THE STARK REALITY

JULY 2023

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The Magazine Of American Beekeeping

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John Root's Passing

Bee Vet Updates

Successful Re-Queening Strategies

AmiFlex

By Véto-pharma

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EVER AMITRAZ **"FLASH" TREATMENT** REGISTERED IN THE USA

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1 - No temperature constraints during use.
2 - 99% efficacy in brood-free colonies in one application, 56% efficacy in colonies with brood in one application, 83% efficacy in colonies with brood with two applications [7 days of treatment + 7 days of break + 7 days of treatment]. Treatment applied on Langstroth hives (4 x 3mL). "Rationale Supporting Proposed Application of Amiflex® to Honeybee Hives for control of Varroa Mite" - 2021

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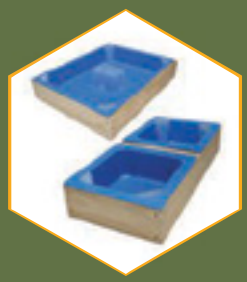
MITE CONTROL

TOP FEEDERS



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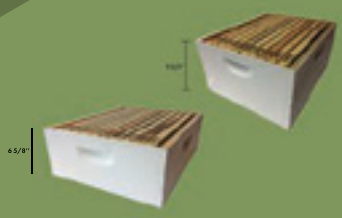

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Hives in the rain. Cover Photo by Deborah Sasser as part of our Image Gallery Photo Contest. Find details about the current contest images on page 95!

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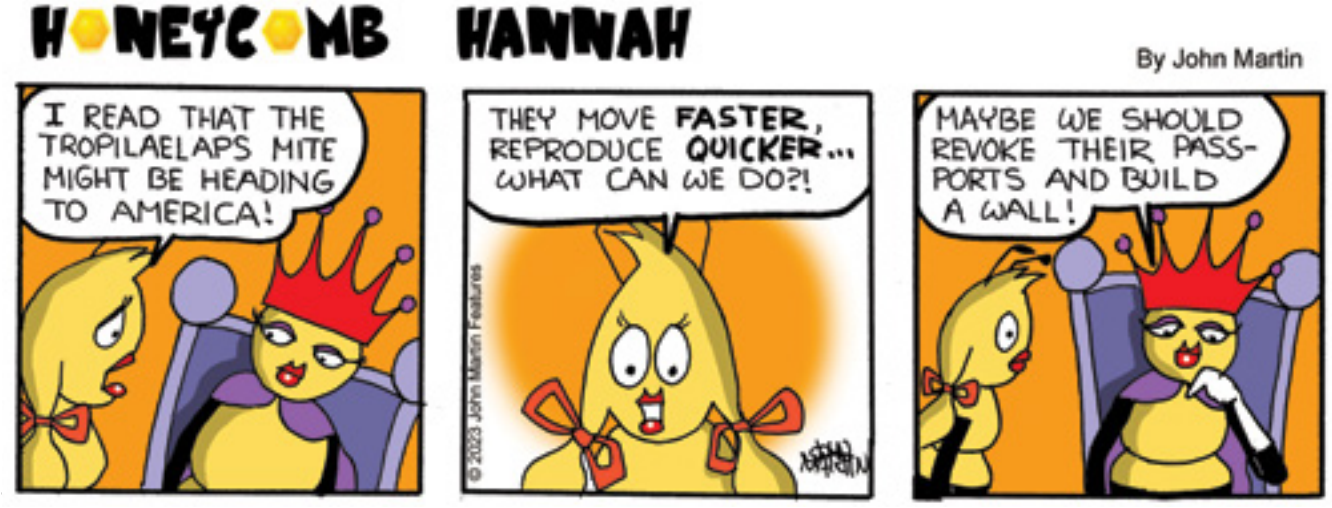

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Swarm Articles

Hi, my name is Lisa Coelho and I am a fairly new beekeeper in Western Kentucky. I was gifted a subscription to your magazine as a Christmas present and just received my first issue, May 2023, and I am enjoying all the information and articles in it.

The reason for writing to you is to possibly get some clarification regarding some of the information in your articles. I also suppose that, in a way, I am questioning some of the practices being covered in those articles. But I sincerely hope that this does not come across as judgmental, but rather as inquisitive with the hope of finding the best path to honey bee health and survival. I know that we all have our own ideas about beekeeping and ways of achieving our beekeeping goals, however there are a couple of statements within the articles that contradict themselves.

The comments that stood out refer to swarming and its connection to *Varroa* mites. Tina Sebestyen writes in the first paragraph of *Control Swarming Without Splitting:* "In fact, we know that our colonies need to swarm to help keep mite numbers low, besides the need to keep colony numbers up." But then she points out the negatives to the strategy of letting the bees swarm as it seems to cause an increase in mites. And without our help with IPM or treatment, the swarmed colony collapses and the robbing colony dies as well.

The other article is *Time Travel* by Ed Colby in which he points out that "…beekeeping's a gamble …a hive that rejects its new monarch is not necessarily doomed. It will most likely make a new queen all on its own, and the ensuing broodless period creates a break in the *Varroa* mite reproduction cycle." And yet he presumably re-queened all of his colonies and did so after losing two colonies to *Varroa*-induced viruses. He touches on the advantages of a colony making its own new queen, which is what happens when a colony naturally swarms, so maybe allowing swarming is something to be regarded as beneficial instead of an unfavorable occurrence.

Personally, I would like to see more information on the benefits of swarming and how it can be a way to help with the battle against mites as well as increasing honey bee colonies. Even if those colonies don't end up in one of our own hives, at least we've contributed to the bee population. Maybe this isn't a good option for bigger outfits who rely on getting as much honey as possible, but for the backyard hobby beekeeper it might be one of the secrets to healthy colonies. While the goal of many and possibly most beekeepers is to produce the maximum amount of honey possible I believe that, as conscientious beekeepers, our primary focus should be on the continuation and growth of the honey bee population. To state the obvious, no honey bees, no honey. Perhaps I sound like I'm simplifying the world of beekeeping and while the lives of honey bees and their colonies are complex, I believe that keeping bees doesn't have to be. We continue to research and study the honey bee to learn about their science and biology which helps us to understand and manage our own hives, but at the same time I feel that we are losing touch with the nature of the bees. We seem to have forgotten that they know what to do and have known how to do it all along. The more we intervene, the more we create a honey bee that relies on us and our treatments and innovations for its survival, when without our "help" it knows perfectly well how to survive. Perhaps we should reflect on some of the words that were written in those articles – "…colonies need to swarm to help keep mite numbers low, besides the need to keep colony numbers up." And I think we need to give the bees a little more credit for doing what they already know how to do.

Thank you for taking the time to read this. I look forward to future *Bee Culture Magazine* issues and hope to read articles that cover some alternative and natural beekeeping methods as well as conventional.

Sincerely,

Lisa Coelho, a honey bee landlady

Response from Tina

Lisa,

I love your inquisitive letter, and the fact that you are really paying attention to the bee biology that makes things work. I often think of it as a puzzle, with many pieces that need to fit together. Here is a little more information that will make this puzzle more complete.

Tom Seeley, who has written many books and articles on beekeeping and the survival of honey bees in the Arnot forest before and after the coming of *Varroa*, has some interesting things to say about this. He is one of the big proponents of "Darwinian" beekeeping, in other words, letting the bees learn how to survive *Varroa*, or die. He is the one I was quoting when I said that bees need to swarm to survive *Varroa*. But, when I asked him directly, "is splitting as good for bees as swarming is?", he said yes! The best way we can help our honey bees do what they want to do (the definition of good beekeeping) is to split the colony just like they would in a swarm. The mother queen moves, along with some of the bees, to a new location, while the daughter queen gets a brood break. This way, both colonies can survive, and we haven't added to the problem by proliferating *Varroa* populations. The point here is that when a colony swarms, they send some of those mites away with the mother queen and the bees that go with her, and the colony with the daughter queen gets a good brood break, during which life is very hard for *Varroa*, who are all on adult bees and are vulnerable to grooming. The mother queen and her colony that swarmed almost always die. By swarming, one of the colonies has a chance to survive, but if we split, and do it with an eye to IPM (Fool-Proof Splitting, or the flyback split), both colonies can survive. Splitting honey bee colonies is not unnatural, quite the opposite, and as part of Integrated Pest Management, it's one of the foundations of natural mite control.

The sad fact is that bees do not know how to deal with *Varroa*, since it is a new parasite for *Apis mellifera*.

Honey bees are doing what is in their nature… sending another colony out into the world, reproduction at the super-organism level. The brood break happens to help the daughter queen sometimes survive *Varroa*. They are not swarming because they know how to deal with *Varroa*. They are swarming because hundreds of years ago, when they did so without *Varroa* on the scene, both colonies had a chance of surviving. Now, we not only have *Varroa*, but in our attempts at "live or let die" we have allowed *Varroa* to proliferate so much that they picked up more and more diseases that they now pass to our honey bees.

I do structural removals; getting bees out of people's houses when they move into inconvenient places. Years ago, when *Varroa* was newer, and were only eating the livers out of our honey bees, and not passing all of these diseases, too, we refused to do cut-outs after the Fourth of July, since the bees didn't have enough time to pull new comb and make enough honey for Winter. The last five or six years, if we leave the bees alone over Winter and go to get them in the Spring, they are always dead. I haven't seen a single colony survive Winter without help against *Varroa*. They really can't do it, and it is getting harder for them, not easier. Even in the Arnot forest where there is not human intervention, where bees live or die, they have not succeeded in gaining a genetic advantage. The mother queen swarms and her colony dies. The daughter queen's colony may live, as long as it stays tiny and does not make much population. That is not how honey bee colonies are meant to function.

I could write more, but, this isn't an article. I recommend that you take that interest and put it to good use. Go on **scholar.google.com** and start doing some research. Start with reading Dr. Sammy Ramsey's work on *Varroa* and fat Winter bees.
Tina Sebestyen

Response from Ed

Thank you, Lisa, for your thoughtful and well written letter to the editor. I understand your concerns, and I respect your opinions. But there are more ways than one to keep bees.

Almost everything we beekeepers do has an upside and a downside. I divide hives to replace my losses, and I like to give the queenless half a mated queen. The downside is that I don't get that nice broodless period to break the mites' reproduction cycle. The upside is that the bees don't languish for nearly a month while they make a new queen. The queen goes right to work laying eggs, and other things being equal, a split with an introduced queen will likely produce more honey than one left to make its own queen. I'll take that. I'm in the bee business to supplement my Social Security. You might not be in my position. You have your interests and point of view. I have mine. I'm not right, or wrong, and neither are you.

Good luck with your newfound hobby, and may I recommend to you Tina's recipe for her remarkable success in the beeyard: "I *never, never, never* give up!"
Ed Colby

Tropilaelaps

Hello Ross, my name is Blake Cothron and I have been following you through *Bee Culture Magazine* for a couple years now. I read your *Natural Beekeeping* book at least twice over the last 10 years. I have been keeping bees organically for about five years now and have experienced amazing success, with lots of hard work. I'm in Kentucky. I read your article on *Tropilaelaps* in the April 2023 issue. Just wanted to say THANK YOU for a positive piece of information. I have never known anything other than *Varroa* and SHB and so the thought of some '*Varroa* on steroids' pest looming over us made me uneasy. Your article clearly points out some major points regarding the nature of the pest that identify some weaknesses and practical management strategies if and when the mite shows up. You've obviously done a ton of research and thank you for sharing this useful article. It made me lose my fear of yet another catastrophic issue with honey bees. Spotted Lanternfly will likely be in our area within five to 10 years and I recently learned that they do not show up in mass until after the main honeyflow in Kentucky (June-early July), meaning that the honeydew the bees collect from them only fouls up the Autumn honey crop, which, personally I never harvest anyway. That was a relief for me also. Thanks again and keep up the good work.
Blake Cothron

Response from Ross

Hi Blake,

Thank you for your message and for your kind words about my book and recent article in *Bee Culture*. It is wonderful to learn of your success with the bees. We are all in this together and I find that we can all learn from each other.

The spotted lantern fly is expected to reach Vermont at some point in the future as well. Until your correspondence, I was not aware that they produced honeydew that the bees might gather. As you are aware, our Winters here in Vermont are much harsher than in Kentucky and bees do not overwinter well on honeydew due to the high amount of indigestible material in the honeydew honey. Thank you for giving me a heads up on a potential issue I will have to contend with in the future. I hope you and your bees are wintering well.
Ross

NEXT MONTH

Region 1
- Think about mite sampling
- Harvest honey
- Get ready for Fall flow
- Feed if in a dearth
- Add supers for Fall
- Create a brood break before mite treatment
- Give room if needed

Region 2
- Re-queen weak colonies
- Watch for robbing
- Inspect colonies for mites/disease
- Check stores
- Replace queens
- Sample and treat for mites
- Combine weak colonies

Region 3
- Sample/treat/sample again for mites
- Check queen patterns, re-queen if needed
- Look for SHB in weak colonies
- Sample for mites
- Feed weak colonies
- Provide water for colonies
- Keep an eye on stores

Region 4
- Brood break / mite count
- Harvest honey
- Remove all supers
- Test mite level before and after treatment
- Combine weak colonies
- Prepare for Fall flow
- Re-queen

Region 5
- Mite sample and treat
- Start Fall feeding
- Pull crop
- Fall flow honey supers
- *Varroa, Varroa, Varroa*
- Check for re-queening
- Inspect all brood boxes

Region 6
- Check for *Varroa*
- Add supers
- Watch for Fall swarm cells
- Get honey supers off
- Late Summer mite treatment if samples show
- Sample/treat/sample/ cross your fingers
- Feed until Fall flow

Region 7
- Supplemental feeding
- Mite sampling
- Replace old queens exposed to mite treatments
- Winter will be here soon
- Build insulated covers
- Equalize colonies
- Inspect all colonies frame by frame

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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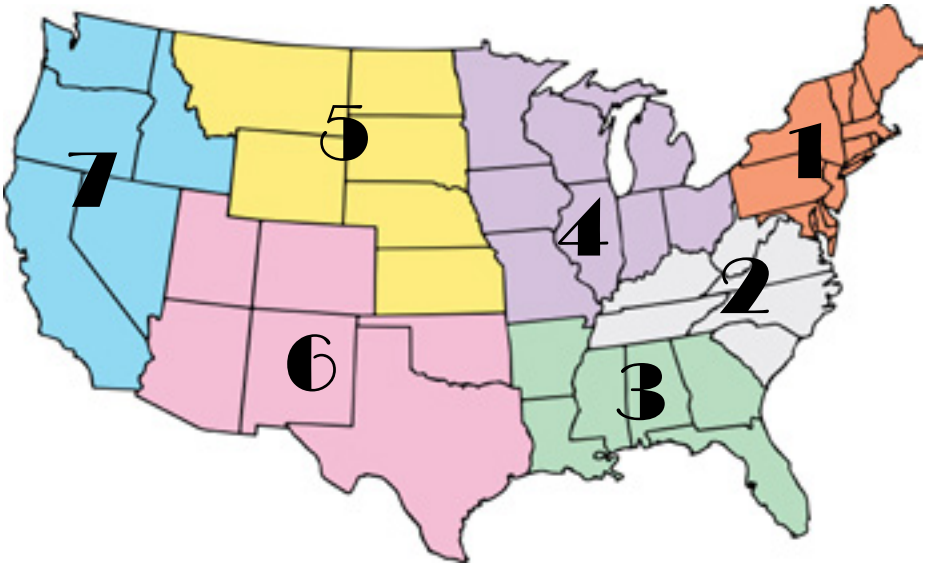


JULY – REGIONAL HONEY PRICE REPORT

	REPORTING REGIONS										History	
	1	2	3	4	5	6	7					
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS								**Range**	**Avg.**	**$/lb**	**Last Month**	**Last Year**
55 Gal. Drum, Light	2.51	2.93	3.13	2.88	2.75	2.87	3.48	2.00-4.00	2.92	2.92	3.05	4.06
55 Gal. Drum, Ambr	2.38	2.82	2.85	2.84	2.87	2.70	3.25	2.00-4.00	2.82	2.82	3.07	3.78
60# Light (retail)	229.92	293.85	237.00	216.50	231.25	243.69	310.00	120.00-390.00	241.92	4.03	244.60	216.79
60# Amber (retail)	224.92	274.15	258.00	212.25	237.50	241.42	252.50	120.00-384.00	238.70	3.98	240.03	214.20
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	99.10	112.80	100.33	85.50	66.40	90.00	-	63.00-144.00	95.44	7.95	105.81	101.24
1# 24/case	179.84	171.00	172.93	140.69	178.71	135.18	144.00	69.00-360.00	164.79	6.87	161.15	146.91
2# 12/case	160.55	192.00	167.22	116.10	173.76	151.50	156.00	84.00-300.00	154.55	6.44	155.04	138.09
12.oz. Plas. 24/cs	167.95	152.10	141.75	98.60	111.84	117.48	117.60	72.00-480.00	137.33	7.63	124.03	115.32
5# 6/case	186.89	240.00	251.47	130.60	126.87	136.00	-	96.00-450.00	179.44	5.98	170.12	149.64
Quarts 12/case	184.60	209.67	224.40	163.38	187.39	206.94	205.50	120.00-350.00	197.18	5.48	197.91	175.71
Pints 12/case	106.80	138.00	117.20	96.31	107.25	135.00	115.20	72.00-180.00	114.02	6.33	114.29	111.79
RETAIL SHELF PRICES												
1/2#	6.28	7.44	5.92	5.29	6.23	7.50	-	3.25-12.00	6.36	12.72	6.27	5.65
12 oz. Plastic	8.74	8.65	7.83	6.98	6.31	8.06	5.92	4.29-20.00	7.93	10.57	7.76	6.87
1# Glass/Plastic	10.15	11.70	10.96	8.45	9.71	8.33	10.25	4.00-20.00	10.17	10.17	10.23	9.01
2# Glass/Plastic	16.98	20.18	18.32	14.90	20.02	14.10	15.00	7.29-38.00	17.24	8.62	18.01	14.85
Pint	12.16	15.36	11.84	12.40	10.23	17.33	12.13	5.00-26.00	12.88	8.59	12.49	11.46
Quart	24.67	23.74	20.06	20.91	19.40	20.13	20.40	10.00-42.00	21.82	7.27	31.90	20.47
5# Glass/Plastic	36.85	39.80	49.25	29.43	31.93	37.00	-	18.00-75.00	36.28	7.26	36.51	33.55
1# Cream	12.21	12.74	10.13	10.60	10.63	10.00	16.00	7.99-20.00	11.60	11.60	12.11	11.09
1# Cut Comb	14.77	15.40	13.17	13.75	13.50	25.00	-	8.00-25.00	14.57	14.57	15.31	14.07
Ross Round	13.80	16.45	18.50	12.25	-	-	15.25	8.00-24.00	14.88	19.83	12.49	10.32
Wholesale Wax (Lt)	7.00	7.90	6.95	6.88	7.50	4.50	4.15	3.00-10.00	6.85	-	7.15	7.19
Wholesale Wax (Dk)	4.71	6.98	7.58	5.40	8.00	3.25	-	2.00-10.00	6.01	-	6.43	6.06
Pollination Fee/Col.	92.90	78.00	97.50	124.00	200.00	-	50.00	50.00-225.00	103.36	-	111.93	97.89
Price of Nucs	194.41	191.09	168.64	173.18	152.50	190.00	225.00	115.00-290.00	185.28	-	183.97	-
Price of Packages	163.26	141.50	126.25	144.50	157.50	200.00	200.00	107.50-225.00	153.36	-	151.57	-

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 April/May 2023.

Average Honey Flow Time and Amount per Region

Region 1:
Timing of Flow: Early
Amount of Flow: Average
Region 2:
Timing of Flow: Normal
Amount of Flow: Average
Region 3:
Timing of Flow: Late
Amount of Flow: Average
Region 4:
Timing of Flow: Equally early and normal
Amount of Flow: Average
Region 5:
Timing of Flow: Late
Amount of Flow: Light
Region 6:
Timing of Flow: Late
Amount of Flow: Average
Region 7:
Timing of Flow: Late
Amount of Flow: Average

Mite Treatment per Region

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

Top Blossoming Plants per Region

Region 1: Dandelion, Apple, Maple, Black Locust, Honeysuckle, Clover, Pear
Region 2: Tulip Poplar, Blackberry, Clover, Poplar, Black Locust, Honeysuckle, Apple, White Clover
Region 3: Privet, Tulip Poplar, Blackberry, Clover, Tallow, Galberry, Trees, White Clover, Wildflowers
Region 4: Dandelion, Fruit Trees, Black Locust, Autumn Olive, Dutch Clover, Locust, Maple, Tulip, Tulip Poplar
Region 5: Dandelion, Apple, Chokecherry, Cottonwood, Elm, Ground Ivy, Plum, Trees, Wildflowers
Region 6: Dandelion, Wildflowers
Region 7: Dandelion, Fruit Trees

Overall Top Blossoming Plants

Dandelion, Tulip Poplar, Clover, Apple, Black Locust, Blackberry, Fruit Trees, Maple

STUDY HALL

GRUMPY SWARM

QUESTION

Early on, I was fortunate to discover that the myth that all swarms are gentle is a big myth. When one of my first colonies swarmed, my husband showed it to me in the hedge. I was dressed in the clothes I wore to teach, not my bee suit, but that didn't stop me from trying to put the swarm in a box. Man, they nailed me! I got at least six, probably more, stings and ran into the house feeling my body pulsating! I never repeat that myth!
Etta Marie

ANSWER

Long, long ago on a planet far, far away after being a high school teacher, I went back to school to study my new passion, apiculture. My major professor was Dr. Jim Tew at the Ohio State University. I was a new beekeeper and wanted to immerse myself in everything Dr. Tew could share and demonstrate.

It was Springtime in Ohio. Dr. Tew got a call from campus security that there was a honey bee swarm on a short sign pole in the parking lot. He asked if I would like to learn how to collect it. "Of course," I said. We went to the storage building and got a nuc box with a top and bottom and a bee brush and took this out to the parking lot where we found the swarm on the five foot T-post. Dr. Tew explained that we didn't need any protective gear as swarms are gentle. As instructed by Dr. Tew, I took the frames out of the nuc box and placed it directly below where this fairly large swarm was hanging onto the T-post. For the next step, I was then told to hold the bee brush above the swarm and then in one motion smoothly move the brush down and 'dislodge' the swarm, making it fall into the nuc box. And voila we will have captured the swarm.

I did as instructed. Immediately, the swarm did not smoothly fall into the nuc box but instead went to my face and body along with Dr. Tew's face and body. We ran. After this learning experience, Dr. Tew explained to me that most swarms fill up with nectar and honey so that they will have some resources to begin wax production at the new colony hive location and as such they are calm and because their abdomens are full of honey, they cannot bend their abdomens easily to insert their stingers in a threat. But, sometimes there are multiple swarms from a colony and not enough nectar/honey resources to fill up on before they leave. They are called 'Dry Swarms'. So 40 years ago I learned about 'Dry Swarms' from the best.

Have a wonderful sting-free day!

DEAD OUTS, NOW WHAT?

QUESTION

Hello,

Can you give me some advice or suggestions on what to do with my old frames from three dead outs that I have this year? I have many frames that are just old comb, and many that have fully capped honey in them.

Could I just put the capped honey frames in a box and open feed the other hives I have? My hives died out because of low numbers, and mites.

Thank you for your help.
Mark

ANSWER

Good morning Mark.

Here are bunch of things to think about and that you should keep in mind.

In the wild, when we had lots of honey bee colonies living in hollow trees, before *Varroa*, they would only live in there three to five years before the colony swarmed many times, absconded or died out. When they died out, that left a significant amount of old, dark, used comb behind. Honey bee foragers are environmental samplers. As they bring nectar and pollen/bread in, they bring along lots of other stuff. So, they're old comb is a reservoir of viruses, bacteria, bacterial spores, environmental chemicals and agriculture and home owner chemicals.

Beeswax, as a fatty acid, absorbs and hangs on to lots of things. The comb is dark because as honey bees develop into adults in the cells, they shed 'larval skins' that are in layers and layers and layers and viola, dark comb. When the colony was no longer active in that site, mother nature had a solution to remove old comb and the disease reservoir. That solution is wax moths. Wax moths want to reproduce, survive and move in as this old comb and larval skins are a food resource for their growing larvae. The wax moth larvae eat and destroy the comb, as you may have seen before, and thus significantly lowers the ability of disease and chemicals to be a future factor in honey bee health for the next colony that moves into this space. Wax moth in this context is the honey bees' and the beekeepers' friend. But we as beekeepers have been told to keep wax moths from destroying our stored comb especially.

There is information available that shows that removing three frames or so of old comb every year and replacing with new foundation can lower disease issues in honey bee colonies. We are in fact acting as surrogate wax moths.

Per your question, get the old comb out, render it for whatever beeswax might still be there or just throw them out and start 'fresh'. Then begin with the every year, three combs replaced management tool.

From the Editor, Jerry Hayes

If your colonies died from high *Varroa* levels, remember the colony did not die from *Varroa* mites, it died from the viruses that *Varroa* bring to the party which then lowered immunity in individual honey bees and the colony in general. Those viruses will be in the honey as well. Whether they will be infective if fed back to other colonies is a toss-up. Being a beekeeper in 2023 is like going to Las Vegas.

All that boils down to you have to make you own decision now. All the best. Hang in there.

WHICH BEES ARE BETTER?

QUESTION

Two native bees *Habropoda laboriosa* and *Voccinium agustifolium* are only two of the many pollinators for the low bush blueberry that are similar to the bumblebee. Why are honey bees promoted as blueberry pollinators rather than providing the much more efficient native bees? Is it just the financial aspect or am I missing something?
Tim Fulton

ANSWER / Earl Hoffman

I turned this one over to Earl Hoffman.
Hello Timothy Fulton.

Thank you for the excellent question on native bees vs *Apis mellifera*.

The economics of pollination require a high density of pollinators per acre because of the density of crops that need the transfer of pollen to create fruit.

Most native bees are not social bees, but solitary bees. They have nests that do not have thousands of foragers but only have, at most, hundreds of foragers.

The other aspect of *Apis mellifera* is easy propagation of the species. Queens and drones of honey bees are created with little effort by beekeepers. This allows thousands of hives to be created each Spring during pollen and nectar cycles.

Bumble bees and other native bees are thousands of times more difficult to propagate. There are only a few companies in the world that produce native bees for sale. These nest boxes are sold to greenhouses and other niche markets. They are very expensive and are only viable for a short period of time.

So I repeat my reply to your question on why native bees are not used to pollinate fruits like blueberries. Honey bees are more abundant and much cheaper to propagate. There are about two million beehives in the U.S. The native bee breeders produce thousands of small nest boxes each year and those are used in greenhouses worldwide. They are very expensive. Approximately 10-20 times more expensive. And again, I repeat these native bee boxes only have a small nest that lasts weeks, not years.

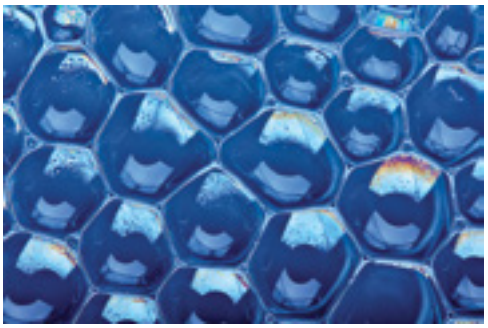
Last, some native bees are not propagated because either man has not learned how to control the creation of queens and drones or the cost and economics of such activities are not cost effective. It costs more in labor and time to create them than what the pollination revenue is worth. You cannot spend a million dollars to make a thousand dollars in pollination fees.

Please ask more questions as you see fit.
Thank you!
Earl Hoffman

HEXAGONAL CELLS

QUESTION

Hi Jerry, thanks for all the great info in *BC*... I have a quick question regarding the bees making their own wax foundation. In reading on the web and elsewhere, there seems to be two conflicting theories about how this is done. One says the bees themselves construct the new foundation cells one by one in a hexagon pattern right from the beginning. The other



says they create roughly cylindrical cells first which, when pushed together as the foundation expands, are forced from the cylindrical form into that beautiful and space-maximizing hexagonal shape. Which explanation is correct?
Dan Smith

ANSWER

Hey Dan,

Check out **https://nautil.us/why-nature-prefers-hexagons-235863/.** Good article.

And yes, both are correct. We humans have made foundation with the starter hexagonal shape to save the bees time and beeswax resources. If you have seen free form comb not made using the hexagonal foundation starter, the cells are more roundish than hexagonal. You can see the kind of intermediate shapes.

In the image above, when soap bubbles, in this case, are formed together, they form hexagons as this shape is more stable and the bubbles can use this structure together to last longer. BC

FOUND IN TRANSLATION

City Bee, Country Bee

Jay Evans, USDA Beltsville Bee Lab

Listen along here!

In Aesop's fable, *City (Town) Mouse, Country Mouse*, a city mouse regales her skeptical country cousin with a rosy view of high density living. Sampling both, the country mouse prefers to stay put, largely because "the country mouse lives in a cozy nest at the bottom of a tree. Her home is small, but it is warm and comfortable." Plus… no cats!

Beekeepers and bee scientists like to contrast the lives of bees under our care in apiaries (dense cities of colonies) versus those out on their own in trees. Aside from giving general insights into bee biology, these comparisons can predict the risks of managed and feral bees sharing disease while also showing how well 'city' and 'country' bees deal with various stresses. We have great data for the numbers of managed colonies, but how many country bees are we talking about?

I have discussed before the achingly beautiful (and hard) work by Tom Seeley and students assessing feral bees in a U.S. forest. Borrowing from those and similar studies, we can get a rough estimate of how many country bees there are in hollow trees and other cavities. My Sunday afternoon and small brain can't grapple with honey bee density in deserts and the vast tundra, but considering four adjoining states (New York, Pennsylvania, Maryland and Virginia) with decent land-use data from the USDA (**https://www.ers.usda.gov/data-products/major-land-uses/maps-and-state-rankings-of-major-land-uses/**), we can estimate 'suitable' acreage (fallow fields, pasture and forests) at around 58 million acres total (60% of the available land). Using consensus estimates of 2.5 colonies/square-mile (one colony/square kilometer, 0.004 colonies/acre), one arrives at 233,000 feral honey bee colonies in these four states. According to USDA (**https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Bee_and_Honey/**) ,there were 67,500 managed colonies in these states on January 1, 2021, surveying beekeepers with five or more hives. Even doubling this number to account for backyard beekeepers and those who evade surveillance, there are still fewer managed than feral colonies in these regions.

So, free-living bees are likely to be important for their own sake, and for the environment. What's it like out there? Taking a disease angle, several studies have compared the relative disease loads of managed and feral colonies in the U.S. Amy Geffre and colleagues from San Diego sampled boxed and free-living colonies (three colonies each) seven times over the course of a year to measure virus levels for three common bee viruses (*Preliminary analysis shows that feral and managed honey bees in Southern California have similar levels of viral pathogens.* 2023. Journal of Apicultural Research, 62:3, 485-487, **DOI:10.1080/00218839.2021.2001209**). Both colony types were remarkably similar in virus levels, changing with the season but hardly differing from each other.

In *Persistent effects of management history on honey bee colony virus abundances* (2021. Journal of Invertebrate Pathology 179:107520, **https://doi.org/10.1016/j.jip.2020.107520**), Lewis Bartlett and colleagues found similar patterns between free-living and managed colonies but noted that the style of management might play a role. Namely, colonies maintained in a larger commercial apiary (hundreds of colonies) tended to have the highest levels of most viruses, with feral and low-intensity 'backyard' colonies being about the same. As in most field studies, there is abundant variation for viral disease *within* each category, so these results will need even more sampling to see how viruses and bees fare under different management styles. Nevertheless, they suggest that beekeepers adopting a 'country bee' approach by spacing out colonies to reduce urban interactions will be doing their bees a favor.

In the most ambitious study to date, Chauncy Hinshaw and colleagues surveyed 25 colonies each from feral and managed colonies in Pennsylvania (2021. *The role of pathogen dynamics and immune gene expression in the survival of feral honey bees.* Frontiers in Ecology and Evolution, 8, 594263. **https://doi.org/10.1080/00218839.2021.2001209**). They surveyed ample bee numbers per collection (75 worker bees), perhaps getting a better sense of average disease loads. Even better, they paired similar city and country colonies from a bunch of regions, which helps account for other factors that might change virus loads. In this study, managed colonies tended to have lower levels of mite-transmitted deformed wing virus, presumably reflecting mite treatments, and roughly similar levels of black queen cell virus and nosema. Perhaps reflecting pathogen exposure, feral colonies had higher levels of several immune response proteins as well. Given the higher number of sampled colonies, these researchers were also able to show how their measurements relat-

ed to colony fates. As in prior studies, deformed wing virus, presumably alongside mite loads, was a good predictor of a bad colony outcome.

Colonies showing higher levels of two immune genes, once other factors were evened out, were more likely to survive the study period. Arguably, these proteins might be good predictors of genetic components that help bees survive in the face of disease.

More can be done to contrast the lives and successes of city and country bees. These comparisons can help improve bee management by those of us keeping bees in clusters of Langstroth high-rises. It is also fun to think of bees in the ancestral habits they have followed for thousands of years. Country bees almost certainly have more threats now than they did when humans were more scarce, and there has to be some level of contact between city bees and country bees that muddies all of these comparisons, but in many ways the presence of country bees at all is comforting. Left to their own care, they are making country homes work wherever they can, and that is a good lesson for beekeepers.

In full disclosure, the lives of country bees were not on my mind until a recent inquiry from British bee researcher Francis Ratnieks and his graduate student Ollie Visick. In their Laboratory for Apiculture and Social Insects (**https://www.sussex.ac.uk/lasi/**), they are comparing the lives of free-living honey bees in their native range to their hived cousins. As ecologists, their studies will give insights into how honey bees used to live in the forests and fields of England. I thank them for the prompt (and welcome hot tips from any of you) and look forward to reading their results! BC

Welcome to Beekeeping

John Miller

According to National Honey Board information, there are between 125,000 to 150,000 American beekeepers. If you are the publisher or the editor of either of the two trade publications, *Bee Culture* or *American Bee Journal* – your mission is to attract new readers.

A lifetime ago, I served on the honey board. I found a remembrance of a legendary advertiser, David Ogilvy who said: "We sell, or else." I hung that full-page *Wall Street Journal* ad inside my office door for several years.

At the time, there was an abundance of beehives to pollinate the almond crop; so we had to sell on our colonies strength, our commitment to service and availability to growers. It's true whether selling nucs, magazines or clicks. We sell, or else. A recent internet search of 'beekeeping' produced 33,800,000 hits. That's a lot of information and disinformation being 'sold'.

Mixed messaging is confusing to new beekeepers. There is a super-abundance of beekeeping disinformation, and the disinformation is hundreds of years old, having achieved a life of its own. We find it in beekeeping clubs, a well-meaning, but incompetent beekeeper will share sage advice which is just completely wrong, along with other situations. Here are a couple of examples:

David Libchaber wrote saying: "For a new beekeeper… reading diametrically opposing views in the same issue [*ABJ*] and have no guidance as to what is true or false." That's a fair observation.

How many of us have been told to introduce a queen: cage between center frames, candy side down, facing the brood, 5d nail punched through the candy so the bees can get to the new queen, but not too fast – or they will kill her. No mention of the lethal nature of a 5d nail punched a little too far, a little too fast, because the candy got a little too soft. Many others of us have been told to introduce a queen: at dusk, at the entrance of the hive, tear the wire screen from the queen cage, allow the queen to walk in the entrance – boom – new queen.

Or how about this gem? Queen cells **must** be in the nuc **before** the virgin hatches.

I cannot tell you how many hundreds of virgins I've herded from a basket of cells into a nuc; in direct defiance of what I was taught – and watched that virgin march right onto the top bar and down into the nuc – in charge and large.

Rod Earnhardt writes, a few pages further in: "I have read everything from do not feed at all – to feed the entire first year and everything in between. Which is right?" Try this with dogs. Do not feed the dog for the first year. Then get another dog, and feed it the entire first year. Leave a bowl of dog food out – the entire first year. A hive will pick up feed when the available nectar is insufficient. Bees can be fed on a honey flow – but they won't pick up the feed.

More? 106 years ago, a patent was issued for "Aluminum Honeycombs to Double Bees Output!" Patent #1,224,479 issued May 5, 1917. The hustle forgot to also mention "Now! Gluten-Free Aluminum!" – but 1917 was before gluten free was a thing.

So, readers: where do we get our information? How do we verify the accuracy of the information? While I actively kept bees, I was familiar with *ABC & XYZ,* a hundred-plus years-old publication from *Bee Culture,* now in its 42nd edition. The internet? Oh, boy! From time to time I view a few sites, and the chats can get pretty out there – and if you're one of the 150,000 beekeepers trying to find your way in beekeeping I'd say the internet is as potentially lethal to your beehive as that club member who thinks he has the answers – and does not.

Question everything. Malcom Gladwell has a book called *What the Dog Saw.* In my previous example about feed, consider what the dog sees. In the first example, the dog sees no food, and goes elsewhere for food. In the second scenario, the dog sees ample feed – and does not go elsewhere for food. In beekeeping it isn't quite as simple as when the human observes the empty bowl, and refills the bowl – the human having been trained by the dog to feed it.

In beekeeping, more than a few times a year we need to gear up and go look in our colonies. If there are no capped stores of honey or feed – *feed your hive.* If the hive is busting with bees, brood and honey – *do not feed your hive.* It's pretty simple.

To mangle a phrase: what do the bees see? Bees are pretty smart, aware even. Their reactions are pretty simple. "I'm hungry. I'm cold. I'm hot. I'm sick. I'm threatened. I'm stuffed. I'm leaving."

Humans are aware that we are aware. That awareness makes us different. By observing what the bee sees, we can actually do pretty good beekeeping. Observe conditions. Mites, disease, stores of honey, general conditions, meaning are hives prospering? Big flight? Ample pollen inbound? How is that flight pattern? If there is no news, scouts return from the field in no particular hurry, hovering and weaving a bit before entering the hive. If the scout found food, and it's news, those scouts beeline straight into the hive to share the news.

Beekeeping should be a great joy to the 135,000 beekeepers who do not subscribe to *Bee Culture.* I don't know how to reach those beekeepers, and I lead a state organization. We have a membership of about 70 beekeepers in a state with almost 450 registered beekeepers. When we send an email newsletter – with vetted, accurate information – our open rate is about 2%. How to reach those 440 other beekeepers? BC

John Root's Passing

John Alan Root, age 90 of Sarasota, Florida, passed away peacefully surrounded by family on April 26, 2023, after a 23-year journey with Parkinson's Disease. He was born on February 17, 1933 in Akron, Ohio to the late Alan and Emilie (Myers) Root.

John was a 1950 graduate of Medina Senior High School, after which he attended Ohio Wesleyan University, earning a Bachelor's Degree in Business Administration. Upon graduation, John moved to Texas where he served his country as a pilot in the United States Air Force, achieving the rank of Captain. In 1957, he completed his military service and moved back to Medina, Ohio with his young family. He became the fourth generation of the family business, The A.I. Root Company. John spent the last twenty years of his career at the Root Company serving as President & Chairman of the Board, officially retiring in 2008.

John was a true servant to his community. Most notably he cherished his time serving on the Medina City Council (1962-1976), the Medina General Hospital Board of Directors (1971-2008), the Board of Directors for Ohio Farmer's Insurance & Westfield Group (1986-2004), the National Candle Association Board of Directors (1989-2010), and the Medina Municipal Airport Advisory Commission (1989-2004).

During his time at the The A.I. Root Company, John was the Executive Publisher of *Bee Culture Magazine*. He was President of the Honey Industry Council of America from 1962-1963 and 1976-1977, President of the Ohio Agricultural Council from 1973-1974, President and Chairman of the Board for the Eastern Apicultural Society of North America, Inc. in 1978 and Chairman of the Board from 1983-1984, as well as Key Advisory Commission of the Agricultural Technical Institute for nine years (1984-1993). There are numerous other organizations that John has served in over the years.

Early in his life, John garnered a deep love for aviation. This passion persisted through his entire life as a private pilot. During his "free time" John could be found at Medina Municipal Airport piloting his airplanes. A loving and kind man, John will be deeply missed by his family and friends.

John is survived by his beloved wife of 30 years, Elisabeth (Grotte) Root; children, Alan (Esther Morera) Root, Nanette (Harold) Waite, Brad (Kathryn) Root; grandchildren Meredith (David) Gilpin, Christopher (Ashley) Waite, Crystal (Jeremy) Doyle, Alex (Abby Araujo) Root, Kyle (Morgan Moritz) Root, Andrew Root, Emilie Root; great-grandchildren, Claire, Abigail, Evan, Samuel, Hank, Josiah, Owen, Oliver, Elijah, Amelia; siblings, Elizabeth Judkins, Stuart (Diana) Root. He was preceded in death by his parents, Alan and Emilie Root. BC

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Apistan, lab study: 95.72% Varroa mortality *(Insects, 2018)*

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

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A Closer Look

Pollen Collection and the Corbiculae

Clarence Collison

Pollen is the main source of protein in a honey bee's diet and the primary food for their brood (Brodschneider and Crailsheim, 2010). To collect and transport pollen, honey bees mix it with regurgitated nectar and form it into a pellet. They carry the pellet on their hind (metathoracic) legs in a structure called the corbicula, or pollen basket. Previous research has shown that a colony will collect 10-26 kg of pollen per year (Brodschneider and Crailsheim, 2010). While the weights of a honey bee's pollen pellets vary with the time of day and with the species of pollen, the average pollen pellet weighs 7.9 mg (García-García et al., 2004), with the honey bee carrying two pollen pellets, one on each hind leg. This means that an average colony will annually embark on up to 1.6 million foraging trips to collect up to 3.2 million pollen pellets to support colony survival. The corbicula, which has an average surface area of 1.81 mm^2 (Milne and Pries, 1984), is a slightly concave, hairless plate surrounded on both sides by long setae, or hairs, that curve inwards. The corbicular hairs are attached to nerves and some of them can detect their angle of displacement, which signals to the bee the pollen pellet's size (Ford et al., 1981). In the process of forming the pollen pellet, the hairs, at least at the top of the corbicula, become embedded into the pellet. In addition to the outer hairs, there is also a single spindle hair located just above the pollen press, and previous studies have found that this hair plays some role in the maximum possible volume of the pellet (Hodges, 1967). When the honey bee has finished foraging, it returns to the hive and selects a cell in which to deposit its pollen pellets (Matherne et al., 2021).

The collection of pollen is greatly influenced by the needs of the colony. Provided there are adequate honey stores in the colony, with an increase in the amount of brood the proportion of foragers that collect pollen and the amount of pollen increases. Although brood of all stages stimulates pollen collection, the larval stage is particularly effective. The smell of brood alone and contact with bees tending the brood are each partly responsible for foragers collecting pollen, but individual foragers must have access to the brood if they are to receive maximum stimulation to collect pollen. Evidently, the larvae produce a pheromone that stimulates pollen collection. The amount of pollen collected is also influenced by the pollen stores present, and giving pollen to a colony diminishes pollen collection and increases nectar collection. Irrespective of the presence of brood, the queen also induces pollen collection (Free, 1977).

The hairs which cover the body and appendages of the bee are of the utmost importance in the process of pollen gathering. These hairs may be classified as 1) branched hairs and 2) unbranched hairs, the latter including both long, slender hairs and stiff, spinelike structures. Of these two classes, the branched hairs are the more numerous. They make up the hairy coat of the head, thorax and abdomen, with the exception of short sensory spines, as those found upon the antennae and perhaps elsewhere, and the stiff unbranched hairs which cover the surfaces of the compound eyes (Phillips, 1905). Branched hairs are also found upon the legs; more particularly upon the more proximal segments. A typical branched hair is composed of a long slender main axis from which spring numerous short lateral barbs. Grains of pollen are caught and held in the angles between the axis and the barbs and between the barbs of contiguous hairs. The hairy covering of the body and legs thus serves as a collecting surface upon which pollen grains are temporarily retained and from which they are later removed by the combing action of the brushes of the legs (Casteel, 1912b).

Hair spacing on the honey bee's body is tuned to the particles they collect to facilitate particle suspension for easy removal, while the hair spacing on the grooming legs enables the effective transfer of particles from the body to the legs and determines the amount of pollen removed during each swipe. It was found that grooming behavior is unaffected by pollen type or initial pollen accumulation. The presence of pollenkitt, or the viscous fluid on the surface of pollen, plays an important role in pollen accumulation. Honey bees accumulated half as many pollen grains when the pollenkitt was removed (Amador et al., 2017).

The mouthparts of the bee are also essential to the proper collection of pollen. The mandibles are used to scrape over the anthers of flowers, and considerable pollen adheres to them and is later removed. The same is true of the maxillae and tongue. From the mouth comes the fluid by which the pollen grains are moistened. The legs of the worker bee are especially adapted for pollen

gathering. Each leg bears a collecting brush, composed of stiff, un-branched hairs set closely together. These brushes are located upon the first or most proximal tarsal segment of the legs, known technically as the palmse of the forelegs and as the plantse of the middle and hind pair. The brush of the foreleg is elongated and of slight width, that of the middle leg broad and flat, while the brush upon the planta of the hind leg is the broadest of all and is also the most highly specialized. In addition to these well-marked brushes, the distal ends of the tibiae of the fore and middle legs bear many stiff hairs, which function as pollen collectors, and the distal tarsal joints of all legs bear similar structures. The tibia and the planta of the hind leg of the worker bee are greatly flattened (Figure 1). The outer surface of the tibia is marked by

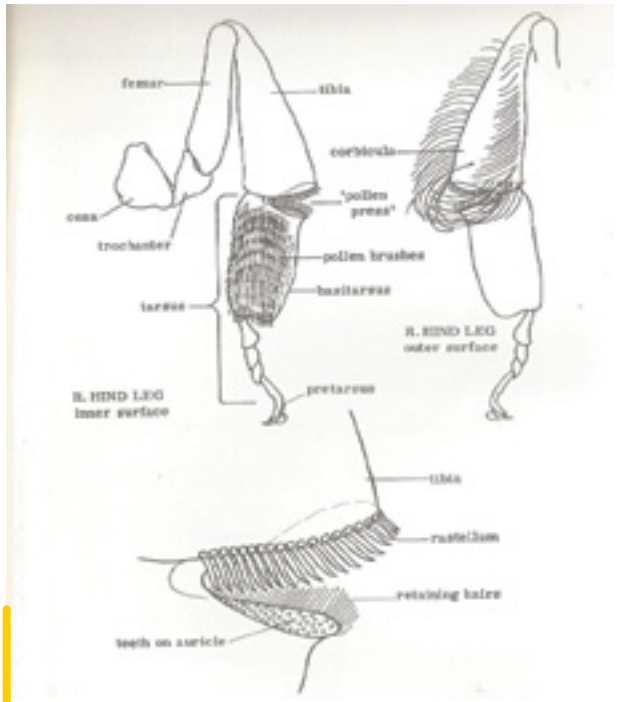


Figure 1. The honey bee workers hind leg, inner and outer surfaces and details of the tibio-tarsal joint (auricle or pollen press). Dade, 1962.

an elongated depression, deepest at its distal end, and bounded laterally by elevated margins. From the lateral boundaries of this depression spring many long hairs, some of which arch over the concave outer surface of the tibia and thus form a kind of receptacle or basket to which the name corbicula or pollen-basket is given. The lower or distal end of the tibia articulates at its anterior edge with the planta. The remaining portion of this end of the tibia is flattened and slightly concave, its surface sloping upward from the inner to the outer surface of the limb. Along the inner edge of this surface runs a row of short, stiff, backwardly directed spines, from 15-21 in number, which form the pecten or comb of the tibia. The lateral edge of this area forms the lower boundary of the corbicular depression and is marked by a row of very fine hairs which branch at their free ends. Immediately above these hairs, springing from the floor of the corbicula, seven or eight minute spines are found, and above them one long hair which reaches out over the lower edge of the basket. The broad, flat planta (metatarsus or proximal tarsal segment of the hind leg) is marked on its inner surface by several rows of stiff, distally directed spines which form the pollen combs. About 12 of these transverse rows may be distinguished, although some of them are not complete. The most distal row, which projects beyond the edge of the planta, is composed of very, strong, stiff spines which function in the removal of wax scales (Casteel, 1912a). The upper or proximal end of the planta is flattened and projects in a posterior direction to form the auricle. The surface of the auricle (pollen press) is marked with short, blunt spines, pyramidal in form and a fringe of fine hairs with branching ends extends along its lateral edge. This surface slopes upward and outward (Casteel, 1912b).

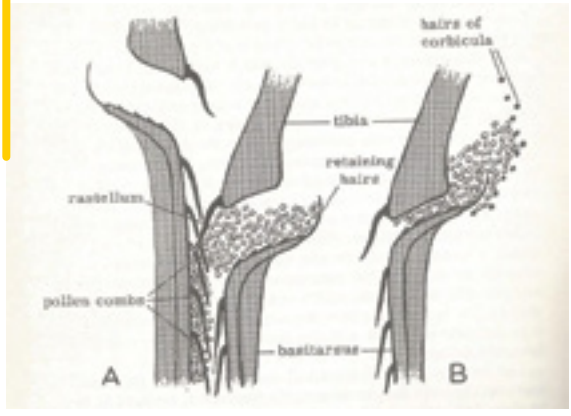
After a bee has crawled over a few flowers, she begins to brush the pollen from her head, body and forward appendages and transfer it to the posterior pair of legs. This may be accomplished while she is resting on the flower, but more often while she hovers in the air before foraging for additional pollen. The wet pollen is removed from the mouthparts by the forelegs. The dry pollen clinging to the hairs of the head region also is removed by the forelegs, and added to the pollen moistened by the mouth (Gary, 1992).

The second pair of legs collects free pollen from the thorax, more particularly from the ventral region, and receives pollen collected by the first pair of legs. In taking pollen from the foreleg, the middle leg of the same side is extended forward and is either grasped by the flexed foreleg, or rubbed over it as the foreleg is bent downward and backward. Much sticky pollen is now assembled on the inner faces of the broad tarsal segments of the second pair of legs (Gary, 1992).

Pollen is transferred to the pollen baskets in at least two ways. A relatively small amount may reach the pollen baskets directly, as the middle legs sometimes are used to pat down the pollen accumulated there. But by far the larger amount is first transferred onto the pollen combs on the inner surfaces of the hind legs. One of the middle legs and then the other alternately is grasped between the first tarsal segments of the hind legs and drawn forward and upward, thus combing the pollen from the middle legs. The pollen now held in the combs of the hind basitarsus is next transferred to the pollen baskets on the outer surfaces of the hind tibiae (Gary, 1992).

With the two hind legs drawn up beneath the abdomen, the pollen combs of one leg are scraped by the pecten spines of the opposite one as the legs are moved up and down in a sort of pumping action (Figure 2). Thus, the

Figure 2. Pollen packing: the diagram shows a section through the pollen press. A) Press open, rastellum of right leg scrapping pollen out of the pollen combs of the left leg: pollen falls on auricle. B) Press closed, pollen forced through to outer side of right leg, where it is caught by the corbicula. Dade, 1962.



pollen removed from one basitarsus is caught on the outside of the pecten comb of the opposite leg, the two combs scraping alternately. The planta is gently bent backward bringing its auricular surface into contact with the outer side of the pecten comb. By this action, the pollen mass is pushed along the slightly sloping lower end of the tibia and thence out onto the surface of the pollen basket at its lower end. Each new addition of pollen is pushed against the last and, simultaneously, the masses of pollen on both legs grow upward, a very small amount being added at each stroke (Figure 3) (Gary, 1992).

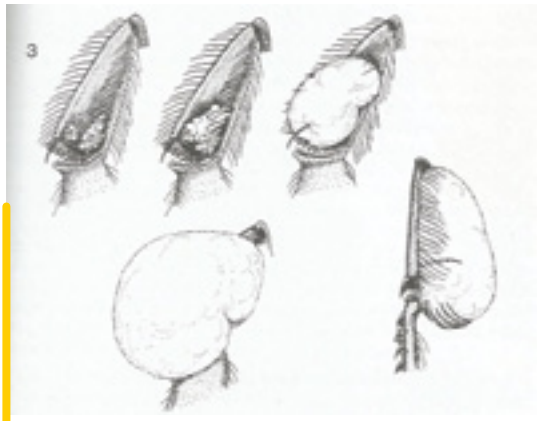


Figure 3. Pollen pellets forming on the corbicula (pollen basket). Transfer of pollen from the inner surface of the hind legs to the outer surface of the opposing hind leg. 1) The pollen rake scrapes pollen from the opposing combs and deposits it on the press. 2) Pollen is then pushed into the corbicula by pumping the legs and 3) transported back to the nest in a sticky ball moistened with regurgitated honey. Winston, 1987.

Finally, each leg is loaded with a mass of pollen, held in place by the long recurved hairs of the elevated margins of the tibiae. If the loads are very large, these hairs are pushed outward and become partly embedded in the pollen, allowing the mass to project beyond the margins of the tibiae. The bee accomplishes these brushing and combing actions so rapidly that the observer probably will fail to see some of the steps in the process without repeated observations (Gary, 1992).

When sensory hairs on the pollen basket signal that the load is completed, she returns to the hive. She may dance to recruit more foragers if the pollen source was very rewarding. Or she may immediately start moving around on the comb, especially in the areas immediately above the brood cells. Then, she sticks her head into the empty cells—one by one—and finally "selects" a cell in which to unload her pollen pellets. She grasps one edge of the cell with her forelegs and arches her abdomen so that its posterior end rests on the opposite side of the cell. Her hind legs are thrust inside the cell. She pries both pellets from the pollen baskets and they fall onto the lower cell wall. After a few cleaning movements she returns to foraging again. Despite elaborate cleaning behavior, large numbers of pollen grains remain on the bodies of pollen foragers after they unload the pellets (Gary, 2015).

House bees use their head and mandibles to tamp the pellets to the bottom of the cell into a compact mass. During this processing behavior, the bees often moisten the pellets with their mouthparts and add nectar or honey. The resulting pollen mass takes on a more moist appearance and becomes darker in color. Complex chemical reactions soon convert the pollen mass into a sticky, gummy consistency. Now it is called "bee bread", a highly nutritious food eaten by nurse bees and ultimately converted into brood food fed to developing larvae (Gary, 2015).

The number of pollen foragers in a colony depends on the amount of larvae (brood) present at a given time, the quantity of stored pollen in the colony, individual forager genotype and available environmental resources (Pankiw et al., 1998). When pollen is artificially added to a colony, pollen foraging activity decreases until the excess pollen has been depleted through consumption. The quantity of stored pollen then returns to previous levels. When pollen is removed from a colony, the number of pollen foragers, their trip frequencies and their pollen load sizes increase until the amount of stored pollen is restored to the previous balance.

Fewell and Winston (1992) examined interactions between individual foraging behavior and pollen storage levels in the hive. Colonies responded to low pollen storage conditions by increasing pollen intake rates 54% relative to high pollen storage conditions, demonstrating a direct relationship between pollen storage levels and foraging effort. Approximately 80% of the difference in pollen intake rates was accounted for by variation in individual foraging effort, via changes in foraging activity and individual pollen load size. An additional 20% resulted from changes in the proportion of the foraging population collecting pollen. Under both high and low pollen storage treatments, colonies returned to pollen storage levels to pre-experimental levels within 16 days suggesting that honey bees regulate pollen storage levels around a homeostatic set point. They also found a direct relationship between pollen storage levels and colony brood production, demonstrating the potential for cumulative changes in individual foraging decisions to affect colony fitness. BC

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A Cross Section of Society

Stephen Bishop

As an introvert, I can't believe I'm about to say this, but I'm glad conferences are back. The pandemic was a nice reprieve from mingling and socializing, but too much isolation is unhealthy. So it's nice to see things mostly back to normal, which means bee conferences are now back in full swing.

For my day job, which pays for my beekeeping addiction, I often have to attend farming conferences of different sorts. If I go to a big cattlemen's conference, I see a lot of boots and hats and flannel shirts. Everybody more or less looks the same. If I go to a big organic or sustainable agriculture conference, I see a lot of Birkenstocks and high-waters (apparently I was born before my time) and unusual outfits. But even in their unusualness, everybody more or less looks the same.

But a beekeepers' conference really is *unusual.* It's one of the few places in our modern society where folks from vastly different viewpoints mingle and interact. At a beekeepers' conference, you'll have your good-ole-boy-farmer contingent, back-to-the-land hippies and homesteaders, millennial hipsters, the science and academic sort, and even doomsday preppers. You'll have young and old, rural and urban, and conservatives, liberals, and libertarians all together in one space. In our modern age of echo chambers and self-segregation, that doesn't happen much anymore. The one thing that all of these folks have in common is that they like keeping thousands of stinging insects for fun. Go figure.

Over the years, I've come to realize that beekeepers' conferences are a safe space where people of all stripes can come together and talk about bees to their hearts' delight. To steal a phrase from Planet Fitness, it's a "judgment-free zone." Out in the real world, talking about bees is often a good ice-breaker or conservation starter with the general public, but it's not always the best conservation holder. If you're like me, you may have had the experience where someone asked you a simple question like, "How often do you get stung?" or "How much honey do you get from one hive?" You quickly answer it and seize the opportunity to further elucidate them on all things *Apis mellifera*, only to have to stop your lecture on queen mating habits thirty minutes later because helicopters are circling overhead and a SWAT team has arrived to rescue your hostage listener.

Yep, you can see it in the general public' eyes when you're talking to them about bees: they think you're interesting, but they also pity you because you're bonkers. And I think that's why I like beekeeping so much. It draws together people who are a little bit kooky, who are misfits even within their own respective groups, who can put on the facade of respectability, but deep down just want to binge on a good bee conversation—and for a few hours while you're at a bee conference, it doesn't matter whether you're wearing boots or Birkenstocks, whether you're a conservative, liberal, or libertarian; you're just a beekeeper just like everyone else.

As a I reflect back on my time as beekeeper, I firmly believe that it's not the honey that makes beekeeping so rewarding—but the people you meet and talk bees with, people who are likely on the opposite side of some cultural or political divide, people whom you never would have met without bees drawing you together.

So if you get a chance to go to a bee conference this year, go. You'll learn some more about bees and meet some interesting people. BC

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WHEN LIFE THROWS YOU CURVES

James Masucci

How many times have you heard the saying, "If you're not going to do it right, don't do it at all?" Or, "You never have time to do it right, but you always have time to do it again?" We as beekeepers spend our careers figuring out how to "do it right". Some years we nail it. Some years are disasters. We know in theory what needs to be done. And, if you are like me, you have a sure-fire plan to make it happen this year. I've written about my growing business. I've finally grown to where I want to be for a while, I have honey contracts for most of my honey, and I have record nuc sales this year. My plan is going as planned until...

Life gets in the way. This April has been a doozy for me. The birth of my first granddaughter, the death of my father, the death of my father-in-law and the graduation of a close friend. I am sure you've all experienced the frustration with a good plan gone awry. There are times I've actually said, "Why the am I doing this?" In the beeyard, when you don't have time to do what you need, the bees are particularly ornery, and you are living in a psychologically trying time, emotions can run high. I find myself acting like a Cubs fan in September (sorry Chicago, I'm from St. Louis), "wait 'til next year."

Then I realized, I seem to say "wait 'til next year" every year. There's the challenge of growing a bee business, of course. But then, there is life. As much as we may think we want to spend 24/7 with our bees, we don't. For if all we did was keep our bees, we would have very lonely lives indeed. We need to remember that in this business, the bees are the stars. We just play supporting roles.

To get through the conflict between life and beekeeping, we need to have two sets of priorities. The first are the priorities to get you through the long-haul. What do you value in life? Family, friends, bees. Having these priorities (whatever is right for you), helps make what seems like a tough decision easier. You may not like the decision, but knowing it's the right decision makes it easier to accept. It may cost you some honey, or maybe some colonies, but you are better off in the long run. Your priorities are important to you and those around you and taking care of them increases your quality of life in the long run.

The second set of priorities helps you deal with not having enough time for your bees. These are bee driven and business driven priorities. What do the bees NEED to get through this. Bees know what they are doing. So, when we can't follow our plan, we can't make things optimal for the bees, we must provide what they NEED. Yes, there is a difference. What do bees need to be healthy? Proper pest/pathogen management, proper space, proper nutrition and proper age distribution of bees with a good laying queen. It's up to you, based on the time of year and what management you've already done, to focus on the right priority when life takes you away from your bees. Focus on minimizing damage and allowing the bees to do what they do best.

As an example, here is what I did. I had just finished splitting. I had a week to prepare my bees for my trip to my son and daughter-in-law's house to meet my new granddaughter. Then I got the call from my mom, dad was dying. I wanted to feed my bees once more, I had queen checks to do, I had mite treatments I wanted to put on and I feared an early black locust nectar flow. My parents were 1,000 miles away. My wife, daughter and I were there in 12 hours. I got to say goodbye to my dad, I got to comfort my mom. Two days after my dad died, my father-in-law died. I got to say goodbye to him, too. We were there 10 days. While I was gone, the bees did what they do. When I got back, I had three days to put everything in order before we left to meet our granddaughter and help out her new parents. This is where the second set of priorities came into play. Wednesday: queen checks, mite treatments, super. Thursday: Take care of my nucs, deliver honey and nucs to customers. Friday: queen checks and super (no time for mite treatments). I got to all but about 50 hives (~25%) then left for another eight days. Black locust came into full bloom. I got a call about one of the hives I didn't get to, swarming. I have no idea what I will find when I get back. It's frustrating. It's not part of the plan. Life got in the way. But I wouldn't have changed any decision. I said goodbye to two dear friends and hello to a new one. Live life, the bees will be fine. BC

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 Infrastructure
September: What it Take 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

I hope you have been enjoying the glimpse inside the honey bee academic world that my team and I have provided through this series of articles in *Bee Culture*. We have really enjoyed telling our story to you. By now, you should understand how honey bee laboratories at land grant institutions (LGUs) are structured, what research/teaching/extension are and how they contribute equally to the LGU mission. In this article, I am going to discuss the money side of things, i.e. how and why honey bee laboratories are funded.

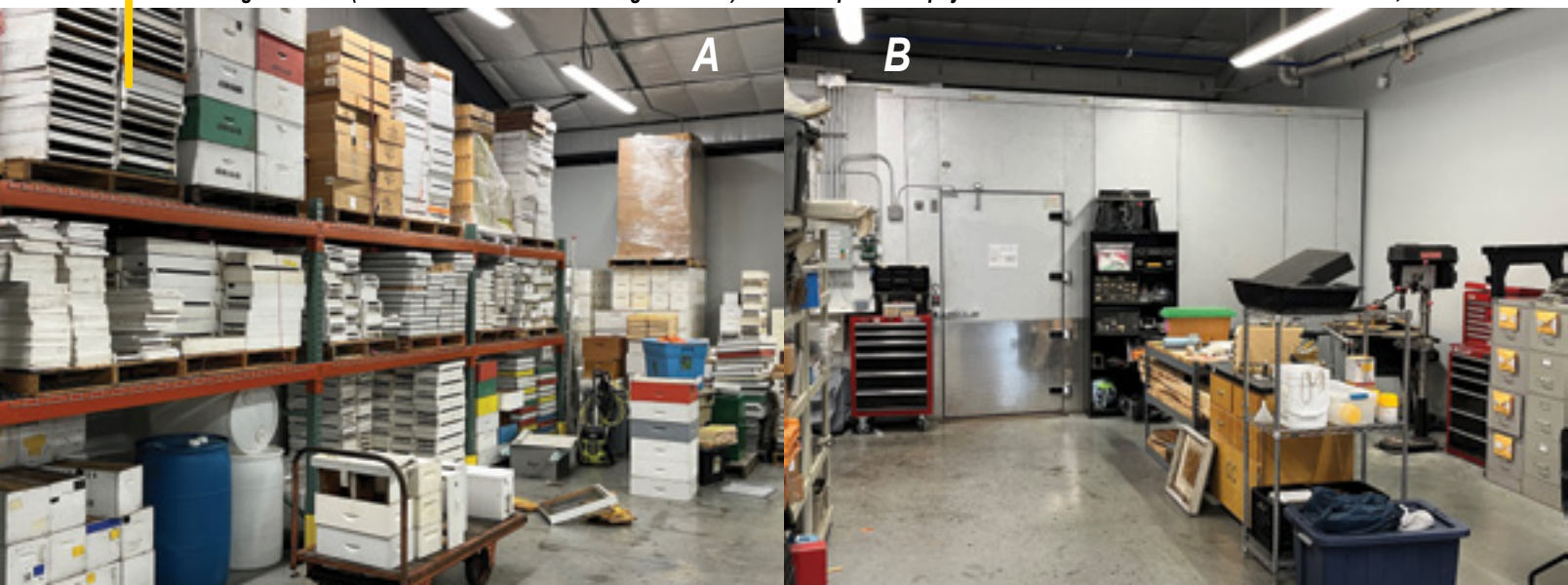
Money is a boring topic to some and a fascinating topic to others. I tend to be a frugal and conservative spender (and an extreme budgeter!) in my personal life. In my professional life, I find money to be somewhat of a necessary evil. Everything we do at and through our laboratory costs money, and Amy Vu, Cameron Jack (my lab co-leaders) and I constantly have to secure funding to keep this laboratory moving forward and productive. It would be hard to write a series about how bee laboratories function without talking about how they are funded. It takes the one (money) to do the other (function).

What costs do bee laboratories have?

Why do we need funding in the first place? Well, we have to pay for much of what we do. I will outline the typical costs incurred by a laboratory. This list might be a surprise for many of you, as you may not have been aware these are costs that we have to pay to do the things we do.

1) *Salaries* – This is, by far, the greatest expense in any honey bee laboratory. Yes, universities cover the salaries of key personnel (usually for the laboratory leaders, called principal investigators (PIs) in academia). However, universities do not usually pay for hourly labor, research technicians, extension technicians, etc. Instead, the PIs have to pay this cost. This includes the take-home pay of these individuals, and their health care, retirement, etc. (i.e. the "fringe benefits"). Fringe benefits are the hidden cost of employing someone and they usually vary by the job title. For example, professors at the University of Florida (UF) have a fringe benefit rate of ~30%. That means it costs UF $30,000 of fringe to pay a professor a salary of $100,000 (totaling $130,000). At our laboratory, we have different job classifications, each with a different fringe rate. Hourly workers are ~7% fringe while research technicians are ~55% fringe. In the latter example, it costs $155,000 to pay a research technician $100,000, making them the most expensive laboratory members to employ. As a PI, I have to factor all of this into my yearly costs.
2) *Materials and Supplies* – UF defines these as items costing < $5,000. This includes ALL the expendables we use. This list is by no means exhaustive, but I wanted to provide you some basic examples: test tubes, Petri dishes, insect nests, personal protective equipment (gloves, lab coats, bee veils, bee suits, etc.), paper, tweezers, test chemicals, computers/printers/monitors, hives, bees, bee food, bee medication, hive stands, mowers, weed eaters,

Figure 1. Laboratory leaders need to own many of the same items beekeepers need to own to manage colonies for research/extension/teaching purposes. How much of the equipment do you recognize in our storage room (A)? We also need to maintain active workshops and even comb storage facilities (the walk-in freezer in the background – B). We are expected to pay for almost all of these items. Photo: Jamie Ellis, UF/IFAS



Bee Research and Extension Laboratory

How University Research Laboratories are Funded

Jamie Ellis

Figure 2. Take a look around the David J. Mendes Research Laboratory (A) in our new facility at the University of Florida. Or, have a look at the Florida Farm Bureau room in the building (B). This room houses our incubators and sample freezers. My team and I had to pay for nearly everything you see that is not screwed to the floor (and even some things that are screwed to the floor) or part of the physical building. Fortunately, the Florida State Beekeepers Association, a number of independent beekeepers/beekeeper organizations, the Florida state legislators and the University of Florida worked together to fund and construct the new honey bee facility on campus. Now, it is up to me/my team to keep the facility stocked and running. Photo: Jamie Ellis, UF/IFAS

etc. (Figure 1). Essentially, this includes EVERYTHING we need in a laboratory. The PIs are expected to pay for all of it… and I mean all of it.

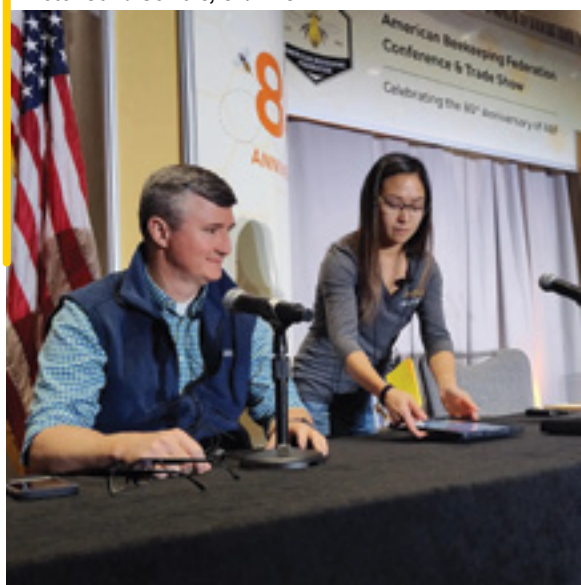
3) *Equipment (Figure 2)* – UF defines equipment as items over $5,000. I have to pay for new incubators, microscopes, PCR machines, freezers, gel-docking stations, etc. This includes ALL equipment of any type that we need to use in our program. Not only that, but I have to pay for the maintenance, upkeep, calibration, etc. of all equipment. This is a yearly cost that I have to factor into my search for funding.

Figure 3. Did you know that laboratory leaders are responsible for purchasing their own new vehicles (A) and anything needed to manage apiary sites, such as this tractor and mower (B)? Faculty even have to pay maintenance/upkeep fees for their existing vehicles. Some universities will not let faculty have vehicles dedicated to their programs. Instead, faculty have to book vehicles through university motor pools. In this case, the faculty member still pays the cost associated with using the vehicle. Photo: Jamie Ellis, UF/IFAS

4) *Vehicles (Figure 3)* – I have to purchase any new vehicles required for our work. This includes flatbeds, trucks, fork lifts, etc. I also have to pay to maintain them (oil changes, new tires, new batteries, fix a transmission, etc.). Sometimes, a university will provide a vehicle to a faculty member upon hire. However, maintenance of that vehicle and subsequent purchase of new vehicles are expenses encumbered by the PI.

5) *Travel* – Think about the number of times you have seen honey bee scientists at meetings (Figure 4). These scientists have to pay all travel costs related to attending research meetings of any type (Apimondia, American Beekeeping Federation, Entomological Society of America, etc.), and extension meetings that occur in their home states. This includes purchasing gas and paying for hotels, conference registration, food costs, baggage fees, taxis/flights/trains/Uber/etc. Travel related to extension meetings outside of one's own state are usually covered by the host beekeeping club. To put

Figure 4. Laboratory leaders from land grant universities travel around the U.S. and world to talk about their programs, network with other laboratory leaders and train beekeepers. In most cases, the laboratory leaders are required to pay all associated travel costs. Here, Amy Vu (right) and I are presenting at the 2023 annual meeting of the American Beekeeping Federation. Photo: Serra Sowers, UF/IFAS



this in perspective: I have to cover the costs of attending research meetings (and the costs of my team members attending those meetings) and extension meetings in the state. When I speak to bee clubs outside Florida, the host club typically covers my associated travel costs. There are other types of travel as well, including trips to the field to conduct research. I have to secure funding to keep gas in the vehicles to make visits to the field possible.

6) *Publications* – I explained in the March article that the final step of completing a research project is to publish it as a refereed manuscript in a scientific journal. Historically, these journals were kept alive by libraries (usually university libraries) that would have subscriptions to the journals or by individuals who would pay the journal for access to a given article. Thus, it was usually free for the scientist to publish their work in a journal. There were occasionally page charges for publishing in a given journal, but they were free more often than not. Now, many journals are moving to an online only or open access model. In this system, the author takes on the cost of publishing in the journal, with the journal then making access to the article free. Now, that cost is paid by PIs. I have seen journals have open access charges as low as $1,500/article and as high as $8,000/article. That means someone publishing 10 research papers a year would need $15,000-80,000 to publish those articles open access. This is getting to be a pretty substantial cost, especially for productive research laboratories.

7) *Consultancy Services of Any Kind* – There are times that PIs or their teams cannot do something that needs to be done related to their programming. As an example, maybe we are hosting a large extension event and need to publish 50+ page programs for all of the participants. Maybe we are performing molecular work and need multiple genes sequenced, or a particular analysis to be conducted. Maybe we are doing toxicology work and need pesticide residue analyses on a number of hive samples, but do not have the infrastructure to do this ourselves. When things like this occur, PIs have to pay for the services of other companies to perform the work.

This is just a sample of the major items that PIs have to cover every year. I know that money is said to be a root of all evil, but (unfortunately) it is very necessary to keep laboratories running smoothly. We simply cannot teach university students about bees, conduct bee health research and work with beekeepers to improve the sustainability of beekeeping without money. Poorly funded laboratories struggle to provide valuable services to beekeepers. Unfortunately, money also does not grow on trees. The best PIs are those who are able to find multiple sources of funds so that they can keep their research, teaching and extension programs humming. So, just where does that funding originate?

What the University Provides

In March, I gave a bit of an overview of how research is funded. I started that discussion by stating my errant belief, when young and outside of the university system, that the university is rolling in money, and that university administrators will pass that money directly to all professors who, in turn, would always have all the funding they will ever need to do all the work that they will ever do. This, of course, is not the case. In fact, this is not how it happens at all. A more accurate picture is that PIs are CEOs of small companies, and that they have to raise most of the money they need to keep their staff employed, the materials/supplies/equipment available and their business booming. That said, the university infrastructure makes the work of the CEOs possible, and the university is the primary "investor" in a PI's laboratory. Here's a list for how universities provide support to their faculty:

- *Salary for the PI* – Professors can be hired for any number of months/year the university desires. For example, I was hired as a 12-month faculty member when I was first employed at UF in 2006. This means that UF paid all 12 months of my salary each year. Now, I am a 9-month faculty member, meaning that UF pays nine months of my salary and I have to raise the other three months if I want to get paid those months. In academia, we refer to these extra months as "Summer salary" because those are the months that we do not get paid if we do not raise funds for salary. The growing trend in academia is that universities are moving away from 12-month appointments to 9 or 10-month appointments. This means that many professors you meet have to raise a good portion of their own salary if they want to get paid for they work they do each Summer. In the case of faculty working at LGUs, the salary paid by the university is provided through state tax dollars. Some faculty members have to raise all of their salaries, meaning their universities contribute no part of their salary at all. These are hard positions to have.
- *Salary for Technicians* – Before I was hired at UF, the university provided each PI with a full-time technician, usually a research technician, to support the PI's program. That has nearly completely disappeared from LGUs across the country. It is far more common for universities not to provide any direct technical support for PIs. That means PIs have to raise money to pay research technicians they hire. Our lab at UF has had as many as 30 employees in the past. Amy, Cameron and I have to find money to support each one. We are fortunate that UF now funds a laboratory manager position for us at the bee laboratory. However, it is now far more common for universities not to provide direct technical support. Instead, PIs have to raise the money to pay for their own technical support.
- *Salary for Staff Support* – While universities may not provide salary for technical support, they do provide salary for staff support. For example, our laboratory is housed in the UF Entomology and Nematology Department. Our department has one human resources staff member, two secretaries, three individuals who work in our business office, two design specialists, an information technology specialist, a photographer/taxonomist, two grants specialists, two student coordinators and one individual who works in the supply office. I do not have to pay the salaries of these individuals, but they are still available to me/my team when we need their assistance. Beyond that, the university also provides staff outside the department. These individuals help with grant management, project compliance, ve-

hicle fleet maintenance, safety issues, human resources, research farm management, etc. These staff members provide services across many departments and universities never seem to have enough of these incredibly valuable folks.

- *Physical Infrastructure (Figure 5)* – Universities build and maintain infrastructure for PIs. Such infrastructure includes office space, laboratories, classrooms, etc. Universities also pay utility bills, provide salaries to janitorial staff, provide maintenance when buildings need it, etc. This is a huge investment by the universities in the success of its PIs. Keep in mind, though, that universities own the infrastructure so they can dictate which PIs get which space. Productive faculty tend to get more space in which to work while less productive faculty may be moved to smaller spaces. Faculty often are required to complete space allocation reports yearly, essentially to defend their use of the space they are allocated.
- *Start-up Funds* – Universities provide faculty start-up funds when the new faculty are hired. This is negotiated when the university is actively recruiting a candidate chosen through the job application/interview/hiring process. Faculty who have large research appointments often are given larger start-up packages (research costs money!) than those given faculty with large teaching or extension appointments. New faculty have to use these funds almost like seed funds, with which they purchase the materials, supplies and equipment they need to get their laboratories up-and-running. Start-up funds are, essentially, a one-time cash investment made by the university to the PI's new program. These funds are not recurring. When they run out, they are gone. Furthermore, some universities pay larger start-up packages than other universities do. I have heard of new faculty receiving $500,000+ to start their laboratories. I also have heard of faculty who have received only $30,000 in start-up funds. In the world of academic laboratories, $30,000 does not go very far.
- *Competitive or Year-End Funds* – Universities often have small pots of money that they may allocate to PIs as needed. This often happens through equipment grants, matching infrastructure grants, etc. If there is a matching requirement, it means the faculty member has to pay a certain portion of the cost. For example, imagine that I want to purchase a new machine that costs $20,000. I might get an equipment grant from UF, with that grant paying $10,000 if I agree to pay the remaining $10,000 (i.e. I "match" what the university provided).
- *USDA Hatch/Multi-State Funds* – This is an interesting pot of money available exclusively to LGUs. Essentially, LGUs are a national, state, local partnership. Thus, the federal government, through the USDA, will give money through Hatch Projects, Multi-State projects, etc. to the university. In turn, the university then provides some of that money to PIs who manage Hatch or Multi-State projects. The money is usually given in proportion to what your academic appointment is. Let me give an example. I belong to the USDA Multi-State project NC1173. This is the national Multi-State project focused on honey bees. The USDA gives Multi-State funds to UF, and some of these funds trickle down to me every year. I get between $5,000-6,000 yearly to support my program. I have a 70% extension appointment so most of these funds go into an extension account to support my extension efforts. Also, some of the funds can only be used to attend the yearly Multi-State meeting (usually occurs in conjunction with one of our national beekeeper meetings). If you do not go to the meeting, you cannot use the funds. All universities spend this money differently. I know of other folks in the honey bee world who only get enough Multi-State money to attend the yearly meeting. Fortunately, UF gives some for programmatic support.

Figure 5. Universities, usually through state appropriations or donations, build new facilities or renovate existing ones to support their faculty. The universities also cover any maintenance coses for the facilities and infrastructure. The Amy E. Lohman Apiculture Facility (back building) and Gordon Clauss Teaching Pavilion (left – behind the tree) can be seen behind one of our research apiaries. Photo: Jamie Ellis, UF/IFAS

It is true that a given faculty member can be wildly successful without much support from their university. However, this is the exception rather than the rule. Successful faculty are often those who work at supportive institutions. The funding of each LGU in the U.S. is intimately tied to its respective state. Some states are managed better than others are. Some states are more supportive of higher education than others. Some states have larger budgets than others do. All of this, and more, affects what a given LGU can provide to its faculty across campus. Fortunately, Florida is prosperous and UF is well-positioned to support its faculty. The success of our honey bee lab at UF is partly due to the university's investment in our program.

Figure 6. The teaching classroom at the University of Florida Honey Bee Research and Extension Laboratory. Photo: Jamie Ellis, UF/IFAS

Funding Instruction

Teaching students costs money. This is true at the undergraduate level (folks pursuing an associates or bachelors degree) and at the graduate level (folks pursuing a masters, PhD, MD, etc.). Teaching undergraduates does not usually cost faculty exorbitant amounts of money. This is because the university provides the classroom/laboratory space needed by faculty (Figure 6). Universities also provide the teaching technologies (data projectors, computers, online infrastructure, etc.) needed to get information to the students. Thus, teaching undergraduate students usually only costs time and as noted, a faculty member's time is paid (well, depending on the appointment) by the university.

There are times when undergraduate instruction costs PIs money. For example, Cameron teaches a practical beekeeping course in which students build their own hives, install packages of bees and tend the colonies throughout the semester. The material costs associated with this are paid through student tuition and/or fees levied on the students when they take the courses. Some undergraduate courses are quite expensive. This is especially true of study abroad courses. As Cameron shared with you in the February issue, he and I co-lead two study abroad courses (Asian Apiculture and *Apis* Diversity) to Thailand every other year. There are certain costs associated with these trips, including costs for the attending students and for me/Cameron as instructors. These costs are aggregated and charged to the attending students as fees required of them when they register for the courses. Apart from these examples, the university does provide small teaching grants (usually <$10,000) to faculty on a competitive basis to create a new course, improve an existing one, etc.

While the cost to teach undergraduate students is low to the faculty member (though, not to the university), the cost of teaching graduate students is comparatively high. At UF, our graduate students receive stipends (i.e. a yearly salary) of ~$25,000/year, their tuition (~$15,000/year) covered, and their health care and other minor costs (~$5,000/year) covered. This works out to about $45,000-50,000 per student per year that someone has to pay. This does not even include the project supplies/materials/costs the student will need to conduct their research. This simply is the cost of having a student. Students pursuing MS degrees usually take two to three years to complete the degree, while students pursing PhDs can take three to five, or more, years to complete the degree. Thus, MS students can cost $100,000-150,000 to have, while PhD students can cost $150,000-250,000. Someone has to pay that cost. When discussing this with graduate students, I always tell them there are five ways their graduate program can be funded:

1)They can pay the cost themselves. We do not allow this in our department, and it was never common anyway. Most students seeking a graduate degree in a field of science do not pay the costs themselves.

2)The student can bring an assistantship with them. Exceptional prospective graduate students have a number of external funding opportunities they can pursue. For example, the National Science Foundation has a competitive Graduate Research Fellowship competition. A student can apply for this and, if awarded, take it with them to a university. This, and other fellowships like it, will pay the associated costs I mentioned prior for the student.

3)The department or university can pay the cost. This is usually done through competitive teaching assistantships. Our department has a number of assistantships (often three to five/year) for MS and PhD students. The university throws in a few additional ones (usually three to four/year) each year. Faculty have to nominate their incoming students for these assistantships, and a committee decides who is awarded. The students who are awarded these have all of the costs I outlined before covered by the assistantship. In return, they are expected to provide teaching assistant services for the department's courses. For example, if a student working with honey bees is awarded one of these assistantships, they will be required to help manage the beekeeping courses we teach.

4)The faculty member can pay the costs. Faculty members can write the costs of graduate students into grants (more on this later). If the grants are awarded, the faculty member can advertise for and recruit one or multiple graduate students. The faculty member, then, would use the grant to pay the fees I mentioned earlier.

5)The cost of the student can be a combination of #3 and #4, where the department/university contributes some money and the faculty member contributes some money. These are called matching assistantships (i.e. the faculty is matching the contribution made by the department or university).

Graduate students are expensive and quite a financial commitment. Remember, faculty have to secure the funding (~$50,000/year for multiple years) for the entire time the student is projected to work on a given project. However, graduate students are definitely worth the investment. They are creative, energetic, tireless, hard-working, valuable members of any honey bee research laboratory. A number of regional and national honey bee groups (for example: The Foundation for the Preservation of Honey Bees) provide support for graduate students.

Funding Extension

Universities fund extension by providing salary for faculty and staff, infrastructure and associated travel support. I discussed much of this already,

but I will add here that extension is a funding juggernaut. Remember, LGUs are mandated to offer extension programming to the citizens of their state. Thus, funding for this comes through the state legislature (i.e. from taxes) to the universities. This money is used to support state level extension specialists (for example: the bee scientists at the various LGUs) and county extension agents across each state.

Traditionally, extension resources and programs were offered free to participants. However, shrinking state/county budgets and diversion of funds away from extension have pushed extension specialists to charge individuals participating in a given program. In fact, many LGUs encourage (or maybe even mandate) their faculty to make their extension programming financially independent, or revenue generating. In other words, we have to charge participants to cover our costs and grow our programming. This may sound bad, but it really should not. PIs who bring in funding for extension via revenue enhancement are able to grow their extension program and offer more services to their clientele. Let me give you some examples of how this works.

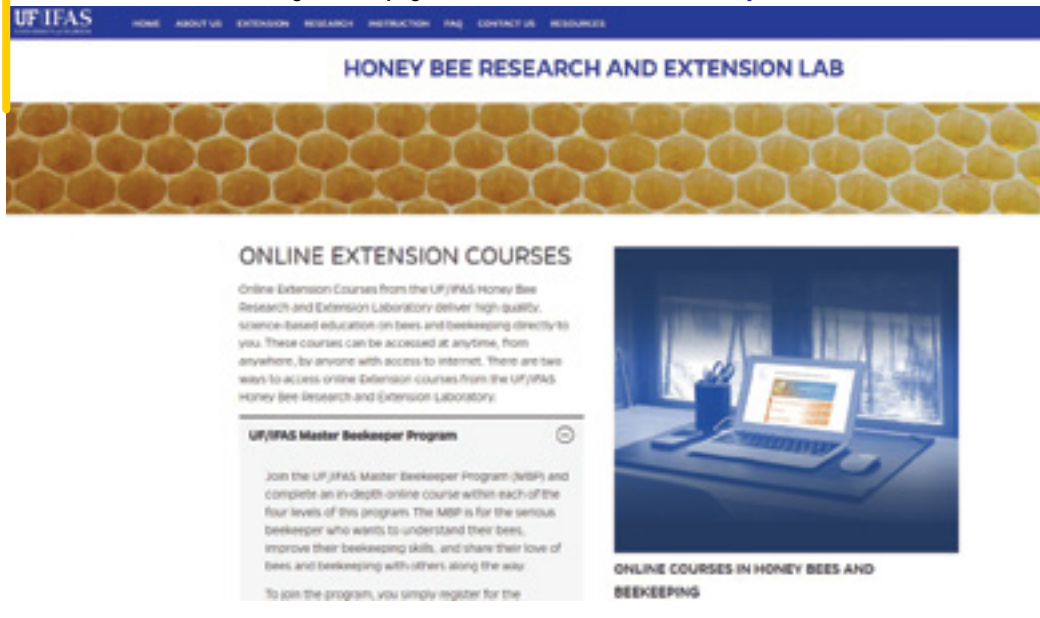
Amy is the primary manager of the extension programs we offer out of our laboratory. Her salary is covered by UF. However, she currently has four employees: one who manages the UF/IFAS Master Beekeeper Program, one who manages our social media accounts (@ufhoneybeelab), one who manages our podcast (Two Bees in a Podcast) and one who manages all other extension activities. The university does not pay these folks' salaries. Thus, we could not offer these services to beekeepers if we did not have a way to generate extension funds for the laboratory. How do we do this? Well, we have three programs that we charge individuals to use: the UF/IFAS Bee College (our two-day, in person, beekeeper training event – Figure 7), the UF/IFAS Master Beekeeper Program (completely online – Figure 8), and the beeLearning short courses (also completely online). Beekeepers have to pay to access or participate in these programs. We use the fees we collect to cover the costs associated with managing those programs and any extra funds are used to support

Figure 7. Revenue enhancing programs like the UF/IFAS Bee College help extension specialists generate funds to expand their extension programs and offer more services to beekeepers. In this photo, Dr. Cameron Jack is giving one of his famous talks on Varroa biology and management. Photo: Cat Wofford/Tyler Jones, UF/IFAS Communications Photography

the production of materials/activities for which we do not charge access. For example, our podcast is free to listeners. We provide free videos and documents on beekeeping through our laboratory website (**www.ufhoneybee.com**). We travel the state, country and world speaking at beekeeper meetings. All of these services (and a whole lot more) are made possible by the revenue generating aspects of our extension program.

On top of offering revenue-generating programming, we can also fund our extension efforts through financial donations (where folks/corporations/etc. donate funds to support the program) or competitive grants. We have been focusing heavily on generating grant support for our extension efforts. Grants are useful for two main reasons. First, they can be large sums of money (meaning we do not have to struggle to raise funds all the time) that last multiple years. Second, they can reduce the financial burden associated with charging for what we offer through our extension efforts. Just in the last year, Amy and colleagues secured >$700,000 in grant support for training

Figure 8. The UF/IFAS Master Beekeeper program also generates revenue for extension programming, leading to greater reach to beekeepers domestically and internationally. This is a screenshot from the online registration page that can be found at www.ufhoneybee.com.



beekeepers to 'level up' (move from hobbyist to commercial level) and train veterinarians about the new veterinary feed directive and how it affects beekeepers. The funding from these and other grants allows us to keep our extension programs cutting edge, available to beekeepers and constantly evolving.

Funding Research

In my March article about research at LGUs (Ellis, J. 2023. Research on honey bees. *Bee Culture*, 46-52. **https://www.beeculture.com/research-on-honey-bees/**), I wrote a summary about how the research component of laboratories is funded. I have copied information from that article and then add to it for greater clarity. From the March article:

(1) Competitive grants – This is a very common method used to fund research. A grant is a monetary award given by an agency to a scientist or group of scientists to conduct a specific series of research projects. To receive the award, the scientist had to develop a proposal, usually in response to a "request for applications" (RFA) made by the agency. For example, the USDA National Institute for Food and Agriculture (NIFA) has a specific funding program on pollinator health. They put out a RFA once a year. The RFA will include specific instructions on how to develop a proposal and what they want to fund. The scientist, in turn, will develop a proposal that aligns with the goals of NIFA outlined in the RFA. The proposal contains background information, hypotheses to be tested, methods the scientist plans to use to test the hypotheses, expected results, a budget, list of collaborators, letters of support, and a lot *of other information required by the agency and the scientist's host institution. Proposals are* considerable *work to develop, taking significant time, resources and energy.*

The scientist(s) must submit the proposal by a specified deadline, at which time the sponsoring agency organizes a review panel of scientists that reviews the merits of many proposals, rank them and provides the rankings to agency staff. The staff then works their way down the ranked list, awarding funds until they run out of funds to award. The funding rate of proposals, especially among the federal granting agencies, is low, often <10%. Some of the best grant writers in my department write seven to eight proposals per year, only getting one to two of those funded. Even still, there are many sources of funding for honey bee research. Such funding agencies include USDA NIFA, National Science Foundation, National Institutes of Health, Project Apis m (PAm), USDA APHIS, etc.

(2) Contracts – A contract is when a company, individual, organization, etc. approaches a scientist about conducting very specific work that the organization wants conducted. For example, one of the beekeeping equipment supply companies may have developed a new type of pollen patty that they want tested by a scientist. Perhaps a wildflower seed company wants someone to test their new seed mixture to see how attractive it is to pollinators. A chemical company may have developed a new compound and want to know its impact on bees in the field.

In these and other similar cases, the scientist will develop a scope of work (SOW, a scaled down proposal) that includes the problem that will be addressed, how it will be tested and a budget. The scientist provides the SOW directly to the interested party who will determine whether or not to fund the research directly. Contracts usually are not competitive. A company/industry representative or individual approaches the scientist directly, asking them to perform the work and agreeing to fund them through a contract.

I will make a quick note here to share that for grants and contracts, money does not flow directly to the scientist. *Instead, the funding agencies/individuals provide the money to the institution, which then enters a contractual agreement with the funding agency/individual to perform specified work as outlined in the SOW or research proposal. I share this to note that some beekeepers worry that contracts lead to nefarious work by the scientist (i.e. that the company/individual/etc. is "buying" services and favors from the scientist). This simply is not true. All work of this type is done through contracts mutually agreed upon by both parties, with the scientist's institute (rather than the scientist themselves) being the responsible party and the receiver of the funds. There is significant scrutiny and oversight by the scientist's home institution. Can there be abuse? Yes. Yet it is not nearly as common as some folks suspect.*

(3) Unrestricted free gifts – This final way to receive money for research is, essentially, the donation route. Individuals, groups, businesses, etc. can make a monetary donation to a scientist's program. I will stress that this money does not go to the scientist's personal bank account. Instead, it goes through the university's development office (fancy title for their fundraising arm) and routes to the scientist's home department for their programmatic use. These donations can range from $100 to $1 million or more. Often, the larger donations can be used to create "endowed" positions. Endowed positions usually come in three types: endowed professor, endowed chair, eminent scholar, with the money needed to create each position being greater as you move up the chain. Endowment money will be safely invested by the university, with the funds generated from it yearly (usually about 4%) going to support the scientist's research program. To illustrate this, a $1 million endowment will generate ~$40,000 for the scientist to use each year. Smaller donations are not used for endowments and, instead, are spent by the scientist however they see fit.

Why is this called an "unrestricted free gift"? This is a very important question, and the answer distinguishes this type of money source from those of a contract or grant. The "free gift" part means that the money was given to the scientist's program (again, through the university) with no strings attached. The individual/company/group making the donation cannot demand anything in return. The scientist is not agreeing to conduct a specific research project as a condition of receiving the funds. The money is simply a donation made to support the scientist's program however they see fit to use it (equipment, supplies, new colonies, staff salary, etc.). Endowments are the one exception to this as the donor can specify, in general terms, how they want the funding spent. For example, they may only want it to be used to support graduate student stipends, or work on honey bee disease/pest control.

I want to spend some time discussing how budgets for grants and contracts work. This was a steep learning curve for me when I arrived at UF. I also think it can be a source of mystery for beekeepers. Hopefully, I can demystify it a bit here.

PIs have to create, and vet, thorough budgets when developing grant and contract applications. We have to estimate how many and what type (hourly, technician, post doc, etc.) of people will work on the project. We also have to project how much time they will spend on the project. Then, we can request their salaries (salary + fringe benefits) on the grant. Let me give an example. For purposes of discussion, let us say that I am working on a project to control *Varroa*. I will need a post doc to work full-time on the project and I want to pay the post doc $50,000/year. The project is for three years. Post doc fringe at UF is ~10% so I need $55,000/year ($50,000 salary + $5,000 fringe) for three years to cover the post doc's salary. Given I put 100% of the post doc's time on the grant, they are required to spend 100% of their effort on the grant. Now imagine a similar scenario, but one in which the project only requires 50% of the post doc's time. Now, I request $27,500 (50% of a post doc's salary and fringe for the year) on the grant and have to find a second source of money to pay the other half of the post doc's salary. Contractually, the post doc can only spend 50% of their time on the grant, since that is the time/salary we budgeted for it. I have to do this for everyone I think will work on the project. Furthermore, I have to budget annual raises for all personnel throughout the life of the project.

On top of that, I have to write material, supply and equipment costs into the grant. If the proposed project lasts five years, I have to anticipate everything (and I mean EVERYTHING) we will need to conduct the project successfully and budget for every item, factoring in inflation, in the grant. Additionally, I need to factor in my project costs associated with traveling to the field for research or attending scientific/beekeeper meetings where we discuss the research. All of that (flight, hotel, food, etc.) has to be budgeted and added to the proposal. Furthermore, I may need outside consultants to help with part of the work (for example – sequence some DNA for us). I have to get a quote from the consultant and add that to the budget. I also have to anticipate how many refereed papers may get published as a result of the work and even where I might publish them. That way, I can estimate the open access fees and add those to the grant. Honestly, developing a good budget is as difficult as having and articulating a good research project in the proposal. It truly is a lot of work.

Everything I discussed in the preceding paragraph is referred to as "direct costs". Direct costs are those costs required to execute the project successfully. For the sake of discussion, let us say that the project I mentioned costs $100,000 to conduct. This includes salaries, travel, materials, supplies, equipment, publication costs, etc. If my project is funded by the granting agency, the money they award will come to my laboratory and I am contractually bound to use the money in the exact way, in the exact amounts and in the exact categories I described in the proposal. There is still one cost missing in this budget: the indirect cost. This is the part of a budget that gets people worked up into a frenzy, and it can be very difficult to explain to folks outside a university setting. However, I will do my best to explain it here so that you have some appreciation for why it is necessary.

Let us go back to my proposal example. My direct costs (those costs my team and I need to conduct a particular study) were $100,000, but they are not the only costs incurred by the university for conducting that research. Think about it. Someone outside my laboratory has to receive and deposit the money. Someone outside my laboratory has to pay the bills we incur when purchasing materials and supplies. Someone outside my laboratory has to manage human resource responsibilities with the folks I employ. Furthermore, the university is providing electricity, gas and water to my laboratory. They are changing the toilet paper in our bathrooms and paying janitors to keep our laboratory clean. Someone outside of my laboratory has to handle the waste we generate while conducting our research. The cost of these and items like them are referred to as indirect costs. They are not a direct cost to me for working on a grant funded project. However, they are a cost borne by the university for supporting my work on that project. With that in mind, the university is allowed to require me to charge indirect costs to the grant, and they will generally do it at the level that the granting agency allows. For example, the federal government allows a nearly 50% indirect cost rate. If I need $100,000 to conduct a research project funded by the federal government, I have to ask for $150,000 to do the work. $100,000 goes to my laboratory to conduct the project; $50,000 goes to the university to pay the indirect costs associated with my project.

Why do indirect costs make people antsy? Well, many funding agencies (especially grower groups, such as beekeeper organizations) only want to pay the costs of doing the project directly (the direct costs). They do not want to pay the university's costs (the indirect costs) associated with doing the work. Remember, I just said that the university will charge an indirect cost on any project at the rate allowed by the granting agency. Some agencies, especially beekeeper groups, will not allow indirect costs to be charged to a grant. That is okay with some universities, but not others. For example, UF has calculated that it costs them ~12% of the direct costs to support a given research project. Thus, I cannot apply for funding from agencies with an indirect cost rate that is <12%. Regardless of how one feels about indirect costs, they are simply the price of doing business in the academic research world.

Conclusion

I am sorry if I got a little too much into the weeds when describing how LGU laboratories like mine are funded. I hope that you found this informative. I also hope that it inspired you to work with your local bee laboratory to see how you can be a funding advocate. I estimate that Amy, Cameron and I have to bring in >$500,000/year to keep our laboratory running smoothly and able to offer the services we provide to and for beekeepers. The best laboratories are those whose PIs are able to secure multiple funding streams. As much as I hate to say it, it really does take money to keep laboratories on the cutting edge of delivering services to beekeepers. Our honey bee team at UF has been fortunate/blessed to partner with a variety of funding agencies and donors. We try to be good stewards of those resources by helping beekeepers every way we can. BC

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Minding Your Bees And Cues

A Swarm in July

Becky Masterman & Bridget Mendel

A swarm in May is worth a load of hay; a swarm in June is worth a silver spoon; but a swarm in July is not worth a fly.

Beekeepers love sayings, but we think this one needs a bit of revision. This famous swarm rating aphorism is credited to the mid-17th century where beekeepers were most certainly honey obsessed and not at all worried about *Varroa* mites, queen quality or keeping their neighbors happy (and swarm free). This old saying both elevates the worth of the May swarm and diminishes the potential of the July swarm and is not necessarily the best messaging for today's 21st century beekeeper.

Once your swarm is managed for pests, you will have an extra queen to use in your operation. Photo credit: Rebecca Masterman

Here are some ideas about moving the swarm saying conversation forward:

A swarm in May's* Varroa *you must slay.

Prior to the arrival of *Varroa*, beekeepers in the U.S. had less to worry about when capturing swarms. Post-*Varroa* arrival, swarms became an easy way for these mites, loaded with viruses, to make their way to a new location. Aided by you, the beekeeper, the *Varroa*-virus complex is often placed right in the middle of a new apiary. Despite efforts to manage mites in your colonies, if you don't practice a bit of biosecurity, your new swarm mite just increase this pesky parasite population in your beeyard.

Assume your swarm is carrying mites. If you want to be very careful, place your collected swarms in a new yard, and monitor and manage mites immediately. The broodless state of a swarm is an excellent opportunity to employ an oxalic acid control of your newly acquired mite critters. Check out the latest *Varroa* management tools at the Honey Bee Health Coalition website (**https://honeybeehealthcoalition.org/resources/varroa-management/**).

Collecting swarms in June will make your neighbors swoon.

Almost no one wants their bees to swarm. There are many reasons why preventing your own colonies from swarming will help your own bee operation as well as make you a good beekeeper neighbor. Taking the Spring management step of dividing your colonies and making sure they have needed space will not only increase your colony number, but it prevents you from losing your foraging workforce at the height of the nectar flow. Most importantly, preventing your bees from swarming also prevents them from moving into your neighbor's house. An added bonus, anyone who has collected a swarm in front of an audience has

felt the adoration of the amazed onlookers. No one is questioning your Spring management strategies, but instead they are impressed with your bee handling skills and you will likely end up as the star of your neighbor's social media post.

A swarm in July might be worth more than a fly.

First, we feel the need to defend the fly briefly. They actually have important ecological functions including being valuable members of the food chain and acting as pollinators (**https://sciencing.com/importance-flies-10016971.html**). Despite the mid-17th century beekeeper's negative view on flies and July swarms, there are positives to both. After you collect your July swarm and monitor and manage their *Varroa* levels, there are many positives in adding them to your operation. But first, setting your swarm colony growth expectations is important. Your July swarm is not likely to draw out a significant amount of comb or collect surplus honey. Giving bees a drawn comb will help them get a jump-start on rearing brood and storing pollen and nectar.

A swarm in July means an extra queen on standby.

Having an extra queen is always helpful in case you discover a queen issue during colony inspections. If needed, you can simply combine your queenright swarm colony with your queenless colony (we like the newspaper method). Alternatively, you can place your swarm queen in a queen cage and slowly introduce her to your queenless colony. Once your swarm colony is queenless, they will raise a new queen and therefore replenish your extra queen supply.

A July swarm can be wintered in a single deep dorm.

If you don't need an extra queen during the rest of the beekeeping season, you can winter bees in single deep boxes if your swarm colony doesn't grow into your standard wintering configuration. We can winter single deep colonies (or double nuc colonies) in Minnesota. We feed them with 2:1 sugar syrup in the Fall to make sure they have enough food stores and wrap them for extra protection. If you are going to attempt to winter single deep or double nuc colonies, we suggest that you seek local advice for the best methods.

Remember that bees might like to swarm or need to swarm.

If you winter your swarm colony successfully, manage them aggressively to prevent swarming the following Spring. It is possible that the bees are genetically predisposed to swarming or building up populations quickly that trigger swarming. Some colonies handle crowded conditions better than others. Divide your overwintered colony and make sure that the girls have enough space.

We are collecting modern beekeeper aphorisms. Please share your best beekeeping aphorism with us at: **mindingyourbeesandcues@gmail.com.** BC

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. Photos of Becky (left) and Bridget (right) looking for their respective hives. If you would like to contact the authors with your own July swarm success stories or beekeeping aphorisms, please send an email to mindingyourbeesandcues@gmail.com.

This 2022, late season swarm grew into two deeps quickly and overwintered in Minnesota easily. They burst into Spring and have been divided twice in 2023. Photo credit: Rebecca Masterman

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The Plastic Legacy

Are the toxic chemicals in plastic affecting you and your bees?

Plastic has become ubiquitous in our lives and is clearly responsible for significant advances in fields as varied as medicine, sports, aeronautics, electronics, food packaging, textiles and construction. Agriculture has also come to rely heavily on plastic, and as beekeepers, we have come to depend on plastic for a multitude of beekeeping uses large and small. This includes every part of the hive in addition to queen excluders, smoker bellows, honey packaging, mating nuc boxes, feeders, support pins, hive wrapping and netting, propolis and small hive beetle traps, hive straps, bee helmets and brushes, extracting equipment and more.

Unfortunately, this incredibly useful stuff is also responsible for slowly and quietly inflicting widespread damage that seriously threatens human and environmental health, as well as the economy. This is well documented in a recent report by the Minderoo-Monaco Commission, and the harm includes illness and death resulting from every phase of plastic's life cycle, and the damage is getting worse (Landrigan et al., 2023).

The report's lead author, Dr. Phillip J. Landrigan is the director of the Global Public Health Program and Global Observatory on Planetary Health at Boston College. Landrigran, who has spent decades researching the health effects of environmental pollutants, also worked on the first studies that looked into the dangers of lead exposure in children.

Production

As the Minderoo-Monaco Commission report outlines, plastic is made from carbon-based polymers that combine many small molecules bonded into a chain or network. Polymers can be natural or synthetic. Natural polymers include rubber, hemp and silk. While synthetic plastics can be manufactured from plant materials, most synthetic polymers are made from fossil fuels and they include polyethylene, polypropylene, polystyrene (Styrofoam), polyvinyl chloride (PVC), and a host of other materials of which over 400 million tons are produced annually and the amount is growing. Single-use plastics account for 35-40% of current plastic production and represent the most rapidly growing segment of the plastic industry.

Various chemicals are then incorporated into these carbon-based polymers to impart certain properties to the plastic being manufactured. Among the properties chemicals impart to plastic are color, flexibility, stability, water repellency, sterility, fire resistance and ultraviolet resistance. Unfortunately, many of these added chemicals are extremely toxic. They include cancer-causing compounds, neurotoxins that disrupt the cells that make up nervous systems, endocrine disruptors such as phthalates that play havoc with the body's hormones, bisphenols, per- and poly-fluoroalkyl substances (aka PFAS or forever chemicals), as well as brominated and organophosphate flame-retardants. These highly toxic chemicals are integral components of plastic. During production, these chemicals, along with plastic particles, leak into the air, water and soil polluting the landscape and sickening those that get exposed. Many of these chemicals are responsible for the majority of plastics' harm to human and environment health.

Use

Due to their wide proliferation throughout society, plastic is present in almost everything we use in our daily lives. Consumers are exposed to toxic chemicals as they leach out of plastic; enter the environment, and cause pollution as a result of their normal use. Sometimes exposure occurs from direct contact with the plastic item, and other times it occurs through contact with a substance such as water or food that has been in contact with the plastic. Accidental and unintended exposures also occur such as when an infant sucks on a plastic toy.

Disposal

We have known for a long time that plastic itself does not decompose, and now we learn that some of the toxic compounds used in plastic (such as the PFAS family of chemicals) also fail to biodegrade which means they do not go away (hence the 'forever chemical' moniker). As a result, plastics are clogging our landfills, choking our oceans, and fouling our beaches. Additionally, some plastic chemicals undergo chemical transformation and form breakdown products and metabolites, that can be highly toxic and contribute further to the harm plastics create.

Unfortunately, our current patterns of plastic production, use and disposal occur with little attention to sustainable design or safe materials and a near absence of recovery, reuse and recycling. Plastic recycling systems are so inefficient and ineffective that studies have found that less than 10 percent of the plastic humans produce and use actually gets recycled and reused while the other 90 percent gets incinerated, or ends up in a landfill or the environment. Despite rising consumer awareness, government regulation and corporate attention, we are creating more single use plastic waste than ever before. Between 2019 and 2021 the world produced an additional six million metric tons of single use plastic waste, mostly from fossil fuels. The more plastic waste we create the greater the harm to human health, widespread environmental damage,

During the past couple decades, plastic hive parts and beekeeping equipment have become common and yet we know little about the impacts to bees that the chemicals that leach out of plastic can have on honey bee health.

significant economic costs and deep societal injustices.

In-depth research of advanced recycling of plastic (also called chemical recycling, molecular recycling or chemical conversion) in the United States finds this new technology is a lot of hype and not much reality (Denney et al., 2022; Singla & Wardle, 2022). These so-called advanced recycling facilities are themselves generating hazardous waste and causing environmental injustices under the false promise of recycling. Even worse, since the plastic we do manage to produce from "advanced recycling" is much more expensive than virgin plastic, much of the recycling output will likely end up as fuel for incinerators creating even more pollution.

Key report findings

The report points out that while manufacture and use of essential plastics should continue, the reckless increases in plastic production, and especially increases in the manufacture of an ever-increasing array of unnecessary single-use plastic products, needs to be curbed and their use greatly reduced. We also need to eliminate the migration of plastic into the biosphere across its life-cycle by embracing environmentally sound waste management.

Among the Minderoo-Monaco Commission's findings are:

- Plastic causes disease, impairment and premature mortality at every stage of its life cycle, with the health repercussions disproportionately affecting vulnerable, low-income and minority communities, particularly children.
- Toxic chemicals added to plastic and routinely detected in people are known to increase the risk of miscarriage, obesity, cardiovascular disease and cancers.
- Plastic waste is ubiquitous and our oceans, on which people depend for oxygen, food and livelihoods, are "suffering beyond measure, with micro- and nano-plastics particles contaminating the water and the sea floor and entering the marine food chain."

The Commission's science-based recommendations include a global cap on plastic production instituted through a Global Plastics Treaty.

Plastic's impact on our industry

So, what does the incorporation of plastic into beekeeping mean for our bees? Mostly, we don't know. No one is looking closely to see how the myriad of plastic related chemicals impact honey bee health. No one appears to be researching the amount of toxins, like the PFAS forever chemicals, that may be leaching out of plastic and into honey from plastic containers, or leaching into beeswax

from plastic foundation. What do the effects of these chemical have on honey bee larvae raised in plastic comb? How does the early exposure of queen bees to plastic (from being raised in plastic queen cups, to being shipped in plastic queen cages) impact their health and longevity?

We know from experience that bees do not like plastic. If a sheet of plastic foundation is not coated with enough beeswax, the bees will avoid the foundation, building their comb next to and parallel to the foundation rather than utilizing the hexagon-embossed plastic surface designed to encourage comb building. Are the bees trying to tell us something?

Thankfully, there are many alternatives to plastic available to us beekeepers. From leather smoker bellows, pure beeswax foundation, wooden hive components, glass jars and metal queen excluders, just about every beekeeping tool or hive part made of plastic has a non-plastic alternative available on the market. The only items I can think of that do not have plastic alternatives readily available are small hive beetle traps and large multi-gallon pails for honey. It's not that these items could not be made from materials other than plastic (think wooden beetle traps or large metal tins for honey packaging like they used to use in the old days), it's just that no one is currently making them and offering such alternatives for sale, at least not in the U.S.

It appears that long-standing concerns over pesticide chemical contamination of bees and bee hives has distracted beekeepers from plastic chemical contamination issues. I know I have not given the issue much thought in the past. The report from the Minderoo-Monaco Commission represents a wake-up call just as multinational fossil-fuel corporations that produce coal, oil and gas and also manufacture plastics are deliberately pivoting from fossil fuel production to making more plastic. As increased renewable energy production erodes fossil fuel use, the fossil fuel industry is looking to increased plastic manufacturing as one of the ways to help maintain a ready market for their global life-support system destroying products. BC

Ross Conrad is the Author of *Natural Beekeeping: Organic approaches to modern apiculture*, and co-author of *The Land of Milk and Honey: A history of beekeeping in Vermont.*

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BEE VET

Technical Updates

Dr. Tracy Farone

It is mid-May here in the foothills of Pennsylvania. The locust trees are in full bloom. It looks like it will be a good year for them. "Good for the bees," says the beekeeper voice in my head. The white-tailed deer have changed color into that beautiful reddish brown that pops out within the fresh, green backdrop of the woods. As my "barn" cat (but not really a barn cat), Sylvester, snoozes, stretched out at my feet, I just watched a doe trot away from a salt block 20 yards from my deck. I am a couple of days out from the end of the semester, time to take a breath… The last thing I want to think about is meetings, committees and the possible political acrobatics that go along with them.

I must admit I usually really hate meetings… "analysis paralysis," pre-determined "communication," hours of my life I will never get back, things "old" people do, and such. I have always thought it ironically funny that "committee" is the term for a gathering of vultures. But I am also appreciating the importance of voicing and hearing ***different*** perspectives on issues and how it's extremely important in today's world. And those that step up and serve on organizational committees are giving up their valuable time to contribute to important and ever on-going work.

As promised, I would like to give you an update and summary on a few exciting collaborations that have recently taken place and hopefully bring about positive relationships and outcomes between the beekeeping industry and veterinarians. The American Veterinary Medical Association's (AVMA) Animal Agriculture Liaison Committee (AALC) Meeting was held at AVMA Headquarters in Schaumburg, IL May 3-4, 2023. I had the opportunity to be a "fly on the wall" at times as an alternate delegate via ZOOM for some of the meeting. The Honey Bee Health Coalition's (HBHC) Annual Meeting in Sacramento, CA was held at the same time. Both meetings hosted veterinarians representing honey bee medicine for the FIRST time. All representatives were veterinarians also serving on the Honey Bee Veterinary Consortium (HBVC) board.

The American Veterinary Medical Association's (AVMA) Animal Agriculture Liaison Committee (AALC) Meeting Summary:

I have been an alternate delegate representing honey bees on this committee for four to five months now. I am still trying to figure out the ropes, doing mostly listening (a benefit to being the alternate). I can say the committee is continually active with legislative consulting and policy considerations coming to my email box every other day. I can also say that the committee is absolutely *enthralled* to learn more about honey bees. As an alternate, I did not attend the meeting in person, but Dr. Terri Kane was there, near Chicago, representing. I jumped into the meeting via ZOOM when I could. Some other perspectives include those that represent veterinarians and producers in the areas of veterinary pharmacology, bovine, fish, aquatics, swine, small ruminants, sheep, public health, cattle, chickens, turkeys and the reproduction of animals, as well as government entities like the FDA and USDA.

Discussions include topics like, the Farm Bill; various drug regulation bills; protective measures for maintaining a safe food supply; humane guidelines in animal handling; policies for identifying, preventing, and controlling several current disease threats; and reports on current issues affecting each industry represented and any on-going actions in place. Our honey bee report included information on the progress made within the HBVC and multiple Colleges of Veterinary Medicine to increase honey bee related education of veterinarians and veterinary students to better serve the industry through grant projects, additional curriculum and certification programs for practicing veterinarians. I wish I could get into more detail, but I am bound by a non-disclosure agreement and a secret handshake (just kidding about the handshake). Maybe I will work on the handshake when I attend a meeting in the flesh.

The Honey Bee Health Coalition's (HBHC) Annual Meeting Summary:

The stated purpose of the HBHC annual meeting is to "advance dialogue and action across workstreams in the priority areas of forage and nutrition, hive management and crop pest control." Focuses included almond production, bee protection, The Bee Integrated Demonstration Project and building relationships within members. Drs. Kristol Stenstrom and

HONEY BEE HEALTH COALITION

Britteny Kyle represented veterinarians and the HBVC, a new member of the HBHC, again for the first time. Various reports were shared on the status of honey bees, pollinators and the industry from both the agricultural and conservational perspectives. Best practices and projects involving disease management, habitat management and pesticide use were working topics of discussion.

Next on the List: Euthanasia and Depopulation Procedures in Honey Bees.

The AVMA is extremely interested in learning more about recommendations and guidelines for euthanizing honey bee colonies in various situations, in the safest and most humane manner. Various situations include smaller verses larger operations, stationary hives, migratory hives, emergency de-population procedures, euthanasia for public safety reasons and euthanasia for disease mitigation reasons. AVMA recommendations and guidelines exist for nearly every type of animal that veterinarians work with, except honey bees. I have been asked to be part of a special sub-committee to consider, write up and present recommendations and guidelines to the AVMA. As we begin this work, I am open to reader's suggestions on the topic. Oh boy… another committee, here we go! BC

Off the Wahl Beekeeping

Richard Wahl

WEATHER AS A FACTOR IN BEEKEEPING

We all know that one of the greater challenges in beekeeping is shepherding bees through our variable northern Winters. But what other weather factors should we consider when we are planning our beehive inspections, splits, mite control or feeding regimens?

In my experiences with beekeeping, I have come to rely on signals from nature and the variable weather patterns in my own surrounding environment rather than reliance on specific calendar dates that follow the same schedule year after year. So in this article, I will relate some of the clues and weather events that signal the appropriate time to take certain actions that have resulted in my success in getting at least one hive through every Winter for the past thirteen years. My greatest result occurred several years ago with nine hives going into Winter and those nine hives successfully surviving through the following Summer. This result allowed me to sell a few nucleus hives (nucs), raise a few more queens and take another step toward being a self-sustaining beekeeper.

As the Year Starts

At the beginning of the year, shortly after Christmas, is when I briefly open hives to add a cane sugar food supplement to the hive. It seems that every so often around the Christmas/New Year's holidays there is a day or two that gets above 45°F (7°C) that allow for both cleansing flights and the insertion of extra food supplies. There are various ways to supply additional food resources including hard candy boards, sugar patties or granulated sugar over newspaper. I hesitate adding any sugar source earlier than late December. Any form of cane sugar is harder for the bees to digest and if they decide to tap into the additional hard sugar source in the Fall, it can possibly result in a form of dysentery. Dysentery is often the result of bees not being able to leave the hive for cleansing flights and finding it necessary to relieve themselves in the hive. The February and March time frames are when most hives are lost over Winter due to a lack of food resources.

Another Winter task is that every other month or so I will also use a bent ½ inch metal bar to clean out any dead bees from the bottom board. Once temperatures only occasionally drop below freezing at night, I will also remove my insulation sleeves that cover all but the bottom and top entrances to the hives. Some of my fellow beekeepers use blanket insulation and also remove them when temps begin to only erratically fall below freezing at night.

Winter sugar over parchment paper is nearly used up, the remains of a partial pollen patty at lower left of sugar.

My next clue is the budding of maple trees in my yard. In some years, I have seen white pollen brought into hives in very early February; possibly from pussy willow shrubs, but not of sufficient quantity to support the needs of potential new larva. If one does see pollen being brought into the hive, this is a clue that the hive is most likely healthy and the queen has started to lay eggs, although in very small quantities this early in the year. In late March or early April there is one of a dozen maples in my yard that is always first to have the buds pop open. On a warm, sunny day, standing under the tree, it sounds like you are standing in a beehive. I use this as my signal to check the cane sugar supply once again and add a partial pollen patty to each hive.

The next pollen/nectar flow will not occur until a month later, in late April or early May. If they gather enough pollen from maples and other sources they will not use much of the pollen patty. But if rainy, cold weather precludes much pollen collection they may use most, or all, of the supplied patty and it may even need to be replaced before the dandelion bloom.

Heavy dandelion bloom is the next signal I use to know that Spring flowers and the dandelions are providing the first nectar flow. This is also my signal to do my first deep hive inspection and commence with any splits I may wish to do. Moving frames around, even if exactly replaced before dandelion bloom, can disrupt the hive in such a way that the cluster does not reform to provide the needed warmth for new eggs and larva resulting in the loss of the hive.

Opening a hive has a different meaning than inspecting a hive. Up to this point, I have only opened the top of hives to add sugar or pollen patties, while inspecting means to quickly examine each frame as it is removed and replaced or substituted if doing a split. The methodology of splits was covered in the April issue so I will not repeat my split techniques here. This is also the time where I will clean off the bottom board and remove excess old or pollen saturated frames.

Bent metal bar used to clean out bottom board in Winter.

Once May arrives, the beekeeping season gets into full swing here in SE Michigan. It is a good time to do the first mite check and initiate treatment, if called for. It is suggested that for the first few months of beekeeping the new beekeeper check hives once a week to every ten days. This is also a good recommendation for any new hives or nucs that have been started in order to monitor their progress. These do not have to be deep hive inspections looking at every frame. Often starting an inspection by pulling a frame or two from one side until eggs/larva are spotted is enough to see the hive is functioning well with an adequate queen without ever seeing the queen or looking at every single frame. As your comfort level and knowledge increases, hives may not need to be inspected for a month or more if things look normal with bees coming and going. Bees that are bringing in some pollen is a good sign there is a laying queen and larva to be fed.

Weather Affects Flying Time

Since beginning beekeeping, I find I keep a much closer watch of weather forecasts to determine the best times to work with my hives dependent on weather. As the Summer flowers start blossoming and nectar flows get into full swing, weather is the key factor in how much time bees can be flying and making collections of nectar, water, pollen or propolis. Any new splits or weaker hives can benefit from a feeding of one to one sugar syrup and an initial mite treatment if needed. I like to use a single Hopguard strip in five frame starter nucs just as a precaution. From this point on through the Summer, it is a matter of periodically checking hives to be sure the queen is laying, mite loads do not become excessive and no inherent diseases occur. When all but one or two frames in the top most super are drawn with comb and filled with brood or nectar and honey it is time to add another super. I prefer to keep my bee's brood chamber in two ten-frame deeps with a queen excluder under any honey supers that are continually added through the Summer. I know of area beekeepers that work with eight frame medium supers and use three supers as their brood chamber with equal success. If I were to start over again, I would most likely choose the eight frame triple supers due to the weight factor of a ten frame deep super when full.

Taking weather into consideration, there are factors that come into play when the bees will be less agitated when doing an inspection. It is generally recommended that inspections be done on days when the outside temperature is above 55°F (13°C). On a warm, sunny day, most of the foragers will be out of the hive. If there is a front moving in or it is rainy out, the bees seem to be able to sense this and will be more agitated. Likewise, cloudy or windy days are not optimal times for inspections. The time of day that works the best seems to be between 11:00 a.m. and 3:00 p.m., although on nice Summer days that are longer, inspections can stretch into the late afternoon or early evenings.

When opening a hive, listen to the noise of the bees. If it goes from a peaceful hum to a louder roar it may not be the best time for a deep inspection of all frames. I recall helping a new beekeeper several years ago who had a work schedule that allowed for inspections to only occur on weekends. Several months of rainy or windy weather made it quite difficult to inspect during optimal weather which made for a more difficult beekeeping Summer. The hobby beekeeper with other employment challenges may find it difficult to find optimal overlaps between good weather and their free time to inspect hives.

Most of my reading and research indicates that mite checks are recommended about every month to month and half with the most critical time being August through September. This is when the mite population is exploding just as the bee population begins to decrease in preparation for Winter. Mite population control is without question the current most important part of beekeeping to insure hive survival over the coming Winter. When doing splits, I insert drone frames which forces me to get into new hives in less than 24 days for their removal. This assumes drone comb has been drawn, capped and drone brood is present. Mites prefer drone brood due to the slightly longer 24 day period it takes for drones to emerge. Removing drone frames prior to 24 days precludes a mite explosion as drones emerge from cells. When mite counts warrant treatment, I follow with a formic treatment in late June or early July followed by another treatment in late August or early September and finally one or two oxalic acid dribbles in October and late November if needed.

Harvesting Honey

Fully capped frames of honey can be taken any time of the beekeeping Summer/Fall season. I have taken honey from remaining Spring hives where the bees did not survive the Winter. If doing this, it is easiest if the honey frames are warmed and checked for any crystallization. Extracting frames that are partially crystallized can quickly plug up the filtration screens and make it very hard to strain the resultant honey. I have found it much easier to feed any unused overwintered frames back to the bees or use them in new hives or nuc splits. Bees from active hives will soon find frames that are set out some distance away from the apiary and will remove the surplus honey to existing honey supers. I have also had some luck with a partial super of near full frames placed over an inner cover that is on top of the upper most honey super allowing bees to clean out the excess frames of honey. During my first few years of beekeeping I only collected honey once in the Fall. This sometimes resulted in very tall hives as supers were added to give the bees more space.

I have since decided it is easier to make a harvest in late July followed by another in September. Any Fall flow is left for the bees to backfill the brood chamber for their Winter honey supply. If new nucs or hives are made from splits, those new starts may not produce any excess honey for the beekeeper in

Three deeps and four full honey supers with a fifth added before Fall honey harvest reached over six feet and resulted in future harvests occurring twice a season.

their first Summer. Taking too much honey from the bees in their first season is also a reason for Winter loss as this may result in Winter starvation.

The amount of nectar the bees collect that can be turned into honey is directly related to weather conditions. Continual rain and thunderstorms during a peak nectar flow can significantly cut down on flying time and wash away available flower nectar. Dearth periods where there is no rain for weeks also effects nectar availability, as the plants are using available ground moisture to sustain leaves and growth rather than producing pollen and nectar for flowers and seeds. Weather that is hotter than normal or nights that are colder than normal also impact the amount of nectar that plants produce. As the beekeeper learns to keep a close eye on weather and forecasts, they can better determine optimal times for inspections and if there will be a larger or smaller honey harvest.

Another aspect to consider is when to start nucs for overwintering. I have found that nucleus hives of four or five frames are best started in May or June but no later than the beginning of July. Four frame nucs started in those months may need a second or even a third story four-frame super added to make space for the increasing number of bees. The earlier the start, the more frames that may need to be added. In the following Spring, five frame nucs can be sold and excess frames used to begin new hives or nucs or simply used to increase ones hive count.

Fall Weather Clues

As Fall weather temperatures get cooler and daylight time gets shorter, the bees will be out foraging less and Fall nectar flows are sometimes questionable. Hives that have had their last honey harvest may benefit from Fall feeding of 2:1 sugar syrup. Any extracted honey supers can be placed over the inner cover and under the outer cover such that only the bees in the hive can clean out the honey supers for storage and reuse the following year. There is less chance of bees storing additional nectar/honey in the extracted honey super if it is placed on a different hive than that from which it was taken.

As the temperatures start to drop below 40°F (4.5°C) at night, it is time to combine hives or restrict hives to smaller spaces. This will also be when the Fall flowers such as golden rod and wild purple asters have passed their peak. If there are several weak hives they can be combined using the newspaper method between supers and pinching the weaker queen. Although, I have had very heavily populated hives come through the Winter in three deeps, I like to confine bees to only one or two ten-frame deeps as Winter approaches. New hives or swarms caught earlier in the Summer are usually best if confined to one ten-frame deep while established hives with a large population of bees may be better if allowed to have two deeps.

As stated earlier, August and September are critical months to keep mite counts under control. A day or two after doing a mite treatment, another test for mites is highly recommended to see if that treatment had an effect. If mite counts are still higher than recommended (3 per 100 in Fall) another treatment may be needed. High mite counts during these months are a strong indicator that the hive may not survive the Winter. As temperatures start to dip below freezing at night, it's time to winterize the hives. I use a combination of a coroplast sleeve over the sides of the hive as well as Vivaldi style spacers for ventilation over the inner cover.

Coroplast plastic sleeves over hives.

There are other numerous ways to insulate a hive, such as using tarpaper or hive blankets if Winter temperatures can get very cold or are somewhat variable in your area. And this brings us full circle to the beginning of the next year.

As you become more experienced as a beekeeper, noting the changes in nature can lead to more efficient beekeeping dependent on your environments weather conditions rather than on calendar dates. I have found that keeping good notes has helped me improve from year to year. If you are not in a note taking mood, I have included a checkoff page (shown to the right. There is also a PDF on our website that can be downloaded and printed. Either scan the QR code or go to **https://www.beeculture.com/off-the-wahl-beekeeping-5/**) that can be copied and used as you inspect your hives. This is a slightly modified checklist obtained from a local beekeeper and used with permission from Jim Ford, who works with a Boy Scout troop to obtain various merit badges including beekeeping. Using clues from how weather patterns effect nature in your local environment can lead to a better beekeeping experience. BC

HIVE INSPECTION SHEET

Apiary Location		Hive ID	
Date and Time of Inspection			

Inspection Details		5 Frame		8 Frame		10 Frame	
Pollen Gathering?		Nectar Flow?		Weather			

Purpose for Inspection		Development Times for Honey Bees						
		Development (days)	Queen	Worker	Drone			
		Egg hatches after	3	3	3			
		Cells capped after	8	8	10			
		Adults emerge after	16	21	24			
Hive		Queen Seen		Marked		Eggs		

Queen Cells w/Egg, Larva or Pupa?		Removed Queen		# Queen Cells Remaining				
Emergency		Spotty Drone Brood		# Frames w/Brood				
Swarm		Worker brood in all Stages		# Frames w/Honey or Nectar				
Supersedur		Compact Brood Pattern		# Frames w/Pollen				
		# Frames of Foundation		# Frames Open				

# Frames bees occupy in brood chamber		Supers in place		# Supers Added				

Hive Health				Actions Taken/Notes				
Signs of Disease?		Good Temper						
SHB Damage?		Aggressive						
Nosema Streaking?		Weak Hive						
Signs of Varroa?		Marginal Hive						
Wax Moth Damage?		Strong Hive		PS Mite Check		Mite Count per 300		

How to Inspect a Hive Part 2

Darryl Gabritsch

Part 1 of this article was originally published in the December 2021 issue. If you missed it or would like a refresher, scan the QR code to the left or go to **https://www.beeculture.com/how-to-inspect-a-hive/**

Inspecting a hive is only one part of colony management. If you see an issue while inspecting a hive there are various management techniques to do depending on what you see. This article will be three parts. Part 1 covers the concepts behind a hive inspection. Part 2 covers pre-inspection procedures. Part 3 covers the actual hive inspection procedures.

How often and when you inspect a hive totally depends on your lifestyle, beekeeping experience, what your philosophy is and what the purpose of the inspection is. All inspections should be systematic and have a specific purpose. Why are you opening a hive? Are you simply lifting the hive body to check under the frames for swarm cells (cold months)? Are you opening the hive to remove frames to do a detailed inspection (warm months)? Are you opening the top to simply look at the cluster location and strength, or simply checking a hive top feeder?

Most of us are just hobby beekeepers and have work and home life to balance along with beekeeping. Ask yourself: How much time can I dedicate to beekeeping? What skill level are you at? Are you a beginner, a Master Craftsman Beekeeper, hobby beekeeper, sideliner beekeeper or commercial beekeeper? How much time do you have to manage the colonies? Do you mind if the honey bees swarm? Do you simply want to help the honey bee? What is the purpose of the inspection?

There are many ways to inspect a hive, this is how I do it. Remember the adage: Ask 10 beekeepers how to do something and you will get 12 answers; all will be right.

Pre-inspection steps I do when I inspect a hive are as follows:

1. Do all your preparations BEFORE opening the hive.
2. Place a storage box in the apiary with items you might need to manage colonies. I have the following in my box:
   a. Newspaper to combine colonies if needed.
   b. Mineral oil to load Beetle Blaster traps to kill Small Hive Beetles.
   c. Several empty Beetle Blaster traps.
   d. Several one-inch ratchet straps to strap down hives in high winds.
   e. Cordage to tie down items, or create loops to hook the straps into.
   f. A bee brush.
   g. Several entrance reducers in case of robbing.
   h. One to two robbing and moving screens in case of robbing. I hold it in place with a strap if robbing occurs.
   i. Painters tape to seal hive cracks if robbing occurs.
   j. A black permanent Sharpie marking pen to write on top of hive tops (This is my version of an apiary notebook instead of using a dedicated inspection sheet that I'll likely forget to take to the apiary).
   k. A one-handed queen marking cage and a marking pen; though I rarely mark queens unless a mentee wants to learn how to do it.
   l. A frame spacer if I'm using honey supers and putting one less frame in than the box calls for, so the bees will draw the comb out further.
   m. Several full red bricks, half red bricks and sticks placed on the ground next each hive stand, or near the storage box. I use these as signals, as needed.
3. Place a complete, spare, empty hive with all component parts in the apiary in case you need it to make a split.
4. Place a spare hive top on the hive stand (or ground if you don't have long hive stands).
5. Place an empty deep hive body on top of the hive top. I use this setup instead of a frame perch to keep debris out of the frames, and to isolate the queen frame if I find her while I continue to inspect the hive. I do occasionally use a frame perch though, if I want to photograph something with my cellphone camera.
6. Place a small LED flashlight, J hook hive tool and L shaped hive tool within arm's reach of the hive. I purchase inexpensive hive tools from Amazon and keep a hive tool on each hive to minimize spreading diseases. I alternate every other hive with either a J-Hook hive tool, or a traditional L-shape hive tool. I use the J-Hook hive tool to lift out frames and the L-shape tool to scrape propolis off the hive components.

Hive Inspection Prep Box

Hive Inspection Prep

7. Place a small red brick, a half red brick and a short stick near the hive if they aren't already there. The bricks are signal tools to let me know what is going on in the hive without me opening the hive. A full brick means I spotted either eggs or the queen. A half brick means I saw queen cells. A stick means I need to stick something in the hive (food, frame, mineral trap, etc.).
8. Start your smoker BEFORE you don your equipment. I had a mentee burn his veil and suit when the smoker fire flamed up as he was adding fuel (long leaf pine straw). I store a bag full of long leaf pine straw in a storage shed, so I have dry fuel all the time.
9. Put on a sweat headband to keep sweat out of your eyes.
10. Put on reading glasses to help spot the eggs. I use inexpensive 1.5 power reading glasses from my local store. Put them on toward the middle of your nose, so you can see through them to spot the eggs, and still be able to look over top the frame if needed. TRUST ME, you will appreciate having reading glasses to help spot the eggs.

Summary. Learning how to inspect a hive is a crucial step in your beekeeping journey. Having a systematic inspection process will keep you focused on the steps needed to conduct a thorough, and eventually a quick, hive inspection. Knowing what to look for will help you determine what is normal and what requires further diagnosis and remedies. Beekeeping is both a science and an art. Beekeeping science is knowing the cause and effect of diseases and pests. Beekeeping art is balancing the various management techniques to keep healthy, strong colonies. Thank you for reading this if you stayed this long. BC

Darryl Gabritsch is a North Carolina Beekeepers Association Master Beekeeper and lives in NC with his family.

How to Inspect a Hive Part 3

Darryl Gabritsch

Inspecting a hive is only one part of colony management. If you see an issue while inspecting a hive, there are various management techniques to do depending on what you see. This article will be three parts. Part 1 covers the concepts behind a hive inspection. Part 2 covers pre-inspection procedures. Part 3 covers the actual hive inspection procedures.

How often and when you inspect a hive totally depends on your lifestyle, beekeeping experience, what your philosophy is and what the purpose of the inspection is. All inspections should be systematic and have a specific purpose. Why are you opening a hive? Are you simply lifting the hive body to check under the frames for swarm cells (cold months)? Are you opening the hive to remove frames to do a detailed inspection (warm months)? Are you opening the top to simply look at the cluster location and strength, or simply checking a hive top feeder?

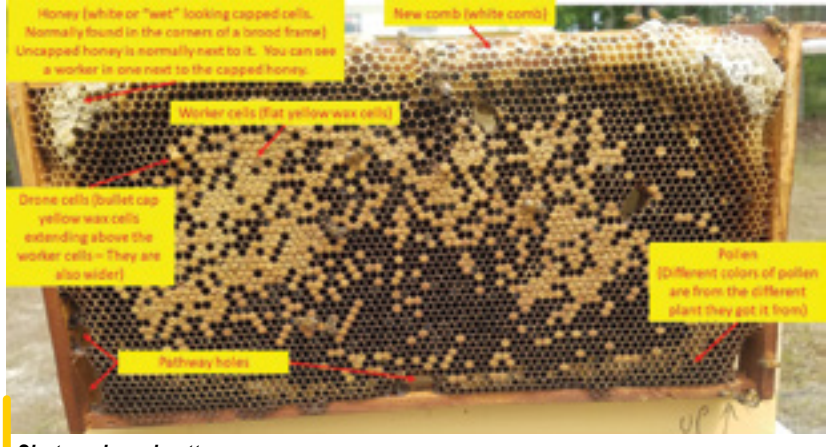
Inspection

Actual inspection steps I do when I inspect a hive are as follows:

1. Look at the outside of the hive as you approach it to see what the bees are doing (swarm preparations, robbing, normal orientation flights, etc.).
2. Look for scattered hive components. This indicates bears, pet interaction with a colony or human activity (vandals). Do you see scratch marks on the ground or hive? This indicates a skunk, or another small predator.
3. Are the bees defensive as you approach the hive? The issue could range from undesirable genetic traits (bad queen and drones), pest issues such as skunks, *Varroa* mites, extreme hive beetle or wax moth infestation. Perhaps you are in a dearth (lack of nectar flow). Rarely do you have an Africanized colony, but it is possible if you live in the deep south where Africanized honey bees have been found. Most of the time, the cause isn't a bad queen or Africanized honey bees. Also realize all colonies will have a bad day occasionally.
4. Look all around the hive and on the ground around the hive for evidence of pests, disease or pesticide poisoning. Don't stand in front of the hive during an inspection. You will be in the flightpath of the bees and will be visible to the guard bees in the colony. Stand behind or to the side of the hive during your inspection.
5. Look for indicators of disease such as viruses (disoriented walking bees, hairless bees or diarrhea on the outside the hive) If you see poop on the outside of a hive, remember to look for it on top of the frames. It's normal to occasionally see small amounts of poop (thin brown streaks and splats) on the outside of a hive; especially during cooler months… a girl's got to go when a girl's got to go! Do you see piles of dead bees on the ground around the hive? It is normal to see a couple hundred dead bees around a hive. Remember the queen lays between 1,200 and 2,000 eggs a day. Most foragers die before returning to the hive, so you won't see thousands of dead bees around the hive unless something is wrong (starvation or pesticide poisoning). If you see thousands of dead bees, call your state apiary inspector to help diagnose the problem. Your bees may have been exposed to pesticides while foraging.

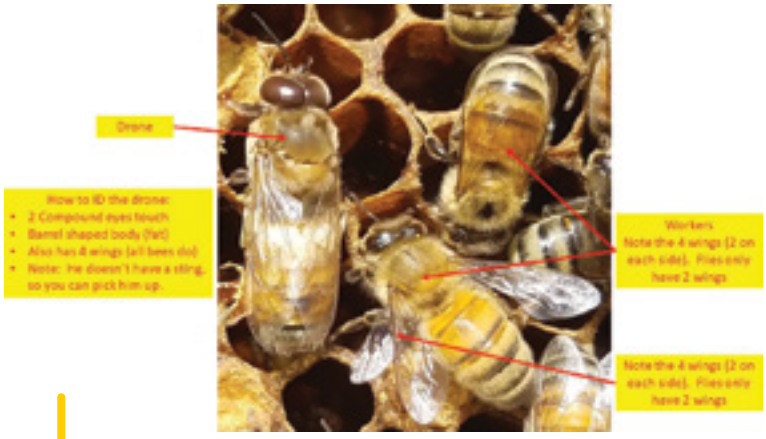
6. Use your senses when inspecting a hive. Do you see indications of problems? What smells do you smell? Do you smell something like rotten oranges? It could be small hive beetles (*Aethina tumida*). Do you smell something like rotting meat? It could be American Foulbrood (*Paenibacillus larvae*)? Does something smell like old socks or old cheese? It could be European Foulbrood (*Melissococcus plutonius*), or it could simply be goldenrod or some other honey in the Fall. Do you know what propolis and beeswax smells like? Do you hear noisy bees? Your senses are only a starting point. You must do further investigation and analysis to determine the cause of the abnormality.
7. Gently smoke the entrance of the hive to mask alarm pheromones.
8. Use your hive tool to crack open the top-most hive body and puff a generous, but not excessive amount of smoke through the crack to mask alarm pheromones.
9. Wait about 30 seconds to allow the smoke to filter through the hive before opening the hive.
10. Remove the top cover and look at the top feeder for ants and if all the syrup is gone,. Does the syrup smell sour (fermented)? Place the hive top on the ground to serve as a base to put the rest of the equipment on.
11. Remove the hive top feeder and place it on the hive top.
12. Look down through the top bars of the frames to see where the brood is and if there is drawn comb or filled cells with brood, honey, pollen, etc. Look for wax moths (*Galleria mellonella*) and small hive beetles trying to escape.
13. Gently remove any hive beetle traps you may have between the frames, being careful to not spill the mineral oil from them. The traps should be filled about half full of mineral oil. The mineral oil should be liquid and move freely. If it is gelled (viscous), you need to replace the trap. Look at the trap to see how many small hive beetle adults are trapped in it.
14. Gently push individual frames to one side of the hive to allow extra room for you to remove the outside frame. If the weather is cold, you should use your hive tool to push down between the frame end bar tabs to prevent breaking off the tabs as you pry apart the frames that have excess propolis on them.
15. Use your hive tool to gently lift up one end of the outside frame. I love to use a J-Hook hive tool with the J-hook end to do this. Grasp that end of the frame with one hand. Use the hive tool to gently lift up the other end of the frame. Lift the frame straight up and out of the hive. Once the frame is out of the hive, you can rest one end of the frame on the hive while you place the hive tool on top of the box.
16. Now inspect the frame. Grasp both ends of the frame like you are holding a steering wheel at 10 and two position. Put your back to the sun, so you have light shining over your shoulder and into the comb. If you don't have good light, you can use a small LED flashlight as a light source. To use the flashlight, rest one end of the frame on a hive and use the free hand to shine light into the cells. You can gently move the frame in small circles to see the flat portion of the cells at the bottom of the cells. I quickly search in a clockwise manner around the side of the frame in ever shortening concentric circles until I finish inspecting that side. Then, rotate the frame around, example: rotate it horizontally while maintaining the frame upright until you reach the other side. NOTE: You could simply rotate the frame out and then upside down; however, if you have unwired / unsupported comb you run the risk of the comb falling out of the frame. You also might spill out any uncured, watery honey. To me, the risk is too great, so I simply rotate the frame horizontally.
17. What are you looking for? You are looking for capped and uncapped honey. Newly capped honey will have white cappings on it. Older capped honey will have a dark "wet" look to it. Wet cap honey is still good honey. Look for honey in the top and top corners (honey band) on a brood frame. Next, you will find pollen of various colors. The colors are from the flower the pollen came from.

Brood pattern

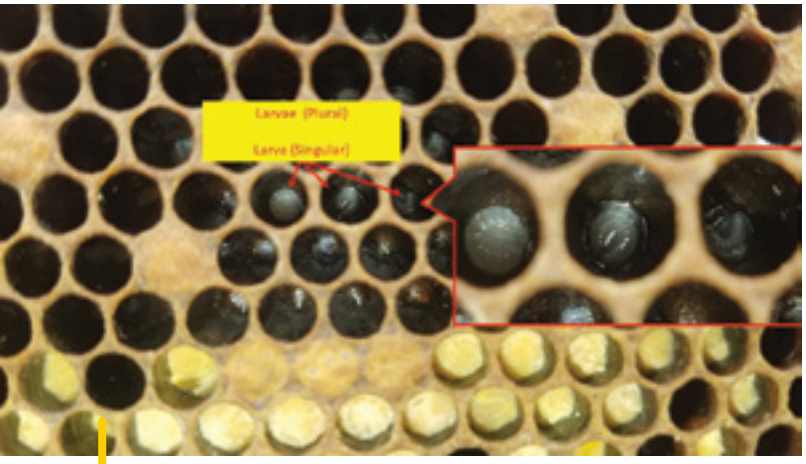


Shotgun brood pattern

18. You will be looking for the queen (marked or unmarked), drones, workers and capped worker and drone brood. Do you see workers with gray, fuzzy hair that can look wet? That's a young or newly emerged worker. Do you see workers with a darker looking thorax? That's an older worker. The hair has been worn off or thinned as it got older.



Drones and workers

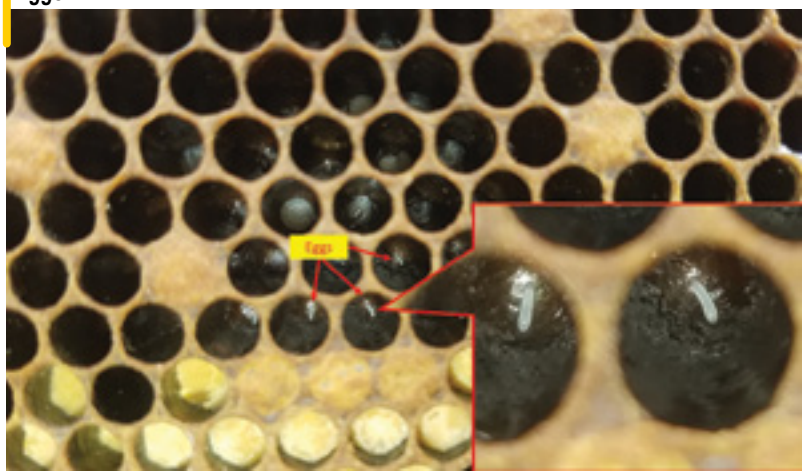


Larvae

Newly emerged workers

19. Look for a tight brood pattern with almost all cells capped. It is okay to see some holes where hygienic bees have sensed something wrong with the brood and removed the pupa, or you might see where an adult bee emerged from its cell. If you see a shotgun pattern (lots of scattered holes), you might have a *Varroa* mite problem. You are looking at the larvae color. They should be bright / pearly white. If you see yellow to brown larvae with visible white lines, you might have European foulbrood. If you see "melted" larvae you might have a severe *Varroa* mite problem. Look at the bees' wings (mostly worker wings). If you see deformed wings (shriveled wings) it is caused by Deformed Wing Virus, which is transmitted by the *Varroa* mite. Look for wax moths (adults and larvae) on and in the comb. Do you see spider webbing through the cells? That's caused by wax moths. Do you see "pepper flake type items"? That's caused by wax moths. Look for small hive beetle adults (they look like a black ladybug) and larvae. Do you see slime in the cells (especially honey cells)? That's small hive beetle damage. Do you see slime on the frames and honey cells? That's small hive beetle damage. Do you see greasy, sunken cells with small perforations? That's likely American Foulbrood. If you find wax moths or small hive beetles, kill them immediately, IF you have first checked for the queen on both sides of the frame. If you see the queen, I wouldn't kill the beetle or wax moth unless you are holding the frame over an open hive body, so that if the queen is knocked off the frame while you are killing the beetle or moth, she will land safely inside the box instead of falling into the grass where you likely will lose her for good. Unfortunately, this has happened to me in the past… lesson learned the hard way.
20. Look for eggs. The eggs are roughly 0.4 mm wide by 1.5 mm long (about the size of a grain of rice). You will be looking at the tip of the egg. Each egg should be roughly centered on the bottom (flat area) of the cell. Do you see multiple eggs in a cell? That could be normal or a laying worker. A queen, especially a young queen, will sometimes lay a couple eggs in a cell. That's normal. The workers will remove one of the eggs. Occasionally, you will have a worker lay eggs in cells in a queenright colony. That's normal. The workers can tell the difference between eggs deposited by a queen and those deposited by a worker. The workers will remove the eggs deposited by a worker. Do you see many cells with multiple eggs in it, with the eggs on the sides of the cell? That is likely a laying worker and the problem needs to be addressed.

Eggs



Laying worker evidence

Queen cups

21. Look for queen cups (acorn shaped cells on the face of the comb). It is normal to see a lot of queen cups. Look in the queen cups. If you see royal jelly (thick white, cream-looking substance), an egg (with or without royal jelly around it) or a larva inside the name changes from queen cup to queen cell. The workers will continue building the queen cell into a peanut shaped cell. Are the cells on the top half of the comb? These are normally supersedure cells. Normally, you will only find a few supersedure cells. Leave them alone and let the queens emerge as adults. You can choose the two best looking capped supersedure cells (cells that are long and have a distinct peanut ripple effect on them) to become queen adults, and destroy the rest (or use the other queen cells in a queen cell split). The workers will ball and kill the mother queen by suffocation and hyperthermia (cook her) during a supersedure. Do you see queen cells on the lower half (some books say the lower third) or along the sides and bottom of the comb? These are swarm cells. You can carefully cut around capped queen cells (being careful not to

Swarm cells

Supersedure cell

damage the cell) and use them in queen cell splits. You can remove the swarm cells completely, or you can put a hole in them to destroy them. The workers will see the hole, think something is wrong with the queen, and will tear down the swarm cell. NOTE: Once the colony gets the swarm instinct it is hard to get rid of, short of letting the swarm happen. You basically have two choices once the swarm instinct starts. You can try the Demaree method of swarm prevention (pioneered in 1892). It normally takes seven to ten days to complete, but it could take up to 30 days. You can also try destroying the queen cells if you want. I did an experiment in 2021 wherein I destroyed all the queen cells I found in a colony once the swarm instinct began. I finally won after ten weeks of destroying the queen cells every weekend. Do you see a queen cell with a thinned tip? This is a queen that will emerge within 24 hours. The workers will help the new queen by thinning the wax on the tip of a queen cell about 24 hours before the virgin queen emerges. The virgin will cut a hole in the tip, similar to the escape hatch on a submarine, and emerge out of the tip. Do you see a queen cell with a hole in the side of the queen cell? This is a queen cell that has been chewed open by a rival virgin queen. The rival queen will chew a hole in the side of her sister's cell and sting her to death while her sister is trapped inside the cell.

22. IF I find the queen, I isolate her frame (with her on it) by placing it in the spare hive body that is sitting on top of the spare hive top. I ensure there are no other frames close to her, so that I can reasonably expect to find her again on that frame before I put it back in the hive with her on it. Once you find the queen, you can speed up your hive inspection because you no longer have to worry about rolling and killing the queen.
23. Go systematically through the hive from top to bottom; all the way to the bottom board (even removing and inspecting under a slatted rack if you use one on your hive). All of my hives have them! It is important to go all the way to the bottom board during inspections. I frequently find a small hive beetle larva under the bees, or under debris on the bottom board. Look for the wax moth or small hive beetle larvae under wax cappings, or under paper shreds if you used the newspaper method of combining a weak colony with a strong colony.
24. You can get the workers to move out of the way as you do your inspections by LIGHTLY puffing cold smoke on them, by blowing on them (it upsets them, but it is highly affective) or by lightly touching them.
25. As you remove each box from the hive to go to the next lower hive component, stack the boxes at an angle on the previous box that you placed on the spare hive body and spare hive top. If I isolated the queen in a spare hive body, I don't place any more boxes on top of the isolated box, so she can't move up to the upper box.
26. If you decide to remove excessive propolis or wax from the frames you can do so after you place one end of the frame on top of hive AFTER you have checked the frame for the queen. You can then hold the frame with one hand and use the free hand to scrape off the excessive propolis. You can scrape off burr comb from the inside sides of the hive body once you have room to do it. If you see ladder comb

(burr comb that is on top of the frame, or under a frame) you can scrape it off (they will rebuild it), or you can leave it alone as long as it isn't interfering with anything. I normally leave ladder comb alone, but I do scrape off burr comb since it may scratch open the outside frame as I remove the first frame.

27. You then reassemble the hive components in the order you found it, or you can rearrange the honey frames. In the Spring, beekeepers will rotate the upper hive body, that contains the brood, to the lower hive body. Beekeepers rotate the honey frames to the upper hive body in the Fall. The concept is that the honey bees will generally move up in the cold months as they consume the food stores.
28. Lastly, mark the hive with a signal, or write on top of the hive top if you want a handy place for notes. The hive top is your built-in hive notes page. Repaint the hive top once you run out of room to write. I write notes with a Sharpie. I write the date of a queen cell split, or perhaps the date and type of mite treatment.
29. I place a signal on the outside top of the hive. I use a brick to signal what I found. I lay a full red brick on top of the hive to mean I saw the queen OR eggs. If I see queen cells, I add a half red brick (break a brick in half by smashing it against a cinder block or other brick… shards work too instead of a half brick. If I need to put something inside the hive (replacement Beetle Blaster trap, frame with foundation, etc.), I place a stick on the top of the hive to remind me to "stick something inside the hive".

Hive signals

Summary. Learning how to inspect a hive is a crucial step in your beekeeping journey. Having a systematic inspection process will keep you focused on the steps needed to conduct a thorough, and eventually, a quick, hive inspection. Knowing what to look for will help you determine what is normal and what requires further diagnosis and remedies. Beekeeping is both a science and an art. Beekeeping science is knowing the cause and effect of diseases and pests. Beekeeping art is balancing the various management techniques to keep healthy, strong colonies. Thank you for reading the entire series if you stayed this long. BC

Darryl Gabritsch is a North Carolina Beekeepers Association Master Beekeeper and lives in NC with his family.

Charles Linder, American Beekeeping Federation

CHC, ABF and *Tropilaelaps*

In the April and May editions of *Bee Culture*, there has been some information shared on the *Tropilaelaps* mite (T mite) and how it relates to the Canadian border and the ABF position recently taken. It is a great opportunity and we welcome the chance to have a discussion on the issue.

First, let me start with the American Beekeeping Federation directive as this needs to be mentioned.

Our Mission

The American Beekeeping Federation (ABF) will act on behalf of the beekeeping industry on issues affecting the interests and the economic viability of the various sectors of the industry.

This is our *key* mission, it is in this light, we addressed the issue in our annual meeting, to make an official statement on opening the Canadian border to U.S. packages. There are several keys to this. First and foremost, obviously, is the economic benefit to our industry. It's difficult to get real numbers as to what the potential will be as price and demand will drive that, but a simple calculation shows the upside of roughly 20-25 million dollars that would be injected to the industry. That's suppliers, and bee producers alike. No matter how you look at it, that is a perk to the industry, from the suppliers of bees, to equipment sellers and to the researchers helping keep them alive.

T mites and the Border. Ross Conrad gave us a good, basic history of the T mites in the April edition, so I am not going to rehash that, but I will add to it. Both species of *Varroa* and T mites share a basic history. Both are mites that jumped from Asian bees when European honey bees were brought into Asia. Much like the origins of our human pandemic, these pests have jumped species, and as such, are not in any sort of equilibrium with the new host.

A bit of history will quickly show us that mites in general have traveled the world very quickly, with little or no success in stopping their spread. From the tracheal mites of the 80-90's, to *Varroa jacobsoni*, to the *Varroa destructor*, the ability for us to stop or even slow their spread has been difficult, or one should say impossible.

Now comes the T mite. It is in fact following the exact same paths as the previous *Varroa* twins. While it's been pointed out, it does in general require fresh brood to survive, which will make it more difficult. One needs to look close at the research. Two KEY points. One species of T mite (there are four that I know of) has been found on rats. This is a huge concern given how easily they move around the world. The second is as noted by a key researcher, they can easily survive the duration of today's jet flights on an adult bee. This is not a stretch of potential, but a basic reality. One claim often made is they simply cannot make those jumps across the ocean. A simple look at how many Indonesian islands are already infected, and common sense must kick in.

It was mentioned we could simply mandate packages are held longer than the lifespan of the T mite, but that flies in the goal of the package producers and customers of Canada who are trying to get bees as fresh as possible. It should also be noted, we have zero ability to ask another country's government to hold packages for any length of time, so while it's an idea, reality is it is not likely to work that way.

We already know that both pollen mites and the bee louse are being brought in from Australia to Canada, would it really be a big stretch to get a T mite from their Fall bees accidentally in the process? It was also mentioned in Ross' writing, some mites have found a place to feed on adults. The process of taking the older Fall bees from down south and shipping them to Canada is peculiar at best, it speaks to the desperation the Canadians have trying to restock their losses.

Let's talk a bit about the T mite impact, here Ross and I part ways. After studying and paying attention to Samuel Ramsey's presentation at the ABF conference, it's quite clear this mite is in fact DEVASTATING. Dr. Ramsey made it clear, first off it only takes one mite, as she is already mated, to start the problem, but we are looking at total hive collapse in a few weeks. This mite's life cycle is incredibly fast.

> *"Pakistan lost 100% of their bee colonies in less than a decade."*
>
> —Samuel Ramsey, 2023 ABF Conference

Watch Dr Ramsey's video by scanning the QR code (or go to **https://youtu.be/jIhvHavThxA**), it is a must see! Pay close attention at the 12 minute mark where he tells us how they are already moving outside of where the science world thought they could. At 12:45, he explains how wrong they were and that T mites have already reached the coldest portions of China. Not only that, Dr. Ramsey tells us *they also inhabit native bees and are NOT specific to honey bees.*

The T mite means the end of honey bees as we know it in the U.S. Wild hives will be quickly decimated, pollination will be almost impossible without bi-weekly treatments. "Brood means death" and honey crops will be a thing

of the past. Don't take my word for it, please do your own research. I am a fan of Dr. Ramsey's work, like many, and when he says be nervous, I pay attention! He is the expert in this area.

Ross is 100% correct when he says "catch more bees with honey," our primary position is to be in a place to supply Canada with bees, so that we sweeten the pot. This will then allow us to reasonably ask them to cease imports from at risk areas.

As such, the ABF is making its primary position to do two things, One: do anything possible to reduce the risk and slow down movement, and Two: develop a real action plan for North America.

As it pertains to the border opening, it's not only ABF in this position, it's the U.S. Apiary Inspectors, the AHPA, the Canadian Beekeepers Federation and a whole host of other U.S. and Canadians who want this change made.

The Canadian need for pollinators is tied even to our own food safety and cost. Many types of crops and produce are produced in Canada and shipped stateside. Also, a win for the global carbon footprint. Do we really want our blueberries to have to be shipped in from South America?

As of yet, we can see no downside to beefing up our industry and reducing the risk of foreign invaders from other parts of the world. As such, I am proud of the ABF and its leadership position on this issue. BC

Charles Linder
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Commercial SIG director for ABF

WHY DIDN'T YOU LISTEN TO YOUR MENTOR Part 2

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.

Jar Feeder – Usage

When inverting a jar feeder, they will leak syrup until a vacuum is formed at the bottom (now the top) of the jar. Once the air pressure is equalized on the outside and the inside of the jar, it will stop leaking. Hold it away from you until this happens.

Laying Worker – This is a situation where the queen has died, and a replacement queen is available. The pheromone produced by the missing queen is reduced to the point where a worker decides to produce eggs. Indications of this situation are:

- Eggs not centered in the bottom of the cell. The worker's body is not long enough to correctly place the egg.
- Multiple eggs in a cell.
- All drone capped cells. The eggs were not fertilized.

Marking Queens – They tend to fly away.

Bees will fly to the light. When marking a queen, use this trait. First, convince your spouse that queens don't sting. Then, hint that the bathroom is an excellent work area. Next, ensure them that if the queen escapes, you can find her before the next shower.

Close the bathroom door, remove the curtains from the window and turn off all the lights. Then use the windowsill as a workstation for the queen marking.

Note: Unless you are concerned about the date/year of the queen, yellow or white are easy colors to find. Red or green on a bee-colored background is difficult for a person that is red/green color blind to see.

Note: Be sure to allow the marking to dry before placing the queen in the hive.

Measurements – Keep them handy.

Keep a "Story Board" in your work room with all the measurements you need to build your equipment. This one is hung directly above my saw.

Migratory Pallet – This unit is used by beekeepers who transport their bees to different sites to provide pollination services. It usually holds four Langstroth hives. The pallet is the bottom board. This unit allows for the use of pallet lifters to load, position and unload four hives at a time with minimal physical exertion.

Migratory Top – Used by commercial beekeepers as a top cover. When using this style cover, there is no need for an inner cover. A hive tool can pry open this style cover without any problems.

Mowing Grass – The bees really get upset.

It only takes one time of mowing the grass in front of the hives to convince you to not do that again. Unfortunately, your spouse requires the grass to be mowed.

Old shingles to the rescue – Placing an old but serviceable tar paper shingle in front of the hive will at least keep you from bumping the hive when mowing. If more depth is needed, then add a second shingle. You will still have to mow the grass, but you won't have to get as close to the hives and possibly bump them with the mower.

Nuc Creation – The easy way.

You now want to expand your apiary by creating nucs, but you don't have time to or you can't find an elusive queen. Select the brood, pollen and honey frames you need for the nuc and place them into a new hive body after brushing all the bees back into the hive. Put a queen excluder back on the hive followed by the newly created box. Then close the hive and wait an hour or two. The bees will move up to cover the brood and bee-less frames. The queen will not be able to get to the selected frames. Now you can move the queen-less frames to the nuc box.

Paper Towels – Indispensable!

Cheap bulk paper towels that can be tossed away can save you an unbelievable amount of time compared to cleaning out cloth rags.

Package – How bees are shipped and distributed to beekeepers. They are normally two sizes. A two pounder which holds 5,000 to 6,000 bees or a three pounder which can hold 7,500 to 8,500 bees.

Note: Bees are sold by weight not by count.

Pails – Food safe pails.

A good place to get free food safe pails is your local bakery or food store that has a cake department. Icing is used by the gallons. You may have to clean them but that is a minor inconvenience.

Paint – Free for the taking.

Free exterior latex paint is available at your local recycling center. Five-gallon pails are usually a mixture of all the half-gallons or less that were turned in. Occasionally full or almost full gallons of one color are available. The bees don't care what color their hive

is, and a pink or yellow hive body adds pizzazz to your apiary.

Painting – Bag your brushes and roller.

When painting multiple coats of paint, you may wait days between the applications. Place the roller and/or brushes in plastic bags. They won't dry out!

Note: Recycled bread bags work great.

Painting – Spackle the edges.

Use external spackle to coat the raw edges of plywood and the end grain of boards before painting the units. This makes painting easier and helps reduce the rot and ply separation caused by moisture.

Pasture Gates – They are there for a purpose.

If you have your hives on a farmer's property, pay attention to the gate positions when going to the hives. Make sure the gate is in the same position when you leave as it was when you got there. A loose animal will lose you your apiary privileges with that farmer and all his friends.

Propolis – Hive glue used by the bees to hide imperfections in the hive.

It is a mainly a mixture of plant resin. It has antiseptic and antioxidant qualities. It is most prevalent restricting the entrance to the hive and cementing the cracks between hive bodies. It is also used to encase foreign matter, which cannot be removed from the hive (dead mice). Flexible and sticky when warm and brittle when cold, it can be harvested by the beekeeper and used in medical tinctures.

Queen Bank

When you place caged queens into an area that will allow non-caged bees to take care of them, it is called banking. The easiest is to place a queen excluder on a hive and then put the caged queens above the excluder. This way the colonies' queen cannot get to them and they will be cared for by the colony.

Queen Cell

When more than one queen cell is built, the first queen emerging attempts and usually succeeds in killing her rivals. You can usually identify this situation when the queen cell has an opening on the side of the cell.

When a queen emerges normally, the cell is opened at the bottom of the cell. Often the "door" is still attached.

Queen Cell – Pinching

One way used to delay or eliminate swarming is to "pinch" the queen cells. This entails killing queen larvae while they are being developed and before they are old enough to allow the old queen to swarm. Therefore, keeping the hive and the volume of worker bees intact. Please be careful doing this. If you pinch all the queen cells and you did not realize that the colony had already swarmed, you have just killed the replacement queen and eventually the colony. There may not be larvae young enough to raise another replacement queen.

Queen Emergence

When a queen emerges from her cell in a normal manner, she will chew the bottom of the cell open. This usually leaves the cell cap hinged to the cell. When the queen was killed by an earlier emerging sister, the cell has a hole in the side of the cell through which the older sister killed her (Sororicide).

Queen Marking

If the reason you are marking queens is so you can find them then ignore the RGBPV color scheme that identifies the queen's year of birth. Use one or two bright colors and stay away from red and green. Over 10% of the USA's male population has some degree of RED/GREEN colorblindness.

Raw Honey

Raw honey has a fluid definition that is whatever the seller defines as "raw" is "raw". As a minimum, it usually is honey that has not been heated above a certain temperature or has had any of the pollen removed through super filtration. Truly raw honey is comb honey where nothing other than packaging has been done to it. Raw honey in a jar has been strained at a minimum and probably filtered but the pollen remains in it. What is your definition?

Recycling Locations – You can find almost anything there.

When looking for parts/pieces or ideas for re-purposing goods into beekeeping equipment, haunt the recycle stores. Most items are reasonably priced. Some stores to visit regularly are:

- Goodwill
- Habitat for Humanity ReUse Stores
- Salvation Army

Removing Supers 3 – Less sticky supers when extracting.

The burr and cross comb you didn't cleanup has come back to haunt you. Even if you tried to keep things orderly, the bees have a way of getting ahead of you. When this comb is broken it creates a sticky mess. To help eliminate this problem, try this procedure.

The day before extraction, remove the supers then swap and reverse them.

1. Remove each super. Place them in order and all the fronts facing the same direction.
2. Reinstall the supers starting with the first removed. At the same time make sure the front of the next super is now above the back of the previous super. This placement maximizes the possibility that torn comb and runny honey will not be replaced back in the original position.
3. The bees will clean up all the loose honey by the next day and the removal should be a lot less sticky.

Rock's Position – Positioning of hive cover weights.

The position and attitude of the weight can provide information you need to remember. Before starting inspection of the ten or twenty hives in your yard, place the brick or rock in a certain position on each of the hives. Then after the inspection is complete for that hive, place the weight in a different position. For example, the top center for a completed good inspection and the rear center of the top for a hive that needs food. This provides an instant view to the status of each hive. BC

A complete list of all 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.

BEHIND THE SCENES FOR THE BEES:

How IR-4 Supports Beekeepers and Honey Bees through Research and Regulation

Hannah Ross & Philip Moore

Photos by Logan Powers

From pest infestations to habitat loss to our changing climate, honey bees face formidable foes—both natural and anthropogenic. There is a delicate balance between protecting bees from those foes and ensuring colonies are unharmed by our interventions. How can we proactively protect bees while doing no harm?

This dilemma is nothing new to beekeepers. What may be lesser known is the rigorous regulatory work addressing this question behind the scenes. **The IR-4 Project** has an impactful sixty-year track record of securing safe, effective pest management products for specialty crops and specialty uses. IR-4's efforts also extend to the beekeeping community. IR-4 continues to help secure registrations of hive protection products to manage devastating pests like ***Varroa* mites**.

Joining Forces with Federal Agencies

In close partnership with the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Agriculture (USDA), IR-4 is working to fill gaps in beekeepers' pest management needs, with a focus on improving the safety, effectiveness and sustainability of approved products and technologies.

Providing Regulatory Expertise with the EPA

EPA has devoted significant resources to protecting pollinators and helping beekeepers, including the establishment of a Biopesticide and Pollution Prevention Department (BPPD) that specializes in evaluating novel tools like gene-based products. IR-4 has expertise in providing the necessary data for the EPA to evaluate the safety and proper use of new products and uses, based on rigorous standards.

Because of the steep regulatory burden, agricultural producers of specialty crops or niche products often lack access to safe, effective and EPA-approved pesticide options (whether conventional or biological). This is where The IR-4 Project comes into the picture, acting as a bridge between producer needs and regulatory requirements. While the core of IR-4's work is securing pest management solutions for growers of specialty crops like fruits, nuts, vegetables and horticultural crops, IR-4's expertise is vital to the beekeeping industry.

Expanding Producer Toolboxes with the USDA

The USDA is the funding agency for IR-4. Beyond this fiscal partnership, IR-4 and USDA work together on critical agricultural issues, including the protection of honey bees and native pollinators. USDA's **pollinator priorities** include forage, habitat and nutrition; environmental stressors; pests and pathogens; and genetics, breeding and biology.

Elizabeth (Izzy) Hill serves as Honey Bee and Pollinator Research Coordinator for USDA, where she works closely with IR-4 and USDA offices on a range of efforts, from putting more tools in beekeepers' pest management toolbox to strategically managing emerging threats. Hill highlights that supporting honey bee health is holistic work; USDA's pollinator priorities not only aim to serve pollinator health, but also our food system, economy and beekeeper livelihoods.

"It's hard to imagine how we would do what we need to do without IR-4," emphasizes Hill. "[Beekeeping is] a small industry; most pesticide registrants cannot make the economics work to invest in pest management products for honey bees. That's understandable. But bees are such a linchpin for pollinating so many of our crops… we need to ensure we are having the right tools in our toolbox for pest management. If honey bees are affected, then all of these crops are affected."

USDA and IR-4, in partnership with the EPA, notably joined forces on the registration of oxalic acid, an active ingredient registered for managing *Varroa* mites. Because the ingredient is so cheap, no private-sector registrants would take it on. USDA stepped in as a short-term registrant, working with IR-4 to submit the required data to EPA for this tolerance.

IR-4 Programs Serving Bees and Beekeepers

Through its **Biopesticide Regulatory Support Program**, IR-4 submits registration packages for biologically-based products on behalf of registrants. IR-4's **Food Crop Program** also lends expertise to conventional product registration efforts, assisting with the submission of residue and product performance data. The specialty crop producers that IR-4 serves have a vested interest in

ensuring the health of honey bees for the pollination of their crops; with these growers and public wellbeing in mind, honey bee protection is vital to its mission.

IR-4's **Environmental Horticulture (EHC) Program** has driven significant pollinator protection efforts in the green industry, from determining the bee forage quality of various greenhouse and nursery crops to measuring pesticide residues in nectar following various application methods. These projects are helping develop the green industry's understanding of honey bee health and how they can support it, from the cultivars they stock to the way they manage pests.

"We've been studying the amount of residues that move into nectar from systemic insecticide applications," notes Dr. Palmer. "Foliar applications result in less residues than drench applications. If growers can shift to using foliar applications at the best times to avoid direct contact on bees, there is very little likelihood that the amount of residues in nectar are at a level that will harm bees."

To learn more about the work of Dr. Palmer and the team of pollinator researchers involved in this project across the country, visit the **Protecting Bees** website.

Impacts of IR-4's Honey Bee Work

In the field, access to pest management products has helped combat the devastating impacts of honey bee colony collapse. While there is a long way to go, existing products have moved the needle for beekeepers, as well as for growers who rely on honey bees for pollination.

Honing in on *Varroa* mite management has been crucial to stabilizing bee populations, and IR-4 knows that this pest is top of mind for beekeepers. IR-4 has been actively involved in nine out of 10 active ingredients currently approved for use on *Varroa* mites and is presently assisting with potential future registrations.* In addition to submitting registration packages to EPA, IR-4 has supported Section 18 approvals for emergency use, conducted magnitude of the residue studies on honey and beeswax, and funded efficacy studies for new active ingredients.

In his March 2023 *Bottom Board* column for *Bee Culture*, Ed Colby emphasizes the importance of proactive *Varroa* control. "Never ever assume that your mites are under control," writes Colby. "Colonies overrun with these little monsters are doomed."

Colby notes that management is always more successful in smaller numbers (before there is an infestation). He highlights his successes, failures and tips for using several active ingredients that IR-4 has been involved with, including oxalic acid, formic acid and thymol.

The existing toolbox for honey bee pest management is imperfect. With variations in efficacy, laborious and costly applications and increasing resistance to certain active ingredients (like amitraz), beekeepers often have to find their best solutions through trial and error.

"We do see some variation in efficacy due to environmental conditions—humidity, temperature—which can affect how certain products work," explains Hill. "We have researchers looking into these questions, making custom recommendations on what types of rates or application methods might be more appropriate. We are short on efficacious modes of action."

Knowing that more and better options are needed, IR-4 and its partners are hard at work behind the scenes fighting for accessible, workable solutions, and a deeper collective understanding of the pest management challenges we face (even those that are just emerging).

Looking beyond *Varroa*, IR-4 is needed now more than ever, with a new mite called *Tropilaelaps* gaining traction overseas. As we speak, IR-4 and USDA are collaborating on a "Tropi" working group led by USDA. Stay tuned for more on this emerging issue, and know that the brightest minds are developing strategic approaches to the management of emerging pests and pathogens. When it comes to mitigating the plight of honey bees and beekeepers, IR-4's support is here to stay.

Sixty Years and Counting

IR-4 invites the *Bee Culture* network to follow along this year as we commemorate **sixty years of impact** across the specialty crop community. Visit the **website** to learn more, subscribe to the **newsletter** and connect with us on social media. BC

Review **this story on IR-4's website to find the Appendix outlining IR-4's role in nine out of 10 active ingredients currently approved for* Varroa *mite management.*

Check your mailing labels! Next to your renew code are your remaining issues left. We suggest renewing if you have 3 or fewer!

www.BeeCulture.com

Successful Re-Queening Strategies

Tina Sebestyen

Photo credit: Tina Sebestyen

In my May article, *Control Swarming Without Splitting*, I mentioned the benefits of re-queening colonies in July. To quickly re-cap, colonies that receive a ripe queen cell or mated queen in mid-July enter Winter with a cluster that has 3,000 more fat Winter bees, and similarly lower numbers of Summer bees that can't really help heat the cluster or feed larvae. Also, colonies that get a new queen in July have queens that are less likely to swarm the next Spring, while also building Spring populations faster than their older counterparts.

There are also negative things that happen that cause queens to fail faster, or to be less able to build colony populations well. And these negative things are what we are purposely doing to our colonies… repeatedly administering organic acids (or inorganic ones). Because we normal beekeepers don't see the damage caused by miticides like oxalic acid, thymol and formic acid, we treat our bees, sometimes multiple times per year with these agents of destruction. All of these acids cause damage to bees. Worker bees die after 38 days in Summer anyway, but what about our queens that are supposed to last multiple years? They get hit time after time. These acids cause thinning of the cuticle of the honey bee, shortened lifespans, damage the egg-laying capability of the queen or the sperm stored inside her and damage the sperm of the developing drones.[1] Not that we shouldn't be keeping mite numbers low, but there are other ways to do it besides with repeated acid treatments (we'll discuss this at greater length in the next article).

Today, we'll discuss methods of introducing a new queen that are more reliable than just placing a queen cell with a candy plug and hoping for the best. A queen cage with a candy plug might be alright, if conditions are perfect. What are perfect conditions for queen acceptance? The queen is recently missing, like you removed her five hours ago, or maybe yesterday. There are no queen cells growing in the hive anywhere. There is open and capped brood in abundance. There is a nectar flow going on. The bees are not of an aggressive nature. Unless all of those conditions are perfect, allowing the bees to remove the candy and release the queen comes with risks.

The number one thing a colony of bees needs to be ready to accept a new queen is brood in the hive. It is the combination of brood pheromone and queen mandibular pheromone that makes a colony happy. If one is missing, no one is happy. This is why you *need* more than one colony, so that if you lose your queen, and discover it after the brood has emerged (which will usually be the case), you have a hive to donate brood from. It is almost impossible to get a colony of bees to accept a new queen without brood pheromone, no matter how long you take in releasing the queen. Buy a sheet of brood from someone if you have to!

Placing a queen in a hive inside a cage doesn't actually provide much Queen Mandibular Pheromone, since it is passed by touch throughout the hive, and they can't really touch her very well through the cage. And, thinking like a bee… if there is no brood pheromone, whose fault is it? Answer: it is the queen's fault. The bees don't make the connection that it was the old queen's fault, and not this one. They just know… poor QMP and no brood pheromone, we ain't happy. If there are still eggs in the hive, the bees will usually start emergency queen cells, even though there is a caged queen, since they aren't getting a good dose of QMP from that young queen whose pheromones haven't developed too well yet, and that they can't really touch. It is important to be aware of the likelihood of queen cells in the hive, since the bees would always prefer to raise their own queen (even if it wasn't their own egg) than to accept your store-bought queen. Even if the sheet of brood you gave them had only older larvae on it, they may have started with a too-old one rather than wait to see if other things are going to work out. So, before you release that queen from the cage, shake the bees off of every frame in the hive, even honey frames, so you can be sure to inspect every square inch of every frame and kill every one of the emergency cells they started.

Letting her out of the cage sooner, so that they can touch her is not the answer, either, since they still know that she isn't theirs. They will ball and kill her (they usually heat her up so much that she cooks, rather than stinging her). They must be ready to accept her before you let her out of the cage. There should be brood in the hive, and there must not be any queen cells anywhere.

It might seem like it would go without saying that there also cannot be a queen in the hive. You need to be sure. About 10% of the time, there is not just one queen, but rather, there are two, a mother and daughter working together. So, even if you just killed or captured and removed a queen, keep looking, there might be a second one. Hone your skills of finding the queen (also described in the May article). And, there could be a virgin running around in the hive. Virgins are skinny and fast, and hard to find, even for seasoned queen-spot-

ters. Ask yourself some questions: has it been two weeks since I was in the colony? Is there no open brood, but just a little capped brood left? Is there even a remnant of a queen cell in the center of a frame? (The bees often break down an emerged queen cell within 24 hours). Those clues all add up to the possibility that there is a virgin in there. How can you know for sure that there is no virgin in the hive? Answer: ask the bees. Place a frame of eggs or newly hatched larvae in the hive from another colony (again, see why you need at least two?) If there is a virgin, they won't start queen cells, if there isn't one, they usually will.

Now that you have removed the old queen, and searched for a potential second one, or you have asked the bees if there is a virgin in the hive, and there is brood pheromone, you are ready to begin introducing a new queen. Step one is to remove the attendants from the queen cage. I know… the books say that you can leave them, but I learned beekeeping from wise old guys who knew that the bees in that cage aren't always nurse bees. Sometimes, they are just five random bees, some of whom might be foragers, and who the house bees in your hive will really want to kill, placing your queen in jeopardy as well.

Here are some tricks to help you get the attendants out without losing your queen. If you are lucky enough to have all of your bees in your own backyard, the bathroom is the perfect place to do this, especially if your bathroom doesn't have any windows in it. If it is completely dark, take your queen cage and a red headlamp in the bathroom, put the plug in the sink, pull back the screen on the face of the cage and dump all of the bees out into the sink. Bees can't see red, so they won't fly, they will just walk around in the sink, so you can pick your queen up (without touching her abdomen!), put her back in the cage, push the screen back in place while you can see that you are not crushing the queen anywhere, and snicker about how your family will appreciate the rest of the bees that are now loose in the bathroom.

I usually wait until I am in my apiary (an hour from home) so I can be sure that I still need to introduce the queen. By the time one shows up by FedEx, something might have changed, and a queen in a cage without attendants won't live long at all, so I don't remove them while I am still at home. Sit down with your veil in your lap, and hands and queen cage inside the veil. When bees are lost, they go up and to the light, so if she gets away from you, the queen will just end up walking around on the inside of the veil, so you can catch her and put her in the cage all alone. Don't forget to let the other bees out of the veil before you put it on!

Both of these techniques require you to be able to handle the queen without damaging her. Practice on drones until you are confident in your ability to grab them by their thoraxes (fuzzy front shoulders) without touching their abdomens. If you aim directly for those shoulders, you will often miss and get the abdomen, since the bee isn't stationary, but has forward momentum. Timing is everything. In hunting they call it leading… aim a little ahead of where you see the target, and by the time your fingers close, the shoulders, and not the abdomen, are what are between your thumb and forefinger. I use my non-dominant hand, and don't think I could catch a queen with my dominant hand, but you might be different. Try learning with your non-dominant hand (so you can use a marking pen in your dominant hand), and if you can't learn to do it, use your dominant hand. Practice, practice, practice, on drones, and then on workers who can "reward" you if you grab the abdomen.

Now, there is no other queen, virgin or queen cell in the hive. There is brood, and there is a queen alone in a cage. You are ready for the next step. Leave the cork over the candy, and place the queen cage near the top of a frame that has brood on it, preferably in the bottom box. Near the top, because if it gets cold and the cluster contracts, we want the queen to be in the center of that cluster. On brood, because that is where queens

Mother and daughter queens are together on this frame,which is unusual. I normally find mine at opposite ends of the brood chamber. Photo credit: Beth Conrey

When searching for a queen to remove her, first look at the pattern of bees on the tops of the frames. She will be in the center, under this five inch circle of concentrated bees.

should be, where QMP and brood pheromone go together, and where the cluster will be keeping it warm. I like to use a large rubber band to secure the queen to the frame. This way, I don't have to worry about something turning or twisting as I push the frames together, and I know for sure that the bees can access the screen to feed the queen. Someone will always feed the queen, even if they are aggressive towards her (and they will be, at first).

Feeding sugar water helps the bees be happier while they are getting used to their new girl. Leave the queen in the cage for three or four days, then check to see if the bees are ready to accept her. There will be a ball of bees around the cage. If it is a single layer of bees, that is a good sign, whereas a huge ball of bees is a sign that they are still not ready. Run your finger down the face of the screen, and the bees should move easily out of your way. If any of the bees are even a little difficult to move, it is because they are biting the cage. Even one bee biting the screen spells trouble. If they all move easily, they are just there feeding the queen. The safest thing to do is to now let the bees have access to the candy. This will be a little extra insurance, since it will usually take the bees 1½ to two days to release her.

Be sure to check one more time for queen cells. Check every frame. I've seen queen cells on the outside honey frame. Shake the bees off or blow them around enough to really see that there really are no little queen cells in the center of a frame all covered in bees.

If you really must release the queen as soon as you are sure they are not being aggressive towards her, then be sure to remove enough frames to reach down into the hive and let her walk out onto a frame near the bottom. Queens that have not been laying are quite capable of flying. If you release her on top of the frames, she quite often will fly away. It is possible to catch a flying queen in your bare hand, just be careful not to crush her. If you miss catching her, leave the hive open and just stand back and watch. She will sometimes come back, and the scent of bees will bring her home. I once had a queen pass by the open colony twice, picking up a bigger comet of trailing bees each time she passed, before she finally landed and walked down between the frames. Even if you don't see her come back , give it a couple of days before you check to see if she indeed returned and is laying eggs.

The reason we are going to all of this trouble to introduce the queen is that the bees can usually get through the candy in a day-and-a-half, while it will usually take three to four days before they are not aggressive towards her if she is alone in the cage, and sometimes many more days if there are attendant bees in the cage.[2] When we discover that our colony is queenless, we want to hurry up and make it right. But, rushing so much that the new queen gets killed is not making it right, and is certainly not faster. Take the time needed to do it right! BC

Tina can be reached at **bee.seeking@gmail.com**, or a list of available talks can be found on her web site **https://beequest.buzz/index.html**

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Bees and Women
Mrs. Mahala Chaddock

Nina Bagley

Mrs. Mahala Blanch Pettay Chaddock was born near the Mississinewa branch of Wabash Grant County, Indiana, December 15, 1845. Her family and friends occupied the same territory among the Miami Indians, who came from the big Miami near Piqua, Ohio. Mahala's family found the land had the most beautiful river in the Mississinewa. The dense forest of black walnut, hard maple, hickory, elm and sycamore trees and the wild plum trees yielded fruit in the seasons in addition to the wild grape, the black and white walnut, beech and mulberry that also yielded their stores. They had fish from the river, flocks of geese and ducks and all the various animals common to the area. Her ancestors were Scottish and were exceptionally proud of their incredible strength and endurance. Raised as a Quaker, her mother appreciated the land and recognized its beauty. She taught Mahala to appreciate nature, teaching her about the different plants and flowers. She was ten years old when her mother got sick and died.

Mahala wrote: "My mother's people were Friends (called Quakers). She married "one of the world's people," and was disowned for doing so. My parents moved to a new state, where there were no "Friends meeting," and there my mother united with people calling themselves "Disciples of Christ" I believe, I was a small child then, but the "New Lights called them," and we went to that church until mother died." (*Gleanings in Bee Culture,* 1888).

Neighbors and strangers helped care for Mahala and her siblings after their mother's death. She found herself living among Christian people and their friends. They were strangers that fed her and clothed her. Mrs. Chaddock attended nine months of school a year, earning her boarding and clothing. She taught her first school at the age of fifteen. Mahala felt gratitude and the debt that she could never repay to the Christian people. She loved them! When she was old enough, she went to find her mother's people who were living in Ipava, Illinois.

Mahala continued teaching until she married, at the age of twenty-two, to John Chaddock who was twelve years older. He was an industrious farmer of Fulton County, Illinois, who patriotically served in the Union Army with Gates Sharpshooters during the Civil War. They had a son and two daughters born into a loving union. During her marriage, she lived on the same farm in Ipava, a Quaker colony in Illinois.

In 1872 she hived a runaway swarm of black bees, which had clustered on a peach tree, and this was her start in bee culture. She was a contributor to the *Prairie Farmer*, and this is how she became friends with Mrs. Lucinda Harrison. Mrs. Harrison was writing articles in the *Prairie Farmer* on her beekeeping experiences. So Mrs. Chaddock wrote to Mrs. Harrison asking some questions about bees. Mrs. Harrison would send Mrs. Chaddock her *Gleanings* to read. Mrs. Harrison sold Italian queens to her in 1874 to help Italianize her apiary. Mrs. Chaddock ran about thirty hives. She sold honey and bees. Mrs. Harrison said, during a visit to Mahala's pleasant home, "[I] found the whitest of combed honey graced her table. I never ate finer canned peaches than at her table, the peaches were sweetened with some honey." Mrs. Chaddock and Mrs. Harrison remained good friends for over 14 years.

A writer for *Bee Culture*, Mrs. Chaddock was considered peculiar and was not always politically correct. When writing, she would speak her mind and not worry about how she would say things. Mrs. Chaddock wrote an article, *The Other Side Of The Story,* in *Bee Culture,* basically letting the readers know that "the bee business is hard work for women and many women could lift a 75-pound box with a 40-pound honey box on top and carry it away so that the returning bees don't find it. They might as well go out with an ox team and break prairie sod and make money faster." She said many good women who wanted to keep bees were like those who came by years ago wanting cheap bees because her bees died. Mrs. Chaddock said she would sell them as cheaply as she could. She paid two dollars a bee herself, but she wouldn't charge for each bee. She would sell the women a good hive for $7.00. A women continued to tell Mrs. Chaddock how she turned two swarms into six and how successful she had been. Then Mrs. Chaddock asked, "And how many have you now?" The woman replied, "OH! I haven't any: they all died this Winter, but I think I had real success in making six swarms out of two." Mrs. Chaddock wrote: "I did not sell her any" (*Gleanings,* 1882).

She had upset some readers, and there were complaints about her. Mr. Root thought she had a peculiar way that enabled her to do what you and I and everybody else would fail at. Mrs. Harrison wrote telling how generous Mrs. Chaddock was, what a good friend she was and what a fair woman she was. Mr. Root thanked her for letting the readers know her as her friends did.

In 1876, she accompanied her sister-in-law to a sanatorium in Dansville, NY. She made her way to Philadelphia, where she made the acquaintance of Clara Barton at her home on the hillside. Clara Barton was a philanthropist and founder of the Red Cross. Mahala was thirty-one years old when she made the acquaintance with Clara Barton. Eleven years later, Clara Barton asked Mrs.

Chaddock to assist in helping the flood victims down the Mississippi. Mrs. Chaddock joined her on the steamer, "The Mattie Bell" in 1882. Clara Barton called Mrs. Chaddock "Her little nature child."

Mrs. Chaddock also wrote an article in the Ladies Department *Gleanings* 1882. She told readers that European women are more robust than American women! Her claim: American women had consumption, were weak and had heart failure. Mahala was the youngest among her friends and the first to pass away at forty-five in 1890. From what I gather, she was very opinionated and set in her ways and she was proud of her descendants. Hardworking women who didn't have hired help in the beeyard would later write that her friends Mrs. Harrison had the Irish to help her, Mrs. Axtell had hired help and a girl to clean house and Mrs. Julian St. Thomas of New Orleans had women help her! Mrs. Chaddock felt the cards were not always in her favor. She felt some people are just born lucky!

As I was looking for more information on Mahala. I found she had a great-nephew living in Canada. I then contacted him, and he wrote:

"Mahala was one of my grandfather's sister-in-law's in Ipava, Illinois, in about the 1860s. As far as I can discern, she only married John C. Chaddock, with whom she had three children. She was a poet and avid beekeeper as well as a humanitarian."

Jeffry Allen Stoker BC

Nina Bagley
Ohio Queen Bee
Columbus, Ohio

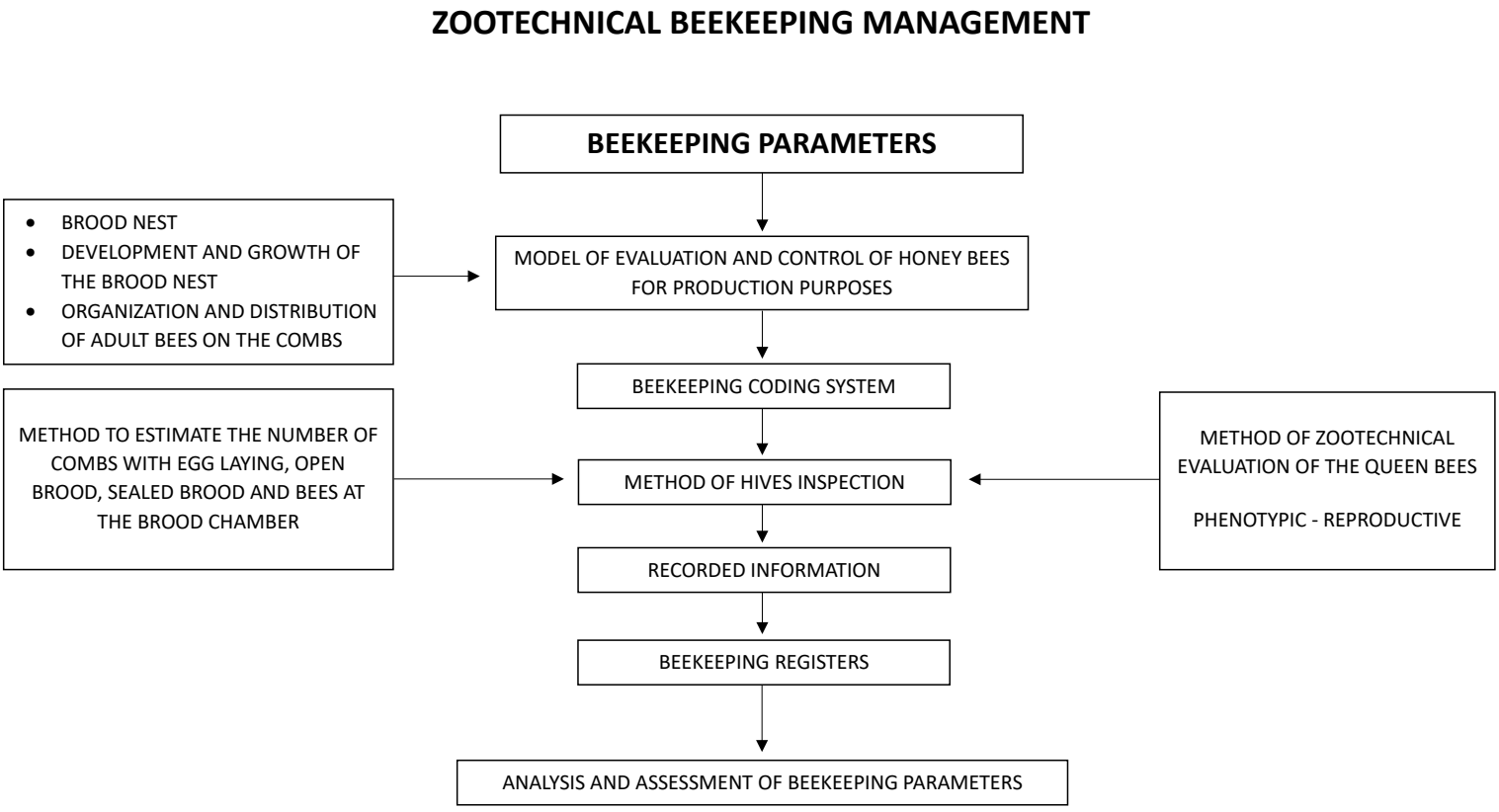


Figure 1. Elements of the zootechnical beekeeping management

Zootechnical Beekeeping Management

Pablo Montesinos Arraiz

As all livestock farms, the breeding of honey bees for production purposes must be managed with professional, technical and business guidelines in order to adapt them to the zootechnical, production and reproduction requirements that increase and contribute to the best operation and profitability of the beekeeping business.

The Zootechnical Beekeeping Management, ZBM (Figure 1), refers to the analysis and evaluation of the beekeeping parameters that come from the principles related to the brood nest, the development and growth of the brood nest and the organization and distribution of adult bees on the combs to apply the General Beekeeping Management, GBM, to obtain the maximum production of honey and by-products from the hives; always in correspondence with the animal welfare of bees.

These parameters, that can be qualitative and quantitative, or only qualitative, and displayed through the Model of Evaluation and Control of the Honey Bees for Production Purposes (Figure 2) using the Beekeeping Coding System, are obtained through the Method of Hives Inspection. All this, taking into account the conceptualization of animal welfare.

The Zootechnical beekeeping management must precede and have primacy over general beekeeping management, so that in beekeeping farms the maximum production and productivity of the hives be achieved with optimal levels of profitability.

The success of the ZBM depends on the solidity and veracity of the information obtained, analyzed and evaluated by beekeepers, during and after routine inspections of the hives. This information, which must be recorded in the beekeeping registers, must include all the biological events of a zootechnical, productive

MODEL OF EVALUATION AND CONTROL OF HONEY BEES FOR PRODUCTION PURPOSES

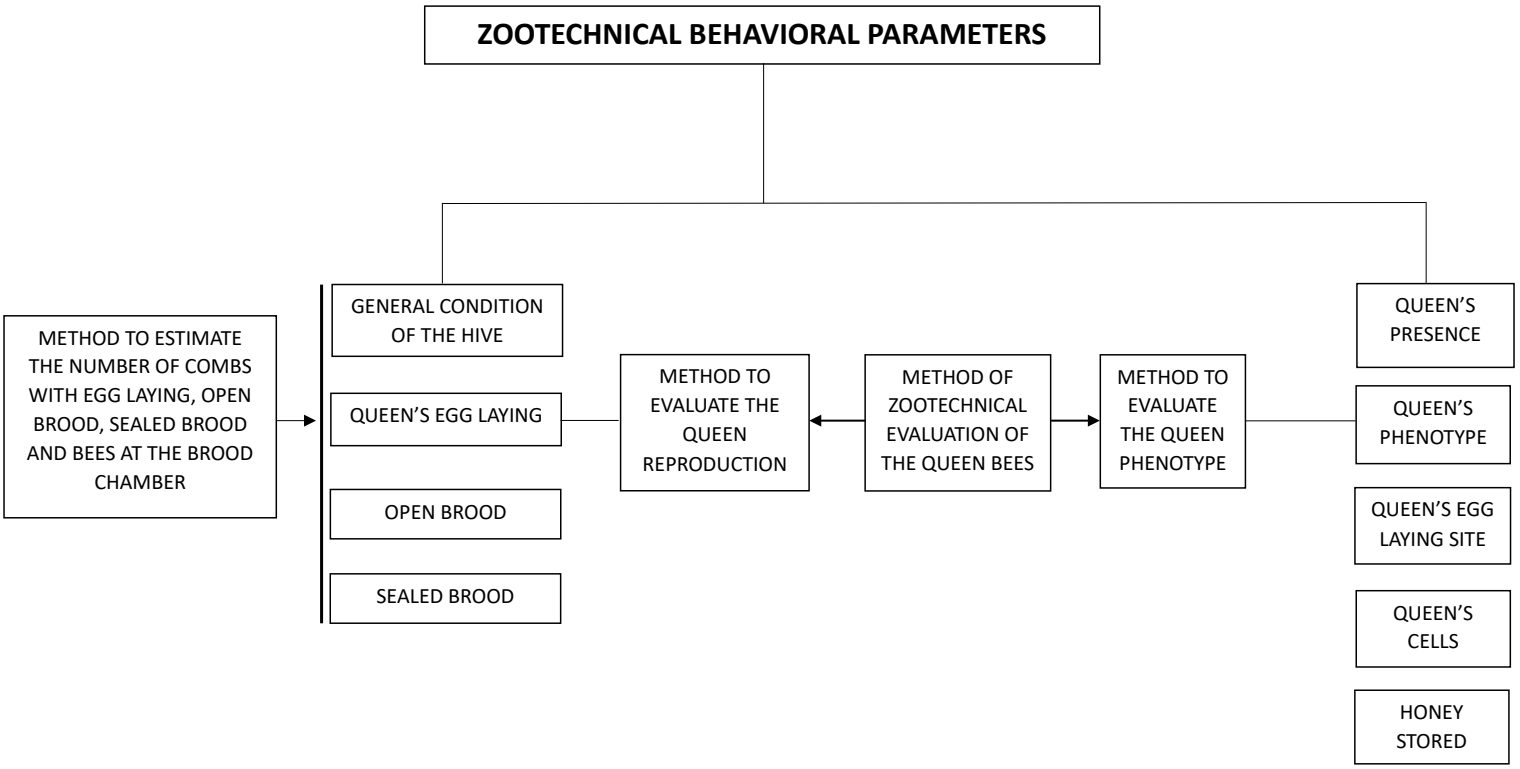


Figure 2. Parameters and method of the model of evaluation and control of the honey bees for production purposes

and reproductive scope that take place in the hives, as well as all the circumstances of beekeeping nature that come about when working with the hives. Hence the importance of periodically inspecting the hives to do an individual and collective assessment and implement the techniques and/or methods of the GBM that best suit each case. It is also necessary to monitor the effectiveness of the zootechnical beekeeping management and the general beekeeping management, and also the yields achieved on the farm, for which zootechnical, production and reproduction beekeeping indicators and indices should be used. In order to apply an appropriate ZBM and a GBM it is a *sine qua non* condition to use beekeeping registers and enumerate the hives.

In beekeeping there are three types of parameters (Figure 3, next page): Beekeeping Zootechnical Parameters, Beekeeping Production Parameters and Beekeeping Reproduction Parameters. The Beekeeping Zootechnical Parameters are classified into two groups: Zootechnical Behavioral Parameters and General Zootechnical Parameters.

The zootechnical behavioral parameters are those biological elements that are constant in the development and growth of honey bee colonies and related to the development and growth of the breeding nest and the organization and distribution of the bees on the honeycombs.

There are nine zootechnical behavioral parameters:

1. General Condition of the hive (Good condition, GC; Regular condition, RC; and Bad condition, BC).
2. Queen's presence (Queen's presence, QP; Queen's lacking, QL; and Orphan bee hive, OH).
3. Queen's egg laying (abundant, a; regular, r; few, ; and null and has egg laying, HE).
4. Queen's phenotype (by color, by side and by age).
5. Queen's egg laying sites (in brood chamber, E BC; in brood chamber and super, E BCS; and only in super, E S).
6. Open brood, OB (qualitative and quantitative).
7. Sealed brood, SB (qualitative and quantitative).
8. Queen cells (open queen cell, OQC and sealed queen cell, SQC).
9. Honey stored (mature and immature and quantitative and qualitative).

The general zootechnical parameters refer to the data or elements of the honey bees breeding that come from the general beekeeping management that is carried out in beekeeping operations.

There are eight general zootechnical parameters:

1. Type of hive inspection (Complete inspection, CI and Incomplete inspection, IC).
2. Indirect introduction of queen, IIQ.
3. Direct introduction of queen, DIQ.
4. Combination of hives, A C B.
5. Transfer bees from a nucleus hive to a hive, TNH.
6. Dead hive, DH.
7. Artificial feeding, AF.
8. Next inspection, NI.

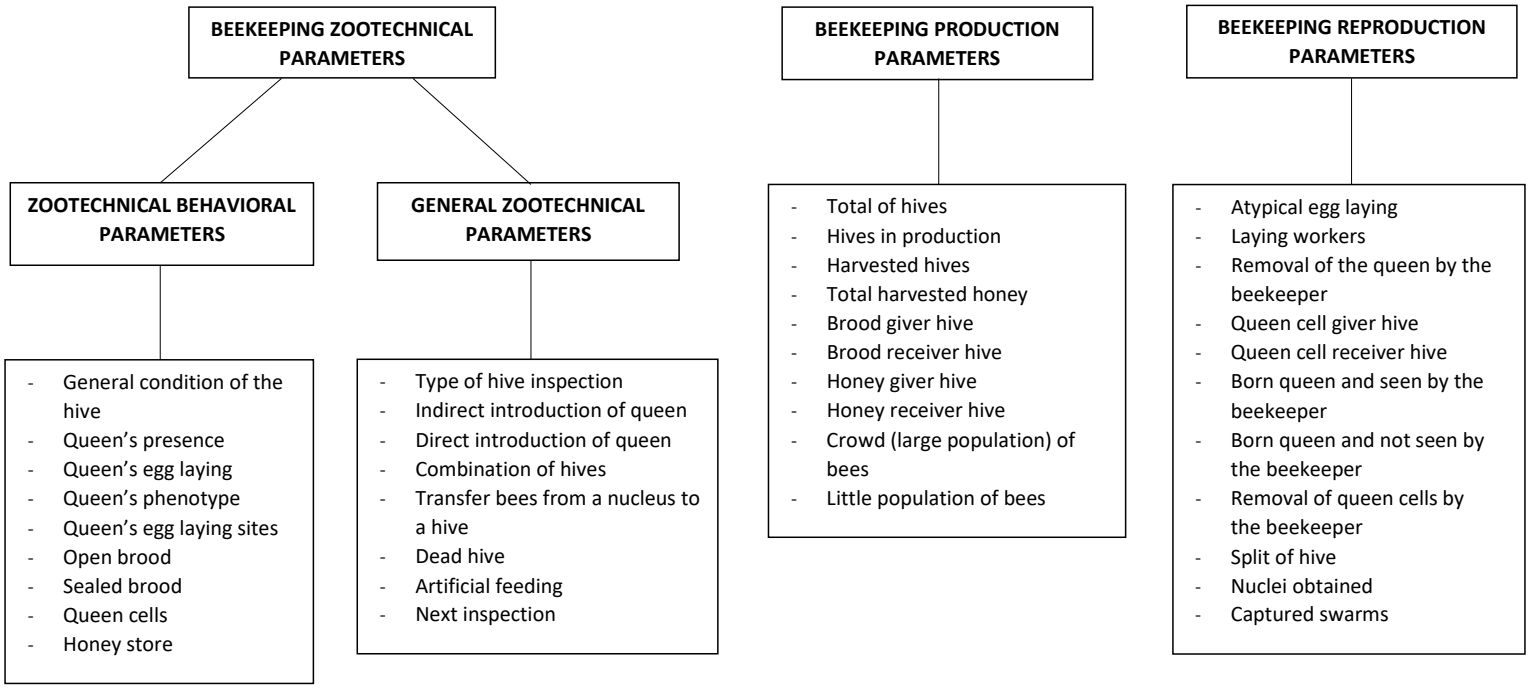


Figure 3. Types of beekeeping parameters

Regarding the production and reproduction parameters, they have to do with the qualitative and quantitative or only qualitative variables that result from the development and growth of honey bee colonies and from which the beekeeper benefits in terms of products and by-products of the hives.

There are ten beekeeping production parameters:

1. Total of hives, TH.
2. Hives in production, HP.
3. Harvested hives, HH
4. Total harvested honey, THH
5. Brood giver hive, BGH
6. Brood receiver hive, BRH
7. Honey giver hive, HGH
8. Honey receiver hive, HRH
9. Crowd (large population) of bees, CB
10. Little population of bees, LB

There are eleven beekeeping reproduction parameters:

1. Atypical egg laying, AE
2. Laying workers, LW
3. Removal of the queen by the beekeeper, RQBB
4. Queen cell giver hive, QCGH
5. Queen cell receiver hive, QCRH
6. Born queen and seen by the beekeeper, BQSB
7. Born queen and not seen by the beekeeper, BQNSB
8. Removal of queen cells by the beekeeper, RQCB
9. Split of hive, SH
10. Nuclei obtained, NO
11. Captured Swarms, CS

Submitted by Lynda Bracken

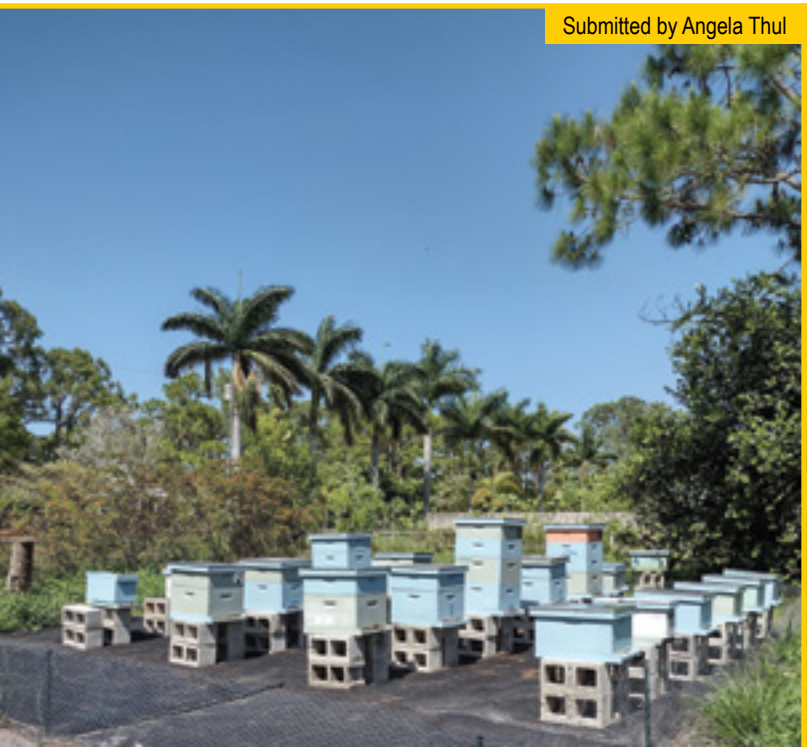
A Summer trip near the NE/SD border submitted by Jeff Server

Submitted by Deborah Sasser

Image Gallery

Apiaries

Submitted by Angela Thul



Submitted by Lynda Bracken

Submitted by Lynda Bracken

Apiary in a field of evening primroses submitted by Deborah Sasser

Submitted by Deborah Sasser

Submitted by Lynda Bracken

Stand turned over in the apiary after a rain submitted by Deborah Sasser

Hive box designs inspired by works of artist Aaron Draplin submitted by Keelie Duncan

Submitted by Deborah Sasser

Jeremy's Corner

Jeremy Barnes

Too Little Too Late

Jeremy's Corner

On March 2nd, 2023, Michael Benfield, spoke on the fiftieth anniversary of Green Party of England and Wales, of which he was one of the founders. He said he believed the battle for the world's environmental survival was "at this moment, lost… I think we have succeeded in helping to educate but we have failed in dealing with the battle for environmental survival." The scale of the solutions is simply too unpalatable for any political party to propose, he argued. The focus now has to be on mitigation. "It doesn't mean to say that we can't perhaps do other things to put things right, but it's a very dire situation that we have."

What follows is an imaginary scenario as to what might unfold if we continue to fail to support the talk with action. I want to acknowledge at the outset my indebtedness to Dave Goulson's chapter, A View From the Future, in *Silent Earth*, David Wallace-Wells, *The Uninhabitable Earth*, which covers a huge amount of ground for such a short book, and Brian Watson, *Headed Into the Abyss: The Story of Our Time and the Future We'll Face*.

Too Little Too Late

I've lost. Last night they came for the last little bits and I was unable to stop them. What surprises me, looking back, is how fast this has come to be. I thought it was something my grandchildren would have to deal with; now I believe there is nothing left to which they can respond.

I recall the abundance of my youth. Supermarkets were filled daily with food, including exotic fruits flown in from all over the world and available throughout the year. And it was so cheap that we bought more than we needed, throwing away at least one third, much of it only half-eaten. Indeed the privileged societies of the world consumed so much that there was an epidemic of obesity and a wave of self-inflicted diabetes at the same time as, every day, hundreds of children were dying worldwide from hunger. And this excess came wrapped in plastic that went into the landfills together with the dirty diapers and unused medicines, the household chemicals and industrial waste, eventually leaching into the water systems and thus the oceans, to the point that microplastics were omnipresent, including at the bottom of the Marian Trench, more than five miles below the sea surface.

Gasoline was plentiful and cheap. Many families had two or more cars, each of which was six or eight cylinders when four was more than enough, heavy on fuel consumption, and there was little hesitation in driving or flying anywhere at short notice, despite the warnings of excess emissions. And we lived in large houses with beautiful gardens, watered by sprinklers that turned themselves on and off without any thought from us.

60 years ago in the midst of the excesses of the developed world, Rachel Carson wrote, "Man's attitude toward nature is today critically important simply because we have now acquired a fateful power to alter and destroy nature. But man is a part of nature, and his war against nature is inevitably a war against himself. We are challenged as mankind has never been challenged before to prove our maturity and our mastery, not of nature, but of ourselves."

In 1992, 1,700 scientists from every corner of the globe issued a *Warning to Humanity* explaining that the lifestyle of developed nations was changing the global climate, polluting our soils, rivers and air, felling rainforests, overfishing the seas, creating acid rains and driving species extinct, in effect destroying the biodiversity which our planet had developed over literally millions, if not billions, of years, and which is both basic and essential to all life, whether it be animal, bird or insect.

Governments paid little heed, even when a second warning was issued in 2017, this time signed by 20,000 scientists. Indeed, in 2000, one of the leading voices on climate change, Al Gore, was narrowly defeated in a Presidential election by George Bush, a climate denier. With the benefit of hindsight, that was a critical opportunity missed. Most politicians, despite their rhetoric, cannot see beyond the next election, and the general public has become so accustomed to short term gratification that it cannot think long term, never mind take actions that might be uncomfortable despite their being for the greater good. Add to this a capitalist system that allows multi-national conglomerates to focus on profits rather than the human or environmental good, an unfounded belief in the benefit, if not the inevitability, of endless economic growth, and a belief that science, robotics, mechanization and Artificial Intelligence, despite being part of the problem, would come up with the necessary solutions. Indeed a UNO report in March 2023, eight years in the making, focused on technological innovation, thereby once again absolving John and Jane Doe from facing any personal change in behaviors.

I have long been a beekeeper, always having (or after last night, perhaps I need to use the past tense) several hives of honey bees. Thus a personal trigger point was some research out of Germany, published in 2022, which showed that the global biomass of insects has declined by 76% in less than 25 years. Insects evoke strong emotional responses – usually fear and loathing – but they are the foundation upon which the natural world rests. Many plants are eaten by them and, in turn, are eaten by other insects as well as by birds, reptiles and a variety of small mammals. But, as this report made clear, insects, as a class, were dying, and we were the cause.

Insects are also the foundation of our food pyramid, from earth worms who aerate the soil lessening our reliance on fertilizers, to those who act as biological control agents that can help reduce our reliance on pesticides, to the myriad of pollinators - bees, moths, butterflies, bats, wasps, ants, flies and birds among many others. 87% of all plant species require pollination in order to produce fruits or seeds and this includes 75% of all agricultural food crops.

Yet most people remained blithely oblivious to these dramatic changes, explainable by several factors. First, shifting baselines, where we mistakenly thought that the current state of the world at any one time was 'normal.' Secondly, the vast majority of people in more developed nations were so detached from the natural world that they saw pollinators only as bugs that needed to be squashed, unaware that the agri-businesses that mass-produced their food was also putting toxins in the water, soil and air to the point that even the nectar collected by honey bees was impoverished. Thirdly, our culture and education system for the most part did not encourage deep connections with the natural world, nor the ability to think and act selflessly in the long term.

Consequently, and like the reports before it, the appeal of 2017 had no visible impact on policy or behavior even as the percentages of wild vertebrates declined and carbon emissions increased, together with those of methane-emitting livestock, global climate temperatures and the human population. It was named The Sixth Extinction and gave rise to numerous appeals on behalf of the polar bears, elephants and white rhinos while the real obsolescence was happening in our own backyards.

By 2030, food crops such as coffee, chocolate, raspberries, strawberries, blueberries, peaches and apples become more scare, replaced by the limited (and frankly unappealing) products of the grass family: wheat, rice, and barley – which are wind-pollinated. It's a self-repeating positive feedback loop because everything in nature is interlinked with synergies that no one could predict. At local levels, with the gradual loss of, and huge increase in the price of milk, cheese and beef, the public learns how cattle are fed primarily alfalfa, that alfalfa is insect-pollinated, and that insect pests had become resistant to the barrage of pesticides to which they had been subjected for decades, thus overwhelming the beneficial insects like ladybirds, overflies, lacewings and carabid beetles, severely weakened as they were by the same chemicals. At a global level, reduced ice cover at the Poles decreases reflection of the sun's energy, leading to more warming and thus more melting (glacier melting in both the Arctic and Antarctica increased more than four times in the space of six years in the early 2020's); the thawing of the Arctic permafrost released huge quantities of methane that were once trapped underground (methane is a far more potent greenhouse gas than carbon dioxide;) changing weather patterns reduced rainfall in the Amazon and forests of equatorial Africa, so the rainforests disappeared after acting as 'the lungs' of our planet for some 55 million years.

At the same time, extreme weather conditions increase, especially hurricanes and wild fires. Heavy rains, storm surges and increases in the ocean level floods cities from New York to London to Mumbai, Shanghai, Osaka and Miami; the weakened economies can not afford to build the necessary protections, insurance companies are bankrupted and eventually large swaths of countryside disappear underwater, starting with the Maldives and Bangladesh and including much of Florida and the Fens of England.

By 2035, it's obvious that the world no longer has the capacity to feed a global population that has stabilized at some ten billion people. Summer droughts in the American wheat belt and the advance of the Sahara southwards in Africa means many farmers had to leave their land with nowhere to go. A century of intensive farming has critically reduced the narrow layer of top soil on which plants depend; what remains is critically polluted by chemicals (the world's only sources of natural fertilizer, especially potassium found primarily in Morocco, are exhausted;) underground water used for irrigation has dried up, and all major rivers have stopped flowing in the Summer, causing storage dams to go dry.

Increasingly, 'climate refugees' are forced into crowded temporary accommodations which are ideal for outbreaks of deadly diseases, not least cholera. The consequent fear, combined with rising unemployment, food prices and shortages, leads to protests, riots, and the election of increasingly extremist politicians who in turn inflame this pubic anxiety for personal ends.

By 2040, countries have become isolationist, putting their own interests before those of humankind or the environment. The mistrust, if not derision, of scientists reaches new peaks in an environment in which 'truth' is defined by those who shouted the loudest or had the money to buy time on the media. The title of Al Gore's book, *An Inconvenient Truth*, seems increasingly prescient.

As agricultural production declines globally, money can no longer buy food from abroad, supermarket shelves begin to empty and families begin to stockpile provisions, resenting any suggestion that they should help feed the migrants camped on their borders.

There is no doubt that those in developing countries suffer the worst. The theme of the 2030's was of the three f's (floods, fires and famines) leaving a billion people destitute and desperate. Millions died in famines; those who survived created mass migrations north and south, trying to escape the civil wars that broke out along ethnic and religious lines as people looked for a scapegoat to blame for their suffering.

Initially, the rich were still able to live in a state of luxury out of all proportion to their numbers, even to their value. But as the environment collapses, as measured by the increasing levels of the oceans and of aridity, share prices fall, hedge funds fold and banks collapse. Hyperinflation makes money virtually worthless and everyone is poor. It's a painful reminder that the foundation of the economy, even of civilization, is a healthy environment – if one cannot grow food the economy is obliterated.

As early as 2022, life expectancy begins to fall, living standards decline and the health services are overwhelmed. An aging population, the epidemic of obesity, related chronic illnesses such as diabetes, the resistance of bacteria to antibiotics, and plagues in the unsanitary migratory camps only make the situation worse.

By 2040, schools, hospitals and a nation's infrastructure are in disrepair, paychecks (when they come) cannot cover the basic necessities of family life, law and order crumble, people steal and loot what they can, and many abandon the cities. Eventually, the electric supply falters and then fails – those who had stockpiled food lost much of it when their freezers failed. And without power, water stops running, shops close, gasoline is rationed (my ration was two gallons per month) but without electricity there was no way to pump nor to get power for electric vehicles.

How have I survived, at least until now? Fortunately, I live in a rural area, have a well that can be accessed by hand, solar panels to provide electricity, a few chickens, some deer

in the woods which I try to trap and, my pride and joy, a two acre vegetable garden, hidden from view and large enough to feed the three generations that live in the farmhouse. Or so I thought.

Last night some desperate, starving people, scavenging what they could to stay alive, invaded the farm. First, they killed the few chickens, desperate for meat and ignoring the fact that otherwise there was a steady supply of eggs. They tore apart the two bee hives, partly for honey, which they could have taken without killing the bees, and then for the larvae which are a rich source of protein, even as their removal will lead to the death of the colonies. Then, they found the garden and tore it up, irrespective of whether the root and leaf vegetables were ready to eat or not. Everything is gone, including the seed which I collected so carefully in the Fall to create seedlings in the Spring. Yes, I have a gun, but it's an empty threat, literally – there has not been any ammunition available for at least five years.

So, for me and my extended family, as for most others, it is over. Like those affected by the dreadful plagues in the Middle Ages, we have no alternative but to accept our fate.

The irony is that in this last decade, with humanity in retreat, there are signs of environmental recovery. The water in the streams is more clear; there are indigenous shrubs and wildflowers growing in the fields that were once intensively cultivated, without smog and microplastics the trees are more leafy, and it might have been my imagination, or even wishful thinking, but last week I thought I caught a glimpse of a butterfly, which would have been the first in three years.

It is all too little too late. We had our chances to change our behaviors, and ignored them, hoping instead for miracles, or at the very least a colony on Mars. Anything but the acceptance of personal responsibility and accountability.

So what of the future? Human beings are newcomers to this world. If we start with the first homosapiens, which is 150,000 years before the first use of language, as best as we can calculate, we have been present for .0004% of the planet's history. That is equivalent to eight seconds in a 24 hour day. There has never been any guarantee that humans are not destined to disappear one day; we just never thought it would be this soon. Not only is the end of our reign imminent, but we should welcome it. By desperately hanging on, repeatedly doing the same things, we are only postponing the inevitable. Without us, the earth will recover and perhaps, sometime in the next one or two million years, another intelligent species might emerge unencumbered with myths of divine creation and the right to domination, and a deeper understanding of the concept of love. All evidence of our existence will have disappeared, and hopefully these new beings, in whatever form they take, will do a better job than we have, not that any of us will be around to see it. BC

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Let's Move!

David Burns

As a YouTube content creator focused on beekeeping, I receive countless inquiries each week through the comments section of my videos. A common question that arises frequently is: "Is it alright to relocate my hive if I am unhappy with its current placement?" Many of us have encountered this predicament, where we initially believe we have found the perfect spot for our hive, only to discover that the hive's growing activity is causing disturbances to our pets or children, staining our laundry on the clothesline, or receiving inadequate sunlight. In such situations, what is the most effective approach for moving a hive?

New beekeepers often underestimate the difficulty of relocating a hive. For one, a thriving colony with supers brimming with honey can weigh over two hundred pounds, making the task a strenuous and demanding endeavor. Additionally, it's remarkable how our bees can fly for miles to gather resources and return to their hive with incredible precision. They are so adept at pinpointing the location of their hive that even the slightest move can disorient them and leave them unable to find the new location of their hive.

Have you ever moved your hive just a few yards away to a different location in your yard? If so, you may have noticed that your foragers continue to fly out as usual to collect nectar and pollen, only to return to the exact location of their previous home. Instead of finding their hive, they return to the old location and become disoriented and bewildered, hovering in the air for days on end. To avoid this scenario, experienced beekeepers have long advised to "move them two inches a day or two miles away." This means that if we move the hive just a couple of inches every day, the bees can quickly adapt to their new surroundings. Alternatively, if we relocate them two miles or more, the landscape is so different that the bees must take a new orientation flight and memorize their new location. After a few weeks, we can bring them back to our yard to their final location.

As beekeepers, we are faced with two pressing challenges when it comes to relocating our hives: how can we safely move a heavy hive, and how can we prevent the loss of our diligent foragers? Ideally, hives would be situated on pallets for easy transportation via fork truck to a flatbed truck, and then driven miles away to another beeyard. However, this approach is not a feasible option for most beekeepers.

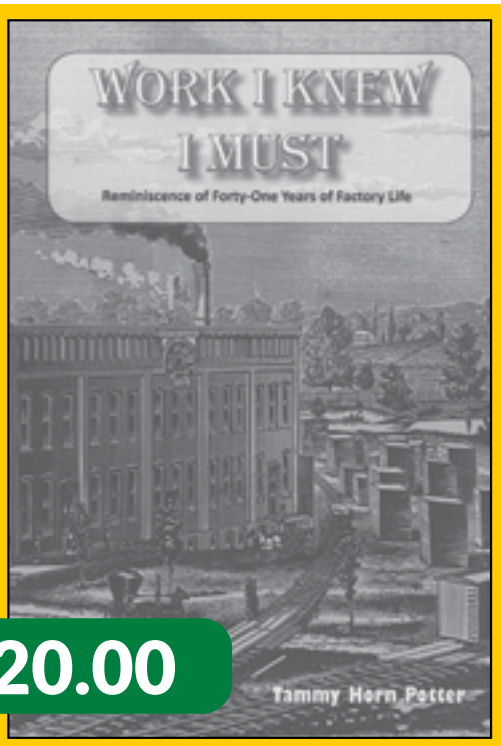
My wife, Sheri, and I raised most of our six children while raising queens, nucs, packages and manufacturing beekeeping equipment in a small family business. Any time I needed to move a hive in the same beeyard, I always had free help. I devised a method that worked well on a tight family budget using sheer muscle and things around the bee farm. Maybe this will work well for you.

The night before the move, once the bees are all back and inside the hive, block off the entrance. I use a robber screen to block the entrance. The BeeSmart robber screen can be screwed on to hold the bees inside the hive by closing the two doors on the robber screen. I've also used ⅛-inch hardware screen, cut to the width of the bottom board to hold the bees in. Early the next morning, I drag one of my strong teenage sons out to the beeyard long before sunrise. I place a six-foot, heavy three-inch bar across the top of the hive, then I place two tiedown straps under the bottom board all the way around the bar on top. The bar hangs over each side several feet. We each lift our side of the bar and walk away with the hive and move it to the new location in the same beeyard.

The challenge of retaining foragers still looms. How can we help our winged workers reset their GPS to the new hive location? Through trial and error, I discovered a technique that triggers many of the foragers to embark on a fresh orientation flight. Placing a sizeable object, such as a folding chair or golf cart, in front of the hive at the new location can disrupt the foragers' usual flight path upon leaving. Startled by the obstacle, they start to fly around the hive's new spot. However, some foragers may still return to their old location. To overcome this obstacle, I place a single deep catch hive with a frame or two at their previous location. The foragers enter but cannot leave as they can't unload their haul. Come sundown, I carry the frame back to the hive's new spot and shake the bees in. Repetition seems to be key

as, after a few iterations, the foragers appear to learn the new location.

Beekeeping has instilled in me the value of resourcefulness. When raising a large family on a bee farm, you learn to improvise and make do with what you have. Sometimes it doesn't make sense to invest in costly moving equipment when all you need is to relocate a hive or two. However, if you have the budget to spare, companies like Dadant and Mann Lake offer useful tools such as the two-man lift ($100) and EZ Lift Hive Truck ($629), respectively. Although I could not justify the expense on a tight budget, I still take pride in seeing my teenage workers out in the beeyards before sunrise, ready to begin the day's work. After all, my father taught me the importance of starting work as soon as the sun rises. If you'd like to watch my video of us moving hives this way, visit: **https://www.honeybeesonline.com/davids-youtube-channel** BC



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Beware of Ticks in the Apiary

Alyssum Flowers

"An ounce of prevention is worth a pound of cure," said Benjamin Franklin, almost 300 years ago. His sage advice is certainly applicable to disease prevention from tick bites. Each year, approximately 300,000 cases of Lyme disease are reported in the USA alone, according to CDC. Other diseases have afflicted people as well as pets and livestock, many of whom suffered for months or years afterward. The range of dangerous ticks continues to spread and many of us spending time outside may be so consumed with our bees that we may not take proper precautions to prevent ticks from climbing on us, riding home to our family and pets and potentially biting and inflicting us with multiple pathogenic diseases.

In the Midwest, we are used to the American dog tick and brown dog tick. We may even be familiar with the lone star tick, all of which can carry several serious diseases; however the black legged tick (deer tick) has spread from the Northeast throughout the Midwest and Mid-Atlantic states. Another tick discovered in 2017, the longhorned tick, is in many eastern states and is a serious pest of animals and livestock. No doubt as we continue to edge out wildlife and "urbanize" wild areas, encounters with new species of ticks will continue to be discovered.

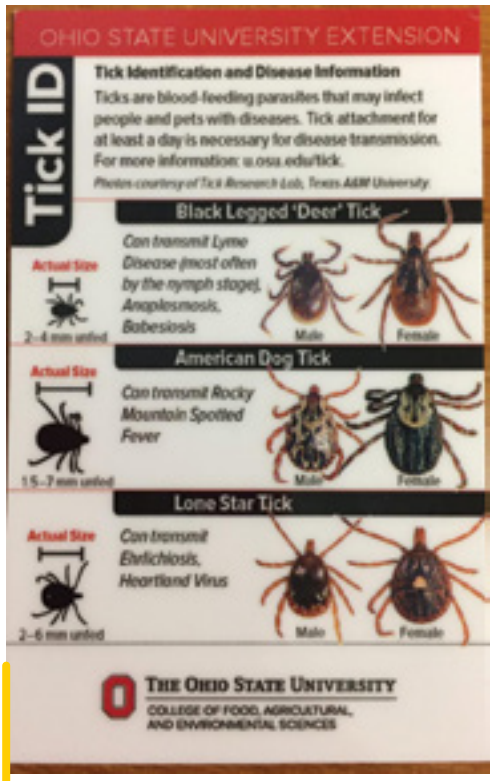
The key is to take preventive measures for ourselves and our animals to keep ticks off and to take action if an engorged tick is discovered. Note that ticks and the *varroa* mite are closely related and all can vector diseases.

Top Ticks

American dog tick, *Dermacentor variablis* (Say)
Asian longhorn tick (*Haemaphysalis longicornis*),
Brown tick, *Rhipicephalus sanguineus* (Latreille).
Blacklegged Tick (Deer Tick), *Ixodes scapularis*
Lone Star tick, *Amblyomma americanum* (Linnaeus)
Western blacklegged tick, *Ixodes pacificus*
Winter tick, *Dermacentor albipictus*

Life Cycle

Ticks have four developmental life stages: egg; a six-legged larva (called seed tick); an eight-legged nymph; and eight-legged adult. Ticks require a blood meal before molting to the next stage and most feed on different host species as they develop. Normally, eggs hatch in early Spring and the ticks crawl onto grasses and quest (search) for small warm blooded hosts (mice, chipmunks, raccoons). They will grab onto an animal as it passes and climb up to find a safe place to feed. The mouthparts of a tick consist of the chelicerae which cut through the skin and a saw-like barbed hypostome which penetrates the skin. Some ticks produce a cement-like substance which helps to glue the tick's mouthparts to the host.



Comparison of ticks in Ohio. *https://wayne.osu.edu/program-areas/agriculture-and-natural-resources/ticks-and-tick-diseases*

Ticks feed about three to four days until they become engorged. At that point, they drop from the host to molt. The larger tick then climbs onto bushes at a higher vantage point to catch a larger host (ground hog, dog, deer, human). At any one-time, overlapping generations may occur with peak adult and nymphal activity occurring from March through May and again in July and August. It often takes up to three years for a tick, like the lone star tick, to complete its life cycle.

By Fall, the female will feed again until engorged, then drop off to produce clusters of thousands of eggs, then die. Usually, the female will dig under the leaf litter so that the eggs are protected from freezing temperatures. Males die soon after mating. The Brown dog tick is often brought indoors, so that in late Winter the eggs hatch and small nymphs are found inside the home. The black legged tick differs from other ticks in that the nymphs can be active all Winter.

Tickborne Diseases Reported Annually. *https://www.cdc.gov/ticks/data-summary/index.html#print*

Tickborne Disease Surveillance Data Summary

Home | Data Summary | Cases by Year | Cases by Month

Tickborne Disease Surveillance Data Summary

Total Reported Cases by Tickborne Disease, 2016-2019

Reported Tickborne Disease	2016	2017	2018	2019
Lyme disease	36,429	42,743	33,666	34,945
Anaplasmosis	4,151	5,762	4,008	5,655
Spotted Fever Rickettsiosis	4,269	6,248	5,544	5,207
Babesiosis	1,910	2,368	2,160	2,420
Ehrlichia chaffeensis ehrlichiosis	1,377	1,642	1,799	2,093
Tularemia	230	239	229	274
Undetermined ehrlichiosis/anaplasmosis	200	269	283	185
Ehrlichia ewingii ehrlichiosis	22	45	33	43
Powassan virus disease	22	34	21	43
Total	**48,610**	**59,350**	**47,743**	**50,865**

Prevention

Ticks can be found anywhere that animals may wander. Ticks can be in woods, fields, trails, front or backyards, near ponds, rivers or around animal resting places. Don't think that spraying a yard or walking trail will stop ticks from occurring because they are being carried on animals and can be dropped off at any point. The best strategy is to keep ticks off you and your pets by using the best repellent for the situation and checking yourself, children and pets after being outside.

Wear light colored clothing so that ticks can be seen and tuck pants into your socks or boots. Insect repellents are available either to apply on skin or clothing. Spray the shoes/boots, legs and waist area before heading outdoors. In general, products meant to be applied to skin should not be used on infants. Follow label directions before using. Products labeled for clothing should not be placed directly on skin. Since products vary in efficacy, make sure to have the repellent available to reapply after the recommended period of time. Pre-treated clothing can be purchased which may be handy to store in the vehicle.

After being outdoors, check thoroughly for ticks. If possible, remove outside clothes in the garage and place clothes directly into the wash or a plastic bag. Remember that the ticks may be in the vehicle as well. Different ticks tend to settle in specific areas but in general, check the back of knees, private areas, back, armpits, the hairline, ears and scalp. Check your pets carefully and make sure that they are properly protected. Treat them with products that repel ticks before feeding or products that kill the ticks with the first bite. Products sold in stores are usually not as effective as those purchased with a veterinarian's prescription. Dogs are susceptible to many tick-borne diseases and both dogs and cats can die from anemia.

Deer tick (Blacklegged tick)
https://www.cdc.gov/ticks/geographic_distribution.html

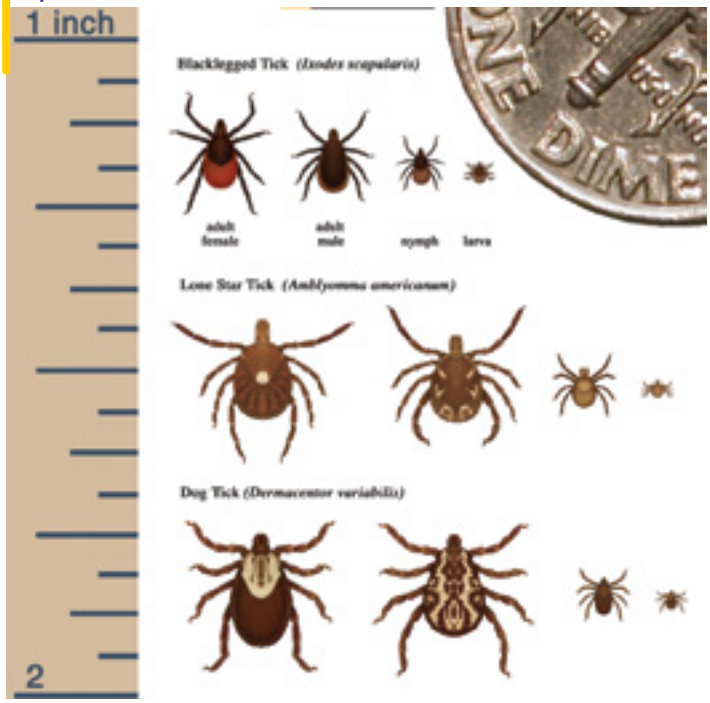
If you find an attached tick, using tweezers, pull the tick straight out and place in a bottle of alcohol. If the tick is still alive, put it in a bottle with ventilation and some grass. If the bite spot continues to be inflamed or if a rash develops *anywhere*, contact a doctor as soon as possible. Several states will test ticks for pathogens but it is more important to talk with a doctor about being bitten and being treated appropriately.

Below are the repellents recommended by the EPA. Remember that although DEET can tolerate freezing temperatures, bottles and cans of repellent should be protected from extreme temperatures and have an expiration date. Make sure that you and your loved ones are properly protected and safe!

- DEET
- Picaridin (known as KBR 3023 and picaridin outside the U.S.)
- IR3535
- Oil of lemon eucalyptus (OLE)
- Para-menthane-diol (PMD)
- 2-undecanone

Note that natural insect repellents (repellents not registered with EPA) may not have the desired efficacy.

Comparison of blacklegged, lone star and American dog tick.
https://www.health.state.mn.us/diseases/tickborne/ticks.html



Tick testing

https://www.cdc.gov/lyme/removal/index.html
https://www.tickreport.com/
https://www.dshs.texas.gov/animal-safety-zoonosis/animal-bites/tick-submission-testing
https://www.ticklab.org/test-my-tick BC

References:

https://extension.psu.edu/common-ticks-and-tick-borne-diseases-in-pennsylvania
https://texasinsects.tamu.edu/lone-star-tick/
http://www.idph.state.il.us/envhealth/tickkey.htm
https://portal.ct.gov/DPH/Epidemiology-and-Emerging-Infections/Ticks
https://www.fs.usda.gov/visit/know-before-you-go/ticks
http://www.idph.state.il.us/envhealth/tickkey.htm

THE STARK REALITY OF BEING A LONG-TERM BEEKEEPER

Listen along here!

Overall, beekeeping is enjoyable – but it's not always easy

Readers, in several previous articles, I have danced to this tune with you. Yet, for personal reasons, I feel a need to try again. Though many of us feel it, it's not easy to explain what we *feel* about our bee efforts. I am an entomologist and I do not have a deep background in human psychological issues. Clearly, I should stick with what *I know*, but sometimes I just need to write about what *I feel*. Even so, I struggle to word it for you. My core thought is – *Though beekeeping is generally rewarding*[1]*, it's not always easy.*

I've done this bee thing for a long time

Having a long history in keeping bees is a helpful attribute for any beekeeper. You remember "*when*" and you acquire a lot of personal bee-related stories. You learn a lot.

Through the years, I have learned that my bee interests will cool a bit during Winter months. So, I adapt to that reality. During those cold, quiet periods, I read about bees, or I write perfunctory articles about understanding more about our craft. I assemble or repair equipment. I plan for the next season. I just try to stay busy in my craft during this down time. While it is a useful time, this quiet period cannot be called true beekeeping. Rather, those times are *"preparing for actual beekeeping."* Try as I might, my bee interest drops to a lower ebb during these slack periods. How could it not?

From experience acquired during many previous quiet Winters, I know this bee-related seasonal *feeling* is coming. I expect it. It's a normal part of my beekeeping psyche. I also know that when Spring comes around, I will – just like my bees – once again awaken and heat back to a higher level of beekeeping interest. In my earlier years, I don't recall a mentor telling me that my bee interest would naturally rise and fall – usually based on the passing of annual seasons.

Building a fire

Successful beekeeping is much like building a glowing bonfire. Fuel must be accumulated. Dates are set. A location is selected. All is made ready. The fire is ignited, it starts slowly and, as more fuel is added, it steadily grows until it reaches its capacity. Then, invariably, it begins to ebb. Without more fuel and tending, it will die out and extinguish. Interest in beekeeping is much like building a fire. It waxes and wanes. Unfortunately, for some of us, the fire goes out. The good news is that the fire can be rebuilt.

In the May 2023 issue of this magazine, I broached some of the feelings that I have about beeyards that I have now vacated. That was one of my most recent efforts to write about beekeeping *feelings*.

In that piece, I described the upcoming fate of my oldest yard – my home yard – and how I will need to adapt to having new, near neighbors and a new street abutting my beeyard. I covered my feelings about that issue in my writings for that month. All things change, don't they?

Then came the wind storm

In early April 2023, a significant wind storm, lasting three days, blew through my area. Trees and apiary damage was all about me. My bee equipment was scattered helter-skelter. On two consecutive stormy days, I had a fifty-five-year-old Colorado Spruce come down. These trees abounded my apiary.

Figure 2. It is not easy working these hives.

On one hand, I can't complain too much. One tree fell away from my beeyard while the other precisely fell in the only place it could to cause the least damage. I still had three colonies that were crushed. The high wind apparently blew the bees away. There were only a few remaining bees in those obliterated colonies. They did not survive. However, the damage could have been worse. On one hand, that's the good news. On the other hand, I now have a huge tree down in the middle of my home yard and I have bee equipment either destroyed or scattered throughout my yard. *(You must know that I will not be giving any tours of my beeyard any time soon.)*

What a mess

I confess that I feel overwhelmed at the prospect of clearing this chaos. I suppose I will select equipment that is still usable, or can be made usable, and form a

[1]After consideration, I have opted to use the word "rewarding" rather than the word "enjoyable." Cleaning dead-outs is not enjoyable, but as I prepare the fouled equipment for future use, I feel rewarded.

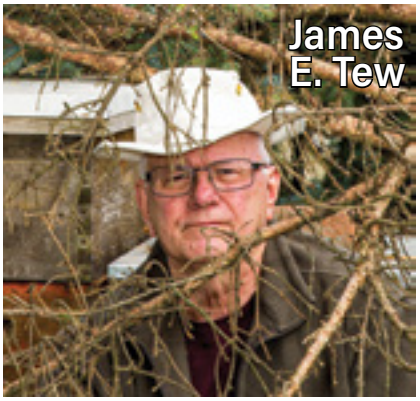


Figure 1. Part of my beeyard in better times.

Figure 3. Part of my beeyard challenge.

burn pile for the remainder. But it gets even better. In the middle of all this confusion, I must move the living colonies from the area. Here's why.

The tree removal people

I had tree removal people come to view the situation. Being professional arborists, I had hoped they would be reasonably comfortable around flying, confused bees. That did not happen! As the tree company representative reviewed the scene – and the bees – from the blue, he asked, *"If the bees are a problem, do you mind if we spray them?"* Readers, I was truly astounded. I think that I probably gasped. Again, I must write that I was stunned. Within that scenario, I would have even more dead bees and a new category of mess. Now I would also have pesticide contaminated equipment to deal with. After a few seconds, I was able to form sentences and was able to tell this uninformed guy that, *"No, I will move these hives to a distant location so his workers could go about their business of tree removal."*

Much like the old late night TV commercials, I now tell you, *"But wait, there's more!"* Probably sensing that he had just mightily offended me, he tried to rebound by showing feigned interest in bees. He asked, *"There's a queen in that box and the bees surround her – right?"* I felt as though I was having some kind of medical exam. I just wanted this whole encounter to be over. I responded that he was somewhat correct but having NO interest in trying to teach beekeeping, I immediately returned the problem of the downed trees. He gave me a fair price and left to attend to my neighbor's downed trees.

This was all a new and unfamiliar reality, being a long-term beekeeper. I have never had my apiary so discombobulated. Then in addition, having people so unfamiliar with bees be so intimately associated with my colonies and with my stressed psyche was a new learning experience for this old beekeeper.

I'm still learning

As I have worked to clean and reorganize my apiary site, I have clearly learned that having a large coniferous tree in the very middle of your apiary is not a positive beeyard feature. As a younger man, I would have fired up my chain saw and removed some of the barrier to my bees. I'm not a young man and I am paying a professional company to clear the mess. *Let them earn their money* has been my feeling. So, I have been trying to work around the big tree as I gather equipment and rearrange bee hives.

I wear high-quality ventilated bee suits. As if to make bad things worse, the needles on the dead tree grab my bee suit and puncture me. At first it was surprising, then it was frustrating, but the stabbing and sticking progressed to being outright annoying. I can hardly move in my apiary without my suit being grabbed by prickly needles that are strong and determined.

But wait, there's even more!

You recall that I have other issues beyond the downed trees. Remember that I will be having new neighbors located near my beeyard. With this reality in mind, last Spring, I had what I originally thought was a genius idea. I will allow Multiflora Rose, an invasive plant, grow to form an impenetrable barrier between me and my new neighbors. After all, that was the original intent of introducing this obnoxious plant into this country. It was to be a hedgerow plant. Unfortunately, the plant went derelict and is now nearly uncontrollable.

Multiflora Rose and ventilated bee suits

Being otherwise cut back, this mega-prickly plant now grows at the edges of my beeyard, but in the storm, confusion and destruction, the unwelcome plant has also been upset. Its tentacles reach here and there and, in some cases, snakes through the branches of the downed tree. As bad as it is to have pine needles grabbing my bee suit, Multiflora Rose is profoundly worse.

It is as though the plant is alive. In snake-like fashion, it grabs my suit and dearly holds onto me. I literally rip it off only to have it whip back and grab me again. On two occasions, I had to remove my suit to get the vine detached from my suit. I must wear bee gloves to deal with the thorny plant, not for protection from bees. I can only candidly write that this is not an enjoyable episode in my beekeeping journey.

The stark reality of being a long-term beekeeper

This month, I will be seventy-five years old and I will have been keeping bees for fifty consecutive years. Yet, I am essentially starting over again in my home yard. I'm either impressively dedicated or a very slow learner.

As traumatizing as it has been for me, I have begun to accept the reality that my most personal beeyard was going to change anyway. I was preparing to deal with that reality. Now, part of my tree barrier has vanished. Even more changes are coming.

While trying to make lemonade from lemons within this fallen tree situation, I admit that, in a bizarre way, the trees coming down will assist in additional future fencing that I would be needing anyway. I have already been forced to relocate the remaining colonies to another temporary location. I was going to need to do that task later this Summer anyway.

For the first time in more than forty-five years, I will (temporarily) not have any hives at this location.

Figure 4. Multiflora Rose in full bloom. Photo credit: Leslie J. Mehroff, University of Connecticut

The yard will essentially be wide open. No trees, no bees and heavy construction nearby. I have a rare window to completely restructure my core yard into a "new and improved" location. I plan to electrify my little bee storage barn and install cameras for security and observational purposes. So, is this a disaster or an opportunity?

Yet another reality of beekeeping

Several of my local beekeeping friends have offered to help, but so far, I have politely declined their offer. Why? Because of *"feelings."* These are my bees and they are my responsibility. If I can't do the job, then I shouldn't take on the job. For reasons beyond my comprehension, I'm on a lifelong apicultural journey and it's *my* thing. I should not seek help from others for the occasional distasteful aspects of my journey in order for me to be able to enjoy the positive aspects of my journey. No doubt, I will get back to you if any of this situation changes in even more unexpected ways.

My lifelong good friend once said...

I once had a lifelong professional friend tell me that I only wrote *"disaster"* articles. It was a passing comment that he made in jest that I have never forgotten. In fact, I do write about stressful beekeeping events because, to me, those are the events, the episodes, that make me grow in my chosen craft. These trying episodes give me unwanted depth and forced understanding. Also, my trying experiences make me compassionate when other beekeepers tell me of their issues and concerns. Therefore, in this article, I choose to use the word, *reality* rather than *disaster*.

I will clean this situation up and I will reestablish colonies in my home yard. It will take a lot of work that is not particularly enjoyable and it will require me to take a lot of naps. It's beekeeping. Overall, I enjoy parts of it immensely. BC

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Zucchini & Tomato Flatbreads

Emma Wadel

Ingredients

- □ 1 zucchini
- □ A small tub of grape tomatoes
- □ 1 garlic clove
- □ 1 lemon
- □ 4oz of ricotta cheese
- □ 2 flatbreads (I use the Storefire Naan 2-pack. I have found it holds its structure better than a pure flatbread.)
- □ Parsley for garnish (fresh or the dried flakes)
- □ Chili flakes (I use red pepper flakes)
- □ Honey
- □ Olive oil
- □ Salt
- □ Pepper

Directions

This recipe makes 2 servings.

Step 1
Place a lightly oiled baking sheet on the top rack and preheat the oven to 450 degrees.

Step 2
Trim and halve zucchini lengthwise. Thinly slice crosswise into half-moons.

Step 3
Halve tomatoes.

Step 4
Peel and mince or grate garlic. I will normally use a garlic press just to save some time – if you choose that, it will come in a later step.

Step 5
Zest and halve lemon. Quarter one of the halves.

Step 6
Heat a drizzle of olive oil in a large pan over medium-high heat.

Step 7
Add zucchini to hot pan with some salt and pepper and cook, stirring, until lightly browned and softened. It should take around 5-6 minutes.

Step 8
In a small bowl, combine tomatoes, garlic (this is the time to use the garlic press, if desired!), and a drizzle of olive oil. Season with salt and pepper.

Step 9
In a second small bowl, combine ricotta, half of the lemon zest, ½ teaspoon olive oil, salt, pepper, and lemon juice. I use half the lemon in a lemon squeezer.

Step 10
Once the oven is finished preheating and the prior steps have been completed, remove the baking sheet. Carefully place flatbreads on the prepared sheet.

Step 11
Evenly spread flatbreads with the lemon ricotta mix.

Step 12
Top with zucchini and tomatoes. Try to get the tomatoes with the cut sides up.

Step 13
Bake on the top rack until flatbreads are golden brown, about 10-12 minutes.

Step 14
If you're using fresh parsley, pick the leaves from stems and roughly chop the leaves.

Step 15
Once flatbreads are done, garnish with honey, parsley, remaining lemon zest and chili flakes (to taste). Serve with remaining lemon wedges on the side.

CALENDAR

♦ABF♦

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

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.

Watch **https://www.abfnet.org/mpage/2024-ABF-Conference-Frame** for more information.

♦ILLINOIS♦

Save the Date! The **Mississippi Valley Beekeepers Association** will be hosting the ISBA Summer Conference in Quincy, IL on July 14th and 15th, 2023. It will be held at the Oakley Lindsay Center (300 Civic Center Plaza #237, Quincy, IL 62301).

Speakers include Kamon Reynolds, Randy McCaffrey, Natalie Summers, Jeff Horchoff, Cory Stevens, Elsa Gallagher and more.

There is something for everyone including vendors, breakout sessions and bluegrass music.

Keep an eye out for more details at **https://mvbees.com/**

♦MINNESOTA♦

The **University of Minnesota** will be holding a Queen Rearing short course on July 21-23, 2023.

Topics include queen and drone biology, timing of queen rearing in northern climates, stock selection and breeding for hygienic behavior, setting up mating yards and record keeping.

Everyone will have a chance to try their hand at grafting larvae and raising their own queens.

There will be a section on queen rearing equipment designs that will allow everyone to build their own.

The cost for the two and a half day course is $350. This includes the Successful Queen Rearing Manual, lunch and refreshments.

Enrollment is limited to 32 people with at least two years of beekeeping experience. Make sure to register early! Registration is first come, first served.

For more information or to register, go to **z.umn.edu/beeclass**

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

♦MINNESOTA, NORTH DAKOTA AND SOUTH DAKOTA♦

The **Tri-State Summer Convention** will be held on July 13th-15th. It will be held at the Holiday Inn in Fargo, ND.

The keynote speaker is Judy Wu-Smart. Other speakers include Marla Spivak, Brandon Hopkins, Garrett Slater, Fran Boyd and more. Bee and Butterfly Habitat and Bee Informed Partnership be speaking as well. There will be a trade show and silent auction.

Early registration closes on July 7th.

For more information, visit **https://minnesotahoneyproducers.com/mn-honey-producers-convention-2023/**

♦PENNSYLVANIA♦

Introduction to Beekeeping is back by popular demand! It will be held at Delaware Valley University in Doylestown, PA on July 15th-16th and July 22nd-23rd.

This course has been lengthened from one intensive weekend to two, allowing more time for work in the apiary discussion. The course is designed for hobbyists, beginning beekeepers and experienced beekeepers wanting a refresher course or the most up-to-date information.

Some topics covered: honey bee biology and behavior, building an apiary and harvesting honey, apiary equipment and supplies, and management practices for each season.

Taught by Master Beekeeper Vincent J. Aloyo, PhD. For more information or to register, see: **https://vincemasterbeekeeper.com/courses/**

♦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/**.

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**"
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- Your renewal code (if you know it)

If your image is chosen:

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For the Cover:
You will get twelve months added to your current subscription.

That gal Marilyn said, "I have a lot of nice thrift store clothes, but we never go anywhere, so I never get to wear them."

I guess she won't be wearing them anytime soon. Marilyn can still turn 'em both ways, but she's no longer an 18-year-old hotshot ski racer. Last Wednesday, while skiing with her brother at Copper Mountain, her skis went out from under her on some bulletproof Spring snow, and she took a bounce on her left hip. Passing snowboarders, Brittany and Maggie, tended to her until the ski patrol arrived, her brother being farther down the hill. When he called Marilyn's cell, she answered with a cheery, "Oh hi Patrick!" Maggie was apparently impressed with the patient's positive outlook. "Oh my God!" she blurted. "I so want to be you when I grow up!"

No surgery required, but a night in the hospital and six to eight weeks on crutches, with full recovery farther down the road. When we got home, Marilyn made lemonade out of lemons and started right in on *Moby Dick*. She's suddenly got lots of time for reading.

I'm nurse-in-charge. Marilyn shuffles around the house with her walker but can't do the simplest things, like pick her ice pack off the floor when she drops it or take off her socks. She keeps the pain under control with those powerful but devilishly addicting drugs brought to us by the Sackler family. My nursing duties cramp my style in the beeyard, but my mantra is "Work smart, not hard."

It's early May as I write. I've had some problems getting queens this Spring, so I've been making walkaway splits, with a wrinkle. First off, I don't bother looking for the queen. She's in one split or the other, right? The other one can make a new queen. What I've always done before is haul one split to another yard, so that foragers from both splits don't return to the split that remains in the hive's original location.

Here's my new way: Let's say a two-story hive faces south before I split it. I place the splits back-to-back, with one facing east and one west, on the original hive location. Returning foragers now have to choose which split to return to. They're right next to each other. I've so far tried this on two sets of splits. In the first, the bee populations three days later were more or less equal. This is what I wanted to see. In the second, they favored one of the splits. But I fixed that by simply switching the location of the two splits, so now bees are re-populating the weaker one.

This is all about keeping things simple and saving myself some lifting and running around.

I want to get out there and make more splits, but between nursing, feuding with a neighbor and getting ready for Dandelion Day tomorrow, I just don't have time.

Dandelion Day is Carbondale's way of celebrating the official town flower. The town mothers preach the gospel of dandelions as food for pollinators and other wildlife. This is very progressive! Every year, I do my part by sending in a letter to the editor warning that if people abuse dandelions, there could be a hangup at the Pearly Gates.

This year's letter: *Dandelion Day is upon us, and every child's favorite flower carpets our yards and farmlands. Aren't you glad?*

Dandelions are not only lovely to behold – they provide a critical source of both nectar (carbohydrates) and pollen (protein) for honey bees and our native pollinators. Deer and elk like to eat them. Without dandelions, honey bees can and do starve. Bees emerge from Winter with their honey stores largely depleted. They need to make more. Since they don't make honey in cool weather, snow, rain or cold during the dandelion bloom can spell trouble for the little darlings.

The more dandelions, the better. Gardeners, dandelions are not your enemies. They're your friends – useful plants that are easy to grow. You can do your part by refraining from poisoning them or digging them up or mowing them. Why does your garden have to look like the centerfold in one of those garden magazines? Relax! Instead of obsessing over dandelions, help Mother Earth and leave them alone.

Marilyn sells honey at Sopris Park in Carbondale on Dandelion Day, but not this year. I'm filling in for her, which is not what I want to do. So I'm packing honey today, along with keeping up a running battle with my neighbor about a fence. Is this what life boils down to? A fence? I'm better than this – we all are – but it's easy to get sucked in.

Newsflash! My neighbor just sent me a series of emails. He's been calling around. He says I need a bee business license, and that my backyard "studio," built in 1930, is too close to our property line and needs to be demolished. He asserts that I need a "Special Event" license in order to host our annual Colorado State Beekeepers Association backyard potluck in June. He assures me that he will object to my event license application, on account of smoke pollution. Five years ago, he loaned me his barbecue grill for the potluck.

I told Marilyn we should put a sign on our gate that reads "Hatfields," pointing down our driveway and "McCoys," pointing towards our neighbor's. She says we should just keep waving. BC

Ed Colby

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5% NATURAL POLLEN

15% CRUDE PROTEIN

High protein content to promote brood rearing

MADE IN USA

Contains 5% natural, USA pollen, irradiated to prevent the spread of honeybee diseases

Made with high-quality ingredients

THOUSANDS of products

EXCLUSIVE online sales

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