs in my office, in my home and in my bee hives.

Figure 5. Adult Black Soldier Fly (Utah State University Extension)

I don't know that they do anything within the hive. I faintly remember one Russian paper, that reported that earwigs could be alternate hosts for the bacteria causing European Foulbrood. Other than that one point, I have never heard complaints about them.

Of course, they are a pain when extracting and must be caught in the filter when processing honey. Straining bees and bee parts from honey is bad enough, but earwigs in the honey filter are unsightly. I don't know of anything that you can do about them. In fact, I'm not sure anything *should* be done about them.

Roaches

As an entomologist, I respect roaches. They are the consummate survivor. Obnoxious that they are to humans, one must respect their persistence. Many, many developmental years ago, roaches "learned" to fold their wings over their bodies so they could exploit more niches, than say, a broad-winged insect like a dragonfly *(dragonflies will also occasionally prey on honey bees)*. By storing their folded wings over their bodies, cockroaches could, more easily, get under your refrigerator or inside your bee hives. They have been a challenge for me everywhere I have kept bees.

[2]Auth, C. Anthony, Hauser, M. & Hopkins, B.K. *A scientific note on a black soldier fly (Stratiomyidae*: Hermetia illucens*) infestation within a western honey bee (*Apis mellifera*) colony*. Apidologie 52, 576–579 (2021). **https://doi.org/10.1007/s13592-021-00844-y**

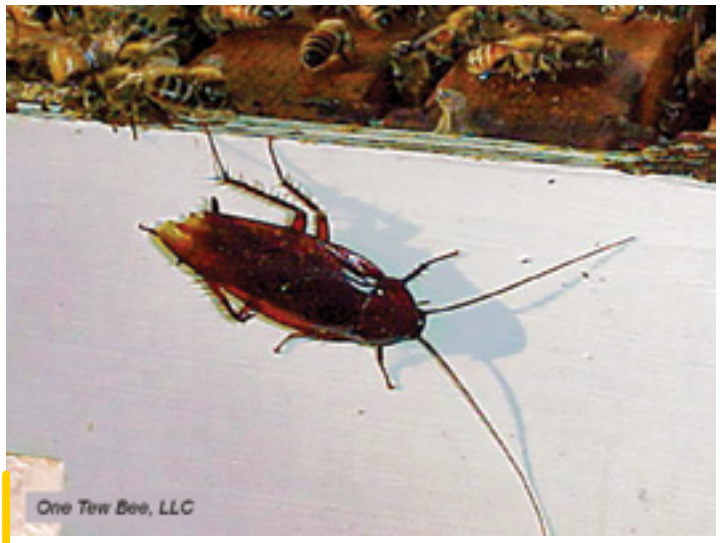


Figure 7. Unfortunately, a cockroach is not an uncommon hive visitor.

Figure 8. A yellowjacket lunching on one of my dead honey bees.

Like so many other insect visitors/invaders, roaches are drawn to both the sweet food supply as well as the protein supplies – and then there are all the decaying larvae and adult bees to munch on. The question is begged, *"Why would roaches NOT be in our hives and stored equipment?"*

In the beekeeping literature, it is often written that the damage roaches do is minimal, but I want to loudly say that the appearance of just a single roach in your honey house can dissuade even the staunchest customer who is considering buying your honey. And then there is the excreta to consider. In fact, one of my most serious concerns of both cockroaches and earwigs is the excrement that they leave behind.

It is also commonly written that cockroaches are primarily found in weakened or otherwise ailing colonies. Yes, that is surely true, but I will loudly say that great numbers of roaches happily live on the inner cover of populous colonies. When the outer cover is removed, in a flash, they scamper down into the bees.

In my opinion, there is little to be done to control a roach infestation. Protecting the customer and protecting the purity of the honey product is about all that can be done. Yet, I cannot conclusively say that a modest roach infestation is absolutely harmful to the bees. Maybe future studies will continue to add information to this colony co-habitant.

Honey Bee Cousins

Yellowjackets

Though yellowjackets are on my "*Big List*" and are common pests in the beeyard, I have included them here. In my yards, these brightly colored insects could almost be a traditional resident of my apiary. Yellowjackets get included on my "*mystery*" list due to technicalities.

Yellowjackets (probably *Vespula maculifrons)* readily see their honey bee cousins as a potential food supply. On occasion, these wasps may have a nest in my apiary, but much more likely is that these hymenopterous insects are simply foraging within my apiary.

Experienced beekeepers have commonly seen yellowjackets mulling around the detritus at the hive entrance, but they will also enter a weakened colony and take honey, pollen, brood and adults depending on their own colony needs.

As such, yellowjackets get an entry on the common list of bee colony pests, but they do not seem to be the effective cause of the colony's decline but are more commonly responding to a colony that has been weakened by other factors. Yellowjackets can be numerous when robbing behavior is rampant.

Bumblebees

I frequently see bumblebees trying to enter a bee colony. How suicidal is that? Only on a few occasions have I stumbled onto a bumble nest in unused honey bee equipment, but they are frequently in my apiary surely searching for food.

In fact, bumblebees may not necessarily be attracted to my honey bee colonies specifically, but they may be drawn to certain characteristics or resources associated with honey bee colonies. I can come up with a few reasons that may explain why bumblebees are sometimes found near my honey bee colonies:

1. *Floral resources:* Honey bee colonies are known to forage on a wide variety of flowering plants to collect nectar and pollen. Bumblebees, like honey bees, are also generalist foragers and seek out similar floral resources.
2. *Odor cues:* Honey bee colonies emit a combination of pheromones and odors that can be detected by other bees, including bumblebees. These chemical signals may serve as attractants, potentially drawing bumblebees to the entrance of the honey bee colony.
3. *Nesting opportunities:* While honey bees typically nest in enclosed structures such as beehives or tree cavities, bumblebees often create nests in the ground or other protected locations. However, bumblebees may occasionally take

Figure 9. Bumblebees can frequently be seen attempting to enter a honey bee colony. This can be disastrous for the bumblebee with deadly results.

Figure 10. The apiary ecosystem can become complicated. This mantis is eating a yellowjacket that it caught while sitting atop one of my hives.

advantage of abandoned honey bee hives or other suitable cavities near a honey bee colony, which could lead to their presence in the area.

It's important to note that interactions between bumblebees and honey bees can vary depending on the specific circumstances and the behavior of individual bees. While they may coexist peacefully in some cases, competition for limited resources, like nectar or nesting sites, can also occur.

My core point for this article

The apiary is an active place, but not only for honey bees. Many other common and not-so-common insects and animals hang around the beeyard foraging for food or shelter. You and I take a staunch view of these unwanted visitors. But truthfully, we do not know a lot about the complex interaction between all these other species and our honey bees.

For instance, Caron[3], listed more than fifteen different beetle species that could be found in beehives – usually in the bottom board litter. Most beetle species had no ill effect on our bees, but I can't help but wonder if some of those species could be beneficial to our honey bees. Currently, no one seems to know.

In this article, I have only tinkered with a few of the species that we can see with our unaided eyes. I made no effort to review the macroscopic visitors. Examples are: protozoans, fungi and nematodes. They're all there, too. Readers, I sense that I'm describing a *bee hive supermarket* or maybe a *big box store* for insects.

Not wanting to run amok here, but it appears to me that the apiary is a significant food and shelter resource for a lot of other insects and animals. As beekeepers, we laud the effectiveness of the workers' defensive stinger, but this protective device does not seem to be very effective against spiders, earwigs, birds or a fungus particle. I'm guessing that out of simple necessity, bees coexist with many of these interlopers. Hive visitors come in differing sizes and represent many diverse species.

Despite everything the bees and their keepers can do, the apiary will seemingly continue to be an attractive site for non-bee species. In this article, I'm trying to ask, *"From a diversified ecological position, is this necessarily a bad thing?"* Consider how many other species are being subsidized and nurtured by resources from our apiaries. Could it be said that our bee hives are "community centers" for a host of non-*apis* species? I think so. Blame my daughter. She started this.

Thank you for reading and thinking. BC

[3]Caron, Dewey. In *Honey Bee Pest, Predators, and Diseases* cited elsewhere in this article.

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Co-Host, Honey Bee Obscura Podcast
www.honeybeeobscura.com

Fresh Broccoli with Honey

Fay Jarrett

Ingredients

□ 4 cups chopped broccoli
□ ¼ cup honey
□ 1 tbsp olive oil (tuscan herb was used this time)
□ ½ tsp pepper
□ ½ tsp salt

Directions

Step 1
Place chopped broccoli in a large bowl.

Step 2
Sprinkle honey, olive oil, salt and pepper over top. Stir.

Step 3
Cook broccoli in the microwave for four to five minutes, until desired tenderness.

Note
This a great addition to pork chops with hot honey drizzled on top.

Enjoy this easy, delicious dinner!





CALENDAR

♦INDIANA♦

The Beekeepers of Indiana will be holding their Fall Conference and Workshop on October 27-28, 2023. The event will begin on Friday evening with speaker talks and a snack.

The keynote speaker this year is Bob Bennie. Bob began commercial beekeeping in 1981 in Oregon and has been involved in commercial beekeeping in 10 states.

Other speakers include Mike Champlin who will present on "Bee Gadgets and Hacks, Stephanie Slate who will give tips and tricks for "Entering Honey Shows" and Jerry Zimmerman who will cover "Bee Biology".

There will be a Smoker Contest, Honey Show, Raffle and Auction. There will also be an area for vendors.

The cost is $50 for members, $60 for non-members and $25 for children 15 and under. The cost includes both the Friday and Saturday programs and a lunch on Saturday.

Registration is open at: **https://indianabeekeeper.com/events/fall_conferrence__workshops**

♦GEORGIA♦

Georgia Beekeepers Association's 2023 Fall Conference will be held on September 21-23, 2023 in Gainesville, GA.

Keynote speakers include Lewis Bartlett, Dewey M. Caron, Brock Harpur, Theresa Martin and Isaac Weinberg.

The conference will also include UGA Master Beekeeper Program Testing for all levels and Welsh Honey Judge training and testing.

For more information and to register: **https://gabeekeeping.com/**

♦LOUISIANA♦

The Louisiana State Beekeepers Association and the USDA Honey Bee Breeding, Genetics and Physiology Laboratory will hold the 27th Annual Field Day on Saturday, October 8th, 2023. The event will be held at the USDA laboratory, located at 1157 Ben Hur Rd, Baton Rouge, LA 70820. This is near the intersection of Nicholson Drive (Hwy 30) and Brightside Dr., which is about two miles south of the LSU football stadium.

Gates will open at 8am, with presentations and activities scheduled from 9am-3:30pm. The Field Day will include a series of talks in the morning for members of the Louisiana Beekeepers Association and the USDA staff about Louisiana beekeeping and research conducted at USDA lab. The afternoon features break-out sessions for beekeepers of all ranges of experience.

The beginning beekeeper course is directed to those who have little to no beekeeping experience. Topics will include basic bee biology as well as necessary beekeeping equipment and management techniques. A question and answer session precedes a practical demonstration in honey bee colonies.

The intermediate beekeeping course is focused on the beekeeper with a moderate amount of experience that is now ready to take it to the next level. Topics will include detecting signs of parasites and pathogens, performing swarm captures and cut-outs, followed by a final field session examining open colonies. This session will address the major problems in colony health and include discussion and guidance on the primary pests and pathogens affecting honey bee colonies.

There will be a workshop for advanced beekeepers that focuses on principles of selective breeding followed by a final session on queen rearing techniques.

LBA member registration fee of $35 and non-member fee of $40 for attendees 12 years of age and above. Children 11 and under must stay with their parents at all times. Registration includes a catered lunch.

Register at **www.labeekeepers.org** and pay by credit card or mail a check and a copy of the registration form to Louisiana Beekeepers Association to Beth Derr, 210 Meadowlark Dr, Jefferson, TX 75657. If mailing, it must be postmarked by October 1, 2023. Walk-up registration will be collected at the door for $40 per person.

For additional information, please visit **www.labeekeepers.org**. Alternatively, contact Kevin Langley (504-669-6830) at **la4honeybees@gmail.com** or Kate E. Ehle, PhD (225-692-1967) at **kate.ihle@usda.gov**.

CLASSIFIEDS

Contact Jen Manis to place an ad: Jen@BeeCulture.com

♦NEBRASKA♦

The Omaha Bee Club 2023 Convention will be held at Journey Church in Gretna, NE on Saturday, October 14, 2023.

Speakers and demonstrations include Dr. Jim Tew (zoom), Jeff Horchoff "Mr. Ed" (zoom), Landi Simone (zoom), Rob Snyder (zoom) and many others.

The event will include vendors, professional honey judging by Ginny Mitchell, a silent auction, classroom interaction and a catered lunch.

Go to **www.OmahaBeeClub.com** or the Omaha Bee Club Facebook page for more information and to sign up.

♦OHIO♦

OSBA Fall Conference will be held on October 27-28, 2023 in Wooster, OH.

There will be something for everyone from beginner to experienced beekeepers. The conference will include speakers, how-tos, latest research, honey judging, drawings and vendors.

Check for updates at **https://ohiostatebeekeepers.org/**

♦PENNSYLVANIA♦

Western PA Beekeeping Seminar will be held on February 9-10, 2024 at Gateway High School (3000 Gateway Campus Blvd. Monroeville, PA 15146).

Early bird tickets go on sale in September 2023.

For more information, please visit **https://www.beavervalleybees.net/yearly-happening-wpa-sem**

♦SOUTH DAKOTA♦

The Black Hills Area Beekeeper's Club will be hosting the annual Buzz in the Black Hills Conference on Saturday, February 24th, 2024 from 8am-4pm in Rapid City, SD.

Go to **https://www.eventbrite.com/e/copy-of-buzz-in-the-black-hills-conference-tickets-673898758327?aff=ebdsoporgprofile** for more information.

♦WASHINGTON♦

The **Washington State Beekeepers Association (WASBA)'s** upcoming beekeeping conference is October 7-8, 2023 in Olympia, WA!

The event will include a Saturday evening banquet with the famous "Dessert Auction", a live auction, raffles and much more!

The conference will conclude with the WASBA Annual Board Meeting on Sunday, October 8.

Profits from the conference benefits Washington Honey Bee Research.

You can learn more at **https://wasba.org/**.

♦ABF♦

The 2024 ABF Conference and Tradeshow will be in New Orleans. It begins with a dinner on Tuesday, January 9th, 2024 and ends on Saturday, January 13th, 2024.

A block of rooms have been reserved at the New Orleans Marriott for a discounted rate of $169/night (plus applicable taxes and fees). The hotel is located on 555 Canal Street, New Orleans, LA 70130.

Keynote speakers Dr. Samuel Ramsey and Dr. Frank Rinkevich will give the latest information about the *Tropilaelaps* mite and *Varroa* mite.

Some changes for the 2024 conference include a three track schedule with each section targeting a difference sector, meals in the evening, and ending with hive inspections at the zoo on Saturday (weather permitting). Special tours have been arranged for those that want to come early on Monday. The tours are available at a special rate.

Registration will begin on July 25th, 2023 with early bird registration rates through October 31st, 2023. Pre-registration will close on December 26th, 2023. Rates are in the table below.

Watch **https://www.abfnet.org/mpage/2024-ABF-Conference-Frame** for more information as well as a link to the registration page.

Looking to exhibit or sponsor? Send an email to Regina Robuck at **partnershiprelations@abfnet.org**.

ABF Registration Pricing	Early		Regular		On-Site	
Registration	Member	Non-Member	Member	Non-Member	Member	Non-Member
Individual Registrants Full Conference	$245.00	$305.00	$295.00	$355.00	$345.00	$405.00
Individual Registrants Day Rate	$150.00	$190.00	$175.00	$85.00	$200.00	$240.00
Student, Educator, ABRC, AIA	$60.00					

* 10% discount for active military and first responders.

To add your beekeeping event to the calendar page, email Emma@BeeCulture.com or Jen@BeeCulture.com with the following information at a minimum: the organization name, the location and date of the event, additional details (ex. speakers, class topics etc.), and a website for more information or contact person for individuals with questions.

If you are having a beekeeping event, we are happy to send back issues to give to your attendees and students. Please email Emma at Emma@BeeCulture.com with the number of magazines needed, a complete mailing address and a contact person.

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Image Contest – Honey Haul

We've started an image gallery! This month, we want to see any and all pictures you have of your **Honey Hauls**. 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.

How To Submit:

Email your images to **Emma@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)

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.

Bull Snake in a Subaru

Ed Colby

Walking down the path to the river the other evening, I almost tripped over a big bull snake. Mottled brown and tan, at first glance it looked like a rattler, but we have precious few of those around here. It was headed for the Interstate, about 20 feet away. What if I just grabbed it? I could turn it loose on the farm. Finally, a check on henhouse mice running amok! It looked sneaky, like the bull snake in the Garden of Eden. It didn't look friendly. But it looked like a snake that could take care of a mouse problem for sure.

When I put my foot on it, it tried to bite me, but I was crafty and quick. When I stepped on it with my other foot, closer to its head, it tried to bite me again. But I pinned it and grabbed it behind the head, like the snake guys on TV. I'm six foot, and when I dangled it in front of me, its tail nearly touched the ground. So it was what, four feet? Five? I'm saying five because I'm an angler, and you know how we are.

I had my snake. Now, what to do with it… It was a short walk to the car. While holding my prize in one hand I was able with the other to search through my junk-filled Subaru for some shopping bags with a zipper closure, some gunnysack waiting to get cut up for smoker fuel, something, anything, in which to put the snake.

Finding nothing, I tossed the snake in the back of the car and closed the door. It slid under the front passenger seat, and I went fishing.

When I got back it was way too dark. I flipped on all the interior lights but no sign of my new friend. I wondered if it might slide across my neck on the drive home, but it was a well-behaved snake and stayed in its lair. When I got back to the farm, I decided to release it in the morning.

About this time I had an unnerving thought: Don't bull snakes eat chicken eggs? Maybe I didn't want an egg-eating python patrolling the henhouse! On the Internet I learned that they also climb trees and raid the nests of wild birds, eating eggs and baby birds alike. My gal Marilyn's a bird admirer and advocate. Imperiled Lewis's woodpeckers nest in holes in dead limbs on the enormous poplar in the front yard. She was out of town and incommunicado, but I was pretty sure she wasn't going to go for releasing an aggressive bird predator on the property.

Next morning, I caught a glimpse of my snake poking its head out from under the passenger seat, but it quickly retreated when it saw me. I thought about killing it but how to commit such an act? And it somehow didn't feel right.

Next, I called a reptile pet store and amused the proprietor with my sad tale. He informed me that bull snakes are "very active" at night. The weather was stinking hot. I kept the Subaru in the shade all day, so as not to roast my reptile. When I checked in the cool of early evening, it was wrapped around the driver's headrest. Again, as soon as it saw me, it retreated under the seat.

Just before dark, I put my bicycle in the back and drove to a place down the road on Bureau of Land Management land that I thought the snake might like. I rolled down the windows and rode my bike home. When I went back the next morning the snake was gone.

But enough of snakes! You're reading this in September, but we just had the Fourth of July. Today, I tested a hive with a new Russian queen and counted 22 mites in a 300-bee sample. It's a little early in the Summer for such a big number. This could be a curtain call. But I don't blame the queen. She probably got dealt a bad hand, that's all.

I've had it with *Varroa*. This time I fixed their wagon. Because most of the mites are in the sealed brood, where they're hard to kill, I scraped the brood into a bucket and put the gooey scraped frames right back in the hive. Then, I gave the bees an oxalic acid dribble treatment, my favorite for knocking down *Varroa* in a broodless colony.

You might say, "Oh, but you killed all those valuable soon-to-emerge honey bees!" Those would be mite-ridden honey bees, and I don't want 'em. With the brood gone, this populous colony with its very fecund queen may, in the fullness of time, recover nicely. Or not. You never know.

When Marilyn got back, I thought she'd be proud of me for saving her Lewis's woodpeckers and her chicken eggs. But no. She insisted I should have released the snake right here on the farm! When I brought up the nest robbing and bird eating, she assured me our snake would surely not stoop to such activities, when mice are so plentiful.

Today, a small bull snake slipped down off the front porch. I looked at Marilyn and she looked at me. We watched it disappear into the high grass. BC

Gentle reader, did you find this poor epistle amusing, heartwarming, instructive? Contact Ed Colby at **Coloradobees1@gmail.com**. Ask him to promptly mail you an autographed copy of *A Beekeeper's Life, Tales from the Bottom Board* – a collection of the best of his *Bee Culture* columns. Price: $25. Satisfaction guaranteed or your money back!

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