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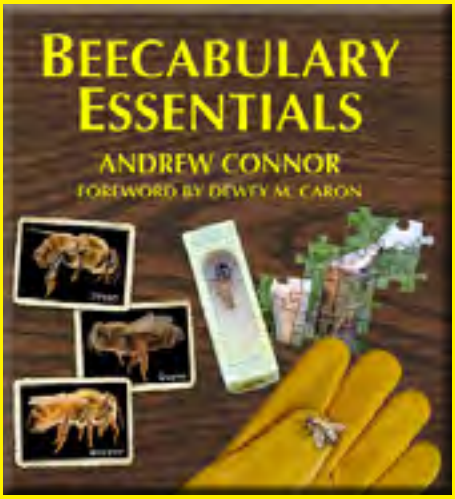

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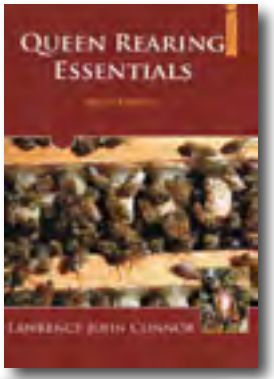

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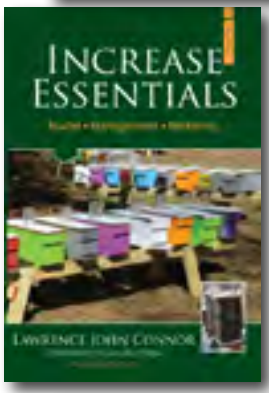

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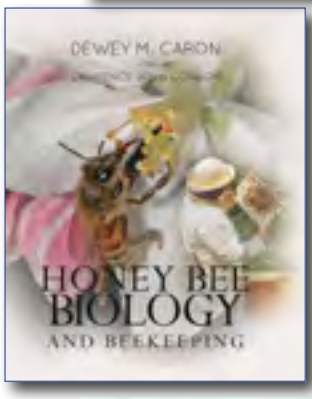

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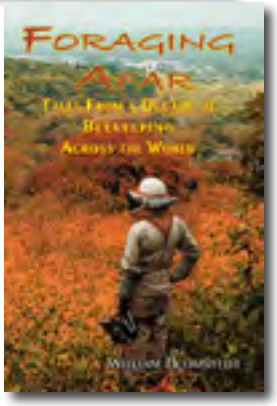

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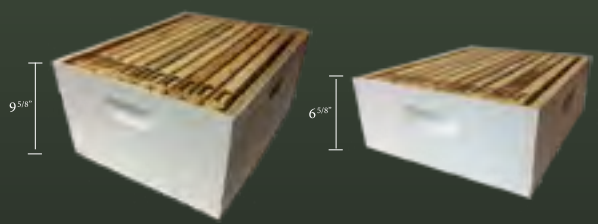

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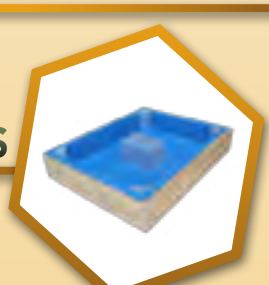

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*Bee wooly butterfly bee bush (*Buddleia marrubiifolia). photo by Joan Fox


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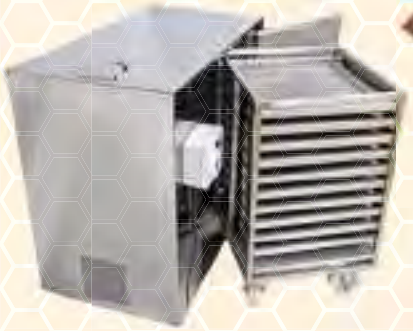

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In Every Month –

Clean Water

As you know, the Environmental Protection Agency (EPA) released new federal clean-water regulations today that are less restrictive than those adopted under the Obama administration.

Thaddeus Lightfoot is a partner at the international law firm Dorsey & Whitney who has spent almost three decades specializing in environmental law. Lightfoot was previously a trial attorney with the US Department of Justice. Of the new regulations he says,

"EPA's announcement of the final Navigable Waters Protection Rule, effective 60 days of January 23, 2020, makes good on the Agency's vow in October 2019 to publish a new final rule after repealing the former Waters of the Unites States rule. It also satisfies a Trump campaign pledge and a 2017 Presidential Executive Order promising a rule that reflected Justice Scalia's concurrence in *Rapanos v. United States*, 547 U.S. 715 (2006). Justice Scalia's plurality opinion rejected the US Army Corps of Engineers position that "land" wet seasonally could constitute a "water of the United States" under the Clean Water Act. According to Scalia, a water of the United States should include only relatively permanent, standing, or continuously flowing bodies of water, or waters and wetlands with a continuous surface water connection between it and a permanent water body," Lightfoot says.

"Justice Kennedy's concurring opinion in *Rapanos* adopted a fact-based "significant nexus" test, observing a water body must have a "significant nexus" to a traditional navigable waterway. The US Army Corps of Engineers used the "significant nexus" test until 2015, when EPA and the Corps promulgated the final "Waters of the United States" or WOTUS rule. Although EPA and the Corps argued the WOTUS rule simply "clarified" existing law, many commentators maintained the rule expanded federal authority. The WOTUS rule was the subject of intense litigation and a nationwide stay. It was in effect in only about 20 states when EPA repealed the rule in September 2019," Lightfoot says.

"The new Navigable Waters Protection Rule largely adopts Justice Scalia's approach in *Rapanos*. Emphasizing the term "navigable waters" in its title, the rule provides that only four categories of waters are federally regulated as "waters of the United States" under the Clean Water Act: (1) territorial seas and traditional navigable waters; (2) perennial and intermittent tributaries to those waters; (3) certain lakes and ponds; and (4) wetlands immediately adjacent to jurisdictional waters. There are also 12 categories of exclusions, including features that contain rainfall, all groundwater, most ditches, prior converted cropland, and waste treatment systems," Lightfoot says.

"Taken together, the rule not only substantially narrows the reach of the WOTUS rule. It also excludes most wetlands formerly within the jurisdiction of the Clean Water Act under Justice Kennedy's "significant nexus" test. Wetland types that EPA and the U.S. Army Corps of Engineers have regulated for decades are outside the jurisdictional scope of the final rule," Lightfoot says.

"EPA Administrator Andrew Wheeler opined in a statement announcing the rule that landowners no longer must rely "on expensive attorneys to determine what water on their land may or may not fall under federal regulations." But landowners and other interested parties will undoubtedly have to rely on expensive attorneys for the courts to determine the viability of the new rule. Environmental groups have already vowed to challenge the rule. And if the amount and level of intensity of litigation over the WOTUS rule it replaces was any indication, it may be many years before the courts determine that landowners may rely upon the apparent certainty in the Navigable Waters Protection Rule," Lightfoot says.

Laura Kelley
w/Dorsey & Whitney LLP

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Global Warming Again

Bee Culture is about bees but from time to time is used to bring leftist point of view about Global Warming. About half of the article of Ed Colby is about it. (*Bee Culture* Feb 2020).

He starts with the sentence "Marilyn and I talk a lot about climate change." Then he writes:

"The dissenting "opinions" of a handful of nay saying "scientists" merely muddy the waters."

I am a scientist (retired) and I feel offended.

Global Warming was a scientific issue long time ago. Now it is a political tool in the hands of the same people who want open borders, medicare for all, free college etc.

Ed Colby uses their language like "Man made climate change is established science which is to say universally agreed upon in the scientific community."

Universally agreed upon science was around always. Few thousand years ago scientists claimed that earth was flat. Few hundred years ago almost all scientists claimed that sun rotates around earth (do you know how dissenting scientists were treated? Ask about Giordano Bruno ***burned at the stake***).

So universally agreed upon science means nothing.

Our science funding is such that a climate scientist must satisfy politicians or look for another job.

No matter what is the truth a movement that has such spokeswomen as poorly educated former bartender (AOC) or mentally challenged Swedish teenager is a joke.

Even if you believe that earth is in trouble try find workable solutions.
Read the article in *The Guardian* by James Hansen (considered to be a father of global warming science.) "Nuclear power paves the only viable path forward on climate change".

Jacek Wierzbicka

*

I always enjoy the monthly column by Ed Colby, *Bottom Board*. He tells good stories and usually throws in some humor and actual helpful tips.

In the February issue his comments on Climate Change were excellent. He gives appropriate examples of what we are facing. Thus, science is science and incontrovertible.

The effect on various species including honey bees and humans looks grim. But, there is still opportunity for humans to change behavior. Hopefully we will have the will to act soon.

Thanks, Ed, for your comments. We will look for the winds of change.

R. Stephen Rankin, M.D.
Farmington, NM

Farm Stored Facility Loan Program

Letter from John Miller to Secretary Sonny Purdue, U.S. Dept. of Ag

Dear Secretary Perdue:

Enclosed please find information on the **Farm Stored Facility Loan Program**.

By including 'temporary refrigerated storage of honey bees' to the eligible uses of the Loan Program, beekeepers could use loan funds to construct indoor beehive storage facilities.

The amount of temporary storage capacity for beehives increases dramatically because indoor wintering is a safer way of protecting agriculture's most important pollinator.

I applied for a FSFL in 2015. We constructed the first-in-the-state indoor storage facility in North Dakota. I was informed that even though the Program allows for storage of honey, storage of beehives is not an allowed Program use. Application denied.

Beekeepers are struggling. In 2020, Honey Prices have fallen. Winter hive losses are stubbornly high. Adulterated funny hunny damages American markets.

Beekeeper access to the FSFLP to help finance temporary refrigerated storage of honey bees will really help American Beekeeping.

Can you help me?

John Miller
Gackle, ND

Pesticide Seed Coatings

I was a big supporter of Jeff Anderson's lawsuit that the planting of insecticide-treated seeds constituted a pesticide application. I can't understand why he lost, since the treatment was NOT to protect the seed, but rather to kill insects later consuming the plant (as opposed to the legit treatment exemption for fungicides).

I feel strongly that anyone introducing large quantities of any pesticide into the environment should be considered as a pesticide applicator, and be responsible.

Randy Oliver
Grass Valley, CA
www.ScientificBeekeeping.com

Almond Orchards

I was surprised to read John Miller's article in the March 2020 issue about the almond orchards.

I was born and raised in the Sacramento Valley. We often went for drives through the farmland in the upper valley to go fishing, and over to San Francisco to visit grand parents. My Mom always pointed out different flowers each season as we passed by. One of the most awesome to both of us was the wild mustard and wild radish flowering beneath the Almond trees in full bloom.

I moved from Sacramento in 1993 to Oregon, I was saddened by John's description and picture in his article. I'm not sure why growers have scraped the ground bare. It's not not necessary to clear "weeds" until harvest. Mr. Miller's article will hopefully get grower's thinking about the "old ways" and what seemed to be a beneficial relationship with crops and those "weeds" our bees love and need to prosper.

P.A. Wackford

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We construct, build, piece together *Bee Culture* approximately two months before it is sent out to you. I am writing this on March 23rd, 2020 for the May 2020 *Bee Culture* issue. Hopefully by May all the scary Coronavirus health issues will have passed and we will have changed for the better.

I have never been to March 23rd, 2020. I have never experienced this thing called a COVID-19 Pandemic. I have never been forced to work from home, which starts tomorrow here in Ohio. I have never experienced working with Great people like Kathy, Jean, Amanda and a dozen or so fantastic writers on *Bee Culture* from a remote digital platform. I have certainly lived through various historical markers that for the most part I have only seen on the 6 o'clock news or PBS NewsHour. But I have never lived in a moment in History such as now. A History driven by an invisible agent. I must believe my elected governmental leaders, the media, health care and bankers. It is Scary and interesting. We don't know when it will end or what it will look like when it does and what changes in society and culture and financial system are going to be artifacts.

I, like you are a puzzle piece on this personal and societal journey. Selfishly I don't want to be part of the older 10% who get COVID-19. And I think about and worry about my children, grandchildren, long time beekeeper friends, neighbors and my community at large.

So, I am going to work from home efficiently with the goal I can bring some value to those that read *Bee Culture* and have trust and confidence in Bee Culture. I will get outside and take walks by myself, go to the Big Box and buy what's left off the concerning almost empty shelves and wait like you for the all clear.

Be safe. Be well and lets trust ourselves and our neighbors more than we have in the past so when we come out of this our neighborhoods, and communities, places of worship, stores, stop light and every place we get the chance for eye contact with our brothers and sisters will register friendship, respect and acceptance.

Now how about some Q&A's. *Jerry*

QUESTION
SMALL HIVE BEETLE LARVAE

Can you address controlling the LARVAE stage of the SHB? It seems like intervening here is a great control method, given that the larvae jump from the landing board in order to pupate in the ground below as an integral part of its life cycle. I've tried placing a few inches of pea gravel directly below the board in hopes of deterring pupation, but I've read that the larvae can simply wiggle away to "greener pastures" once they land. I'm wondering if anyone has any experience or ideas regarding interrupting the SHB life cycle by preventing pupation and therefore reproduction?

Perhaps something akin to the West Beetle Trap but placed below the landing board instead of on top of it, with a grate designed specifically for larvae rather than for the beetle itself, and that somehow prevents their escape to the outside?

I don't have a major problem with SHB, but it seems easy to control if it's life cycle can somehow be interrupted.

Thanks, Dan in
Southern California

ANSWER

Remember that SHB are a secondary predator of honey bee colonies. They are looking for a colony that is weak or weakening so they can reproduce and make baby SHB and there simply are not enough honey bees to 'guard' the colony.

Once the hundreds of SHB females have laid their eggs, an egg is an egg for 1 day, and the aggressive larvae are present with the kodamaea slime (just like cow snot) caused by a colleague yeast its for all intents and purposes over. Why try to catch the larvae? It's after the fact. You failed.

What the management goal is or should be is to be checking your colony often and if there is a visual weakening of the colony figure out why and then fix it. Most of the time its *Varroa* weakening the colony and the beekeeper has not been on the game. You are the Honey Bee manager in 2020. Do it!

QUESTION
NO BEES LEFT

I hope you are well. Quick question. One of my hives absconded. One week they were there and the next week they were all gone. This was a healthy appearing group of bees. I treated with oxalic acid vapor earlier in the season.

My question is, can I use the equipment and the sugar honey from fall feeding in other hives without risk?

Thanks
Bill Fleming

ANSWER

First you have to understand that the colony made the decision that this hive/location wasn't a good place to be living in. They were losing population getting weaker because they were most likely 'sick'.

Sick generally means *Varroa* and the *Varroa*/Virus Legacy. My question is did you follow the protocol in the 'Tools for *Varroa* Management Guide' developed by the HBHC (Honey Bee Health Coalition)? How often did you sample and when you treated did you sample after to see if the treatment worked?

Unless you had an AFB secondary infection most likely all the equipment and stored food resources will be OK to start another colony.

I would encourage you to download the "Tools . . ." Guide and memorize it.

QUESTION
QUEEN DIFFERENCE???

What is different between Russia Hybrid Queen and Purebred Russian Queen ?

Thanks!!
Vinnie

ANSWER

Virgin queens' mate in an open air location called a Drone Congregation

Area or DCA with Drones/males who are attracted to DCAs from miles around hoping to mate and spread their genetics. She will mate with 20+ Drones and store sperm in an organ in her body called a spermatheca for use the rest of her active life.

Impossible to control what drones from whose colonies with variable races of managed honey bees and feral populations go to the DCA. Unless the queen is artificially inseminated with declared 'pure' Russian Drone semen with the cost of the Queen at several hundred dollars or more there is no such thing.

There are no such things as Italian, Carniolan, Caucasian, German bees etc. In North America because we can't control drones in the DCA for commercial Queen production.

We have mutts.

QUESTION
DON'T MOW!

I am living in Appleton, WI. Someone here has recommended to the city to make May a "no mow" month. To help with the bee population. I am not so sure it isn't just people that don't like to mow their lawn.

If it passes, it would actually be mid June before residents would be required to have their lawns mowed.

Do you think it would actually help the bees to do this? I would think maybe planting early blooming flowers may be a better idea?

Thanks for your input. Any ideas you may have are really appreciated!

Take care. Dode Walsh

ANSWER

There are approximately 50 million acres of suburban lawns in the U.S., taking approx.. 80 million lbs. of chemicals and 10,000 gallons of water each to make them look like the 18th Hole at Augusta.

In the best of cases and worst of cases grasses are wind pollinated and have little value for ANY pollinators.

Can you imagine 2%, 3%, 5% of 50 million acres being converted into pollinator friendly forage? Doesn't have to be the whole yard but may along the driveway, or next to the house or that spot in the backyard.

Short story is you are right.

QUESTION
MITE TOOLS

I'm a backyard beekeeper on Cape Cod. Haven`t had bees for a few years because I keep losing them to the mites and other possible reasons. What is your current advice for mite treatments? Thanks so much.

Bob Baron

ANSWER

Memorize this and put into action EXACTLY and you will be incredibly more successful. I promise or I owe you lunch.

https://honeybeehealthcoalition.org/wp-content/uploads/2015/08/HBHC-Guide_Varroa-Interactive-PDF.pdf

QUESTION
SWARM TRAPS

I hope you are well. When using swarm traps, should the bees be left to build out some comb and settle in for a week or should they be transferred to a empty hive as soon as possible?

As always thanks for your help.

Bill F.

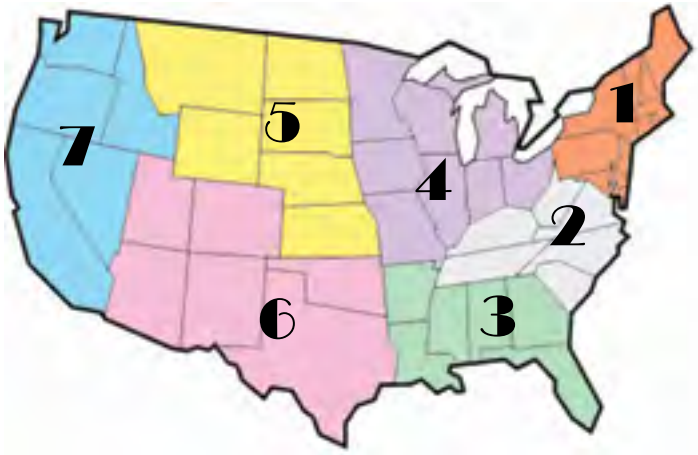
ANSWER

If the swarm trap is an empty container and is not using honey bee comb or beeswax as an attractant the swarm attracted to it should be relocated as soon as convenient to a hive with frames and comb/foundation. This allows them to begin consolidating their colony begin brood rearing as soon as possible. The goal.

Apologies From *Bee Culture*

In the March issue, the entire team responsible for the U of Montana Master Beekeeper's Certificate research project, North American Beekeepers' Communication Database, was inadvertently omitted.The team included Cesare Del Vaglio, Anastasia Bake, Julie Cahoj, James Harper, Wayne Hodgdon, Melvin Leedle, George O'Neil III, with assistance from Tracy Klein.

MAY – REGIONAL HONEY PRICE REPORT



Coming Up

So what's the prognosis for the honey market this coming season? We checked in with our reporters again this year to see what they think is going to happen. Overall, 54% believe that the demand for their honey this season it's going to increase. This ranged from a high of 67% in Region 6, to a low of 40% in Region 7. Will demand remain steady, we asked? 38% believe it will be about the same this season as last. That ranged from a high of 60% in Region 2, to a low of 25% in Region 4. Will it decrease? Only 9% overall think demand will decrease this season.

Prices will increase think only 18% of our reporters, remain steady think 75% and actually decrease say 7%. Nobody is very optimistic about increasing prices but just over 50% think that increase in demand will drive prices up a tad, while 38%, those who keep good records, think costs will make them raise prices, and then there are the 11% who will raise them because they can, primarily due to the cost of keeping bees alive, but also simply to increase their margins and annual profit. I think we need more of the profit minded beekeepers out there.

As a result of all this, demand, price increase and the rest, fully 45% of our reporters will increase production this season (providing all the rest fall in place), which is up from only 33% last year, but fully 52% don't intend to do anything different. They will just stay the same. And, interestingly, only 3% actually plan to decrease prices, for reasons not specified, this season. Now, take a look at the overall prices for each of the products we list. And if you routinely don't, take a look at last month's prices and last year's prices now and note how the market is changing. That $0.75/lb imported honey is slowly changing the world market, and price, of honey. And read the Annual honey report in this month's issue too. Note that per capita consumption isn't up, but imports are up, and US production is slowly changing from honey production to pollination production.

	REPORTING REGIONS							SUMMARY			History	
	1	2	3	4	5	6	7	Range	Avg.	$/lb	Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS												
55 Gal. Drum, Light	2.07	2.27	2.25	2.05	2.25	1.80	3.00	1.503.00	2.16	2.16	2.17	2.23
55 Gal. Drum, Ambr	2.04	2.15	2.30	2.01	2.14	1.70	3.00	1.35-3.00	2.11	2.11	2.02	2.15
60# Light (retail)	231.67	185.33	211.06	160.00	160.00	185.25	219.00	120.00-325.00	199.62	3.33	204.23	206.30
60# Amber (retail)	236.25	189.13	185.00	157.33	212.22	163.25	213.00	119.74-325.00	202.07	3.37	203.69	206.88
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	98.03	74.10	99.20	81.50	61.20	108.81	108.81	57.60-194.40	91.63	7.64	91.93	89.84
1# 24/case	148.65	109.93	153.03	109.39	152.50	111.00	128.40	45.00-300.00	137.07	5.71	131.62	129.34
2# 12/case	133.24	102.70	137.11	100.53	111.84	96.00	114.00	79.20-246.00	124.71	5.20	124.58	120.48
12.oz. Plas. 24/cs	100.36	102.47	86.50	89.14	80.32	96.00	103.20	37.20-172.80	95.24	5.29	99.09	102.40
5# 6/case	147.26	106.73	170.33	116.93	113.16	105.00	146.00	71.50-240.00	136.26	4.54	133.14	136.55
Quarts 12/case	186.06	176.27	147.30	110.01	157.92	192.00	222.00	50.00-300.00	166.00	4.61	143.36	159.95
Pints 12/case	100.79	102.04	96.00	87.28	105.50	94.67	84.00	69.84-144.00	97.49	5.42	90.17	91.57
RETAIL SHELF PRICES												
1/2#	5.83	5.31	5.15	4.91	4.40	5.74	5.74	3.09-9.00	5.44	10.88	5.08	5.01
12 oz. Plastic	6.99	6.88	5.00	5.26	5.05	7.00	6.93	3.79-12.00	6.33	8.45	6.19	5.98
1# Glass/Plastic	8.98	7.75	8.83	6.72	6.86	7.45	9.33	3.65-17.00	8.11	8.11	8.20	7.76
2# Glass/Plastic	15.42	13.50	15.00	12.14	11.35	12.00	16.50	6.99-25.00	14.19	7.09	14.21	13.74
Pint	13.93	10.84	10.00	11.33	10.08	11.67	8.40	4.00-22.00	11.52	7.68	11.05	10.33
Quart	31.42	26.15	38.67	26.00	23.03	25.50	29.75	15.00-45.00	29.51	5.90	18.28	18.27
5# Glass/Plastic	31.42	26.15	38.67	26.00	23.03	25.50	29.75	15.00-45.00	29.51	5.90	28.94	28.87
1# Cream	11.63	8.38	11.55	10.55	11.06	11.55	12.33	6.00-18.00	11.11	11.11	9.99	9.89
1# Cut Comb	13.39	13.08	8.00	11.93	12.33	13.82	13.82	6.00-24.00	12.63	12.63	12.85	11.87
Ross Round	10.01	7.55	10.73	12.00	10.00	11.00	14.16	6.00-15.60	10.67	14.22	11.11	9.90
Wholesale Wax (Lt)	6.91	9.32	4.67	6.36	8.75	6.45	8.67	2.70-16.00	7.08	-	6.70	6.48
Wholesale Wax (Dk)	5.11	5.13	2.55	4.88	8.00	6.47	10.00	2.00-15.00	5.79	-	5.54	5.28
Pollination Fee/Col.	97.22	65.00	82.50	91.67	100.00	120.00	47.50	45.00-190.00	86.46	-	88.97	87.85

NEXT MONTH

Welcome to NEXT MONTH, where our Honey Reporters share a line or two about what they will be doing NEXT month with their bees. Advice is given for each region so you can see what others are doing where you are, and, of course in all the rest of the regions. Check these out. These reporters are successful in business.

Region One
- Feed Sugar Syrup and Pollen Substitute
- Make Splits
- Sample for *Varroa*
- Continue Disease Inspections
- Add Supers
- Tell Neighbors not to Spray Chemicals
- Install Packages
- Keep Bear Fence up

Region Two
- Sample and Treat for *Varroa*
- Check for Overcrowding
- Check Queen Pattern
- Add Supers
- Inspect for Disease
- Put in SHB Traps
- Make Nucs to sell

Region Three
- Sample for *Varroa*
- Make Splits
- Add Supers
- Inspect for SHB and Disease

Region Four
- Super
- Inspect for Queen Cells/Swarming
- Reverse
- Control Weeds in Apiary
- Combine Weak Colonies
- Inspect Weekly for Disease

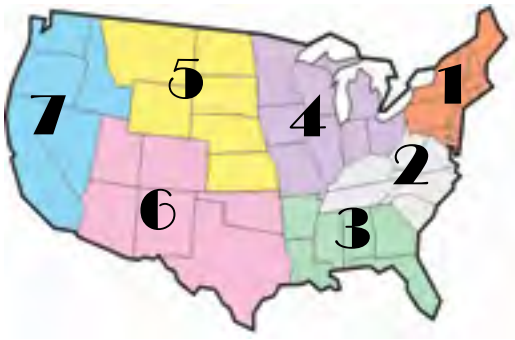
Region Five
- Sample and treat for *Varroa*
- Check for Queen Cells and Swarming
- Add Supers
- Make Splits
- Feed Probiotics
- Feed Sugar Syrup and Pollen Substitute

Region Six
- Sample and Treat for *Varroa*
- Check for Queen Cells/Control Swarming
- Manage SHB
- Continue Feeding
- Check Brood Pattern
- Feed Syrup/Pollen Sub.

Region Seven
- Sample for *Varroa*
- Feed, Feed, Feed
- Check Brood Pattern
- Control Swarming
- Requeen

More Honey Reporters Wanted

We are always expanding our Honey Reporter population and need new reporters in EVERY region. We ask that you fill in most of the wholesale or retail or both sections, most months, and our short survey on the back. We give you a FREE subscription for your service. So if you are interested send an email to **Amanda@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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It's Summers Time –

Staying Home And Staying Alive

What a difference a month makes? Who could have ever guessed what was coming at us. Just over a month ago the *Bee Culture* team was at the Tri-County meeting with a thousand beekeepers. Word was just getting out about the Corona virus. We went to the meeting armed with wipes and hand sanitizer and didn't shake anyone's hand and only gave hugs to those very exceptional few people. A week later church was cancelled and life changed drastically. All bee meetings pretty much into June and some in July have been cancelled or postponed. We have had to adjust to a different way of life that has separated us from friends and loved ones and it's hard.

By nature I tend to be a bit of a recluse. I've never minded staying home. My kids always enjoyed being home. When my older son Grant was tiny, less than two years old, and he got stressed or tired if we were out and about, he would look at me and in that tiny voice just say "Home." That meant I've had enough, let's go.

I still feel that way for the most part. I love being on Spieth Road, still a bit out in the country, with Kim and the chickens and the cat and the bees. But I also really enjoy all of the "kids" we have in our life coming and going and helping in the yard and just being with them. So that's the part I'm missing right now. Plus the fact that, at least here in Northeast Ohio, we have not had a lot of Spring.

As I write this it is early April, actually it's Good Friday right now and it snowed this morning. Yesterday it hailed and we had sleet and the wind blew like crazy. I think Monday it was 75 and sunny and Tuesday night we had a tornado. So it's been an exciting, somewhat difficult week here in Medina, OH. I'm not sure exactly where the tornado touched down, but the center of town and surrounding neighborhoods were hit pretty hard. The amazing thing is that no one was hurt and mostly minor damage to structures. The incredible loss is trees. There are trees down everywhere and lots of folks lost power for about two days. My boy Grant being one of those. He lives just a few blocks from the center of town. He was headed home from work just about the time the tornado hit. He made it home after having to abandon his car by the side of the road and run the short distance to his house, as his street was blocked by a huge tree.

But there are daffodils blooming even among the snow and tulips are starting to pop up and the trees are budding. Some of our neighbors have already gotten out the lawnmowers. So Spring is in the air although not always really visible.

And we are awaiting our shipment of bee packages. We should get ours around the end of April and that brings excitement and new hope. And folks are doing clever things with technology to keep us ready and informed. Kim is actually doing a live webinar for a group in Oklahoma. He was supposed to go there sometime in March, so instead they've organized the meeting similar to the Kim&Jim webinars we've done in the past. The members will sign in, Kim will be sitting here at home and he'll have his slide presentation.

I hope you're taking advantage of all of the resources out there in the land of Facebook, YouTube and all of the others. There are so many people doing good things – podcasts, beekeeping classes online, music, stuff for kids. If you haven't yet, check out Kim and Jeff's podcasts at **BeekeepingTodayPodcast.com**. They are talking to a lot of interesting people and they did a beginner's series with Jim Tew.

Facebook, Facetime, Texting and Email are life savers in this craziness that we are living in. I'm able to talk to my children and friends and even see their faces. I know it's not the same as that close up hug, but it sure helps. I have groups of friends that I connect with at least a few times a week. Three of my friends and I are trying to arrange a parking lot coffee time. We'll go to the church parking lot, park a safe distance away from each other and then shout at each other. Again, not the same, but it helps during this time.

As for *Bee Culture*. This May issue you are holding was entirely done offsite. I'm in Medina, Jerry is in Mansfield, Jean in West Salem, Amanda in Brunswick and Brenda is in Minnesota. But we made it work. I have to be honest it's not been easy – change never is, but here it is. And we hope you enjoy it. Make sure you check out our Annual Honey Report starting on **page 38**. There's a lot of information there. With Kim's help we're attempting weekly Zoom meetings. At least we'll get to see each other's faces that way.

And speaking of Honey Report we will not be sending one out to all of you reporters for the June issue. It's hard to make that work, so we'll have a report that will come from the USDA ERS and USDA NASS. Hopefully, by the time you get this issue we'll know more about what the future holds.

We know some of you are missing issues and have ordered books that haven't been received yet. Please know that we are doing our best under the circumstances. The Root Company at this time has a skeleton crew working around the storm damage, back in the warehouse and factory, so hopefully you'll be receiving your books. As for subscriptions and missing issues please be patient. Amanda is keeping track of all the phone calls and emails we get and as soon as possible we'll get you what you need.

This is the view from my new workspace. It's been hard to discipline myself to working from home. For a lot of years I've spent some weekends and snowy days here at this table working, but never for an entire issue. The hard part is looking around seeing all of the things that need to be done around the house and now the yard and remembering that 'Oh yeah! I'm supposed to be at work?'

Happy Spring to all of you. Summer is coming and the bees need tending. We'll keep doing what we're doing on this end.

BEE TALK

Send us your questions, we'll find the answers. Our regulars and our guests will share what they know. Send your questions to Jerry@BeeCulture.com, with BEETALK in the subject line.

Question 1

Do I need to sample for Varroa now, should I?

A. I am writing this form a Northern Ohio perspective so depending upon the temperature, you may or may not want to expose the brood to outside temperatures. I have looked at some brood on warm days and worried about the amount of heat escaping. The remaining bees have to consume their stores to obtain the energy to maintain a steady temperature for the brood. Opening the hive disrupts their efforts.

If it is too chilly to access the brood, and the hives have a screened bottom board, simply slide a white board ('plenty of election signs to choose from!) and spray the white side with cooking oil. Slide the board, white side up, under the hive and pull it out in 24 hours. The Honey bee Health Coalition provides guidelines for the level of mite infestation depending upon the stage in which the bees are developing. The guide says that a mite level over 1% (1 mite/100 bees) is the limit at this time, which is about 24 mites on a drop board in 24 hours. See the guide at **https://honeybeehealthcoalition.org/varroa/**

If the hives have a solid bottom, you may want to wait for the warmest day to do a quick alcohol wash of the bees when they have broken cluster. You may want to take a smaller sample if the bee population is low. A low population of bees may indicate that mites have already impaired the colony. The colony should have a mite level of 1% or less, so less than 1/100 bees. ***Barbara Bloetscher, OH***

A. Yes, you should definitely sample for *Varroa* ASAP! Overwintered hives often have a Springburst of *Varroa* populations given the exponential and quick growth the bees experience along with the flower burst as you mention. It is best to sample at least 1x per month using the alcohol wash, if possible. If you are accustomed to using sugar shake, no worries continue to use it, the key is being consistent so you can have comparison data throughout the season. I challenge you to experiment and see if counts differ using both methods!:) Always take the time to sample, this vital in managing honey bees! ***Kim Skyrm, MA***

A. The way your question is phrased makes me think that you look at monitoring colony conditions as too disruptive, and something that might better be left until later. The truth is that monitoring is important at all times, and disrupting the bees for a day is not nearly as hard on them as fighting through high mite numbers, or an outbreak of Chalkbrood (a spring disease) will be for them, for instance. As far as counting for mites, keep in mind that numbers will be artificially low in spring, as a higher proportion of adult mites will be behind cappings, reproducing. This is reflected in the lower "acceptable percentage" listed on the HoneyBeeHealthCoaliton website, which will also tell you what can be done at this time of year. ***Tina Sebestyen, CO***

Question 2

Do I need to treat for Varroa?

A. See #1 – If the mite level is above 1%, you should treat. If the queen is affected, her progeny could have viruses vectored by mites. If the nurse bees have mites, the developing larvae will have mites as well. With a forecasted long wet Spring, you will need as many forgers as possible to find whatever is flowering. Bees damaged by mites have shortened lives and often can't function in a hive. Let's not start the spring with sick bees. ***Barbara Bloetscher, OH***

A. Possibly, it depends on what you get when doing your sampling - if sample value is between three to nine mites, consider treatment,

if value is below, no need to treat, but continue to sample monthly. Remember if you do apply a treatment, sample BEFORE and AFTER. The AFTER is what most folks forget, and then bees/beekeepers suffer trying to remedy poor hive health situations in a pinch. Applying mite treatments when *Varroa* populations are very high, is often too late, so sample often, sample consistently, sample, sample, sample! ***Kim Skyrm, MA***

A. For myself, any colony that had higher than 0 count in September got a mid-Winter OA treatment, so I probably won't need to use a miticide in Spring. ***Tina Sebestyen, CO***

Question 3

Do I need to bust open a hive and look for other pests and diseases?

A. I would be very careful opening colonies in early Spring. Bees use propalis to glue the box and frames together and block out cold air if the hive corners are broken or damaged. "Busting open a colony" sounds more disruptive than necessary.

Look for debris that has fallen on the bottom board. Pieces of bees and comb may indicate that a mouse has moved in. The mouse/mice are probably in the bottom box. Remove the top boxes together if possible to look in the bottom box. On a warm day, you can remove the top boxes and check for mites and mice at the same time. Don't disrupt the frames or boxes any more than possible though as the bees will need their insulative propolis for the upcoming months. ***Barbara Bloetscher, OH***

A. It is up to you and weather in your area. It is best to do a Spring inspection for overwintered hives to see what you are working with and set the stage on your seasonal management. If the hive is dwindling – "Spring Dwindle" you may need to consider getting additional colonies to boost your apiary numbers and revitalize. How is the queen looking - wings tattered? age? Queen viability is the key to Spring buildup and ultimate seasonal colony success – if she is not in great shape physically and the brood pattern (i.e. location and amount of eggs/larvae) are not great, then perhaps, you need to order a queen ASAP to replace that ole' girl – queens do not last forever, like most things in life, we all have an expiration date. How are food stores – Do they need to be fed? Bringing in pollen? Food is key to producing new bees, so you may want to consider feeding if the hive is light.:(Regarding pests and disease, it is a great idea to check on brood, particularly larvae – they should bee "pearly-white" and "C-shaped" if you do not see this, then consider taking a sample and sending to USDA-Beltsville Bee lab for diagnosis. There are great guidelines on sampling listed on the website: **https://www.ars.usda.gov/northeast-area/beltsville-md-barc/beltsville-agricultural-research-center/bee-research-laboratory/docs/how-to-submit-samples/** ***Kim Skyrm, MA***

A. Culling the first sheet of drones is a great way to help the bees keep mite numbers low, and should be done even in colonies that had a 0 count in fall, because there are really never 0 mites in a colony. ***Tina Sebestyen, CO***

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Number 1 Tip of the Month – Bee Collector

DIY Bee Collector for Mite Tests

Control and testing for *Varroa* mites continues to be a challenge for beekeepers. I felt there must be an better way to collect that ½ cup of bees for a powdered sugar or alcohol test. I was never a fan of shaking bees into a tub and scooping them out or of scooping straight off the brood comb to get the bees needed for the test. I devised a single frame bee collector as described below.

Cut a ¾-inch thick board or ¾-inch plywood scrap into 1 ¾ inch wide strips. You will need about four feet which will get cut into five pieces. You will also need a 19⅞ x 17¼-inch piece of luan, ¼-inch plywood or tempered hardboard panel for the two sides, most any material will work, but I like the light weight of the luan. Cut the 1¾ inch wide strip at 45° on both ends with two pieces each 11 inches on the long side, two pieces at 45° on only one end that are 9½ inches on the long side, and one piece that is 6½ inches at 45° on both ends on the long side. The two pieces with a straight cut get a ¼-inch deep x one-inch wide notch where the brood frame rests. These notches stick up about ⅜-inch above the luan sides making it easier to grasp the inserted brood frame. The shortest piece is the bottom and will need a 1½-inch hole through the center with a hole saw or 1½-inch wide drill bit. The pieces are assembled as shown in the picture where one side of the luan is missing. The piece with the hole gets a plastic canning cover mounted with the same 1½-inch hole. Fasten the cover to the bottom wood strip with small flat-head screws leaving enough space where the jar screws into the lid lip so as not to interfere or chip the jar glass.

Cut two pieces of luan or sides of your choice at 19⅞ (the same length as a Langstroth hive with ¾-inch walls) x 17¼ inches and lay out the 1¾-inch strips to mark where to cut the 45° bottom corners off. Nail or screw the luan sides to the 1¾-inch strips as shown in the bottom picture. Fill a pint jar with ½ cup of water and use a permanent marker to mark this water level on the outside of the jar. (½ cup gives you about 300 bees.) Cut a circle of ⅛-inch hardware cloth to fit snuggly in the top of a canning jar ring. A second plastic lid can be used when shaking/coating the bees.

Once assembled insert a brood frame of bees and with just a shake or two enough bees fall into the jar. Remove the jar and screw on the 1/8 hardware cloth lid, add powdered sugar or alcohol and replace with the solid lid to shake for a bit to continue the mite check. There is plenty of info on other sites as to how this mite check works so I will not cover it here. The dimensions are for deep frames so if you are using only mediums you can adjust sizes accordingly. Happy beekeeping. *Richard Wahl, Richmond, MI*

When I visited my brother in Ohio, I saw the perfect idea for all of us screened bottom board guys.

Take old chair cushions or sofa cushions apart and using a bandsaw, cut up the foam pieces inside into one-inch strips, 15 inches long and use the strips as entrance closures to move hives or splits. You can press it in and it will expand to any size openings. The one-inch square strips can also be pulled apart by hand to make small pieces for closing upper entrances. *Enos Miller, NY*

HEART & SOUL

A family of beekeepers producing superior beekeeping supplies.

The lines on our skin hint at our age. Our backs ache, our knees creak and every morning we take that first step out of bed unsure if our legs will hold, but they do.

Our tools are covered in wax and propolis from decades of use. We clean them from time to time but our smoker's bellows still push calming puffs out and that's all that matters.

We're not new to this like some. We've seen 'em come and go over the decades. When you've been in the game this long you're bound to say goodbye to old friends from time to time.

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New For This Summer –

The Sentinel Queen Bee Women's Beekeeping Suit – The Modern Beekeeping Suit designed exclusively for Women

For beekeepers, stings are an occupational hazard – which is why in 2018, we launched our 'virtually sting-proof' Sentinel Pro Bee suit.

We're delighted with the fantastic response from beekeepers who have told us how the suit has revolutionized their chosen pastime. Extremely lightweight, it keeps you cool in Summer months and offers the protection needed against bee stings – therefore giving the beekeeper more confidence when working with bees.

Since then, we've had many requests for a suit specifically designed for women. Having spent some time looking into the prospect, we could see that all bee suits are sized generically – without consideration for a woman's size and shape. So, after much research and deliberation, we made several prototypes, and finally, the Sentinel Queen Bee Range was born.

Now we can offer women a bee suit that's designed to fit from size 10 to 24 in a subtle shade of lilac. It has all the features of the Sentinel Pro range, but importantly it is designed to fit the characteristics of the female body.

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- DESIGNED BY A BEEKEEPER FOR BEEKEEPERS

Features of the Sentinel Queen Bee Beekeeping suit include:

- Dual security at neck junction
- Excellent visibility through strong, clear view veil
- YKK durable zips
- Velcro fastening at cuffs
- Waterproof kneepads
- Two lined hive tool pockets
- Queen marker pen pocket on sleeve
- Mobile phone breast pocket with zip fastening
- Extended ankle zips
- Detachable interchangeable hat or veil
- Machine washable
- The suit is lightweight, weighing just 1.2kg
- Matching gloves available

For more information and to purchase visit **www.oldcastlefarmhives.com**.

The Upstairs Downstairs Intrance from BeeSpace in the UK

The basic kit contains four entrances. Normally, three are placed in the bottom brood box in place of the standard long opening, and one is placed further up. The kit can be used with either wood or poly hives as long as they have standard dimensions that respect bee space. Following the instructions included in the kit, you start by drilling three one-inch holes in the bottom brood box. A super-sharp, high-quality **Forstner bit** is included, should you need it.

The UD Intrnace starter kit contains all the parts you need to convert your current hive.

Inside the brood box you attach three internal entrances with the stainless-steel screws provided. These are plastic devices with openings on the bottom that direct the bees downward to get inside the hive. The space inside the plastic device is like a vestibule of sorts. From outside, the bees enter the one-inch hole and then must go through a second opening on the bottom on the device to actually access the hive.

The fourth internal entrance is included for installation into an upper brood box or a honey super, depending on your set up. In addition, **four solid plugs** are included that can be used to reduce wintertime ventilation or for temporarily closing your hive to facilitate oxalic acid vaporization. On top of that, the standard kit also contains **four vented plugs** that can be used to keep the bees indoors during pesticide spraying or to quickly block extra entrances in case of robbing.

For more information on the product and on pricing visit **www.beespace.xyz**.

If you rip a hole in a net, there are actually fewer holes in it than there were before.

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Good Reading For Strange Times –

BEE PEOPLE And The Bugs They Love. Frank Mortimer. Kensington Publishing Corp. **www.kensington.com**. ISBN 978-0-8065-4083-2. 5.5" x 8.5", 312 pages, hard cover, black and white, $25.00 at book stores.

This is far more about the people who keep bees than the bees themselves, but it does a pretty good job of telling about them also. The author, who has written a few pieces for this magazine, is the president to the Northeast Beekeepers Association and has guided it well in the decade he's been in that position. He's also a Master Beekeeper, so has done much of the homework needed to do right by his bees.

He's also met some really interesting people in his day, and, not surprisingly, some of these people are just like the beekeepers you've already met, or will if you stick to this long enough. Knowing them is one thing, knowing about them before you meet them is altogether different. You'll see.

There's lots of learning going on here, and if you haven't already started with bees the author goes over a lot of things you won't have to learn the hard way, which is how a lot of beginners seem to learn.

First packages, first spring, first Summer, first harvest, first bee meeting, mentors, friends and neighbors. As he learns, he makes mistakes, just like we did. But if you haven't started yet, you can avoid some of the most common, and, most dangerous of these and save your self a whole heap of trouble.

If you are just getting started this is background you should be aware of. You'll end up meeting some, maybe most of the people Frank meets, because beekeepers tend to be more alike than not. You'll see these people here, before you meet them out there.

Kim Flottum

HONEYBEE. The Busy Life Of Apis mellifera. By Candace Fleming and Eric Rohmann. Published by Neal Poter Books:Holiday House Publishing Inc. 40 pages, 10" x 12", color, Hard cover. ISBN978-0-8234-4285-0. $18.99.

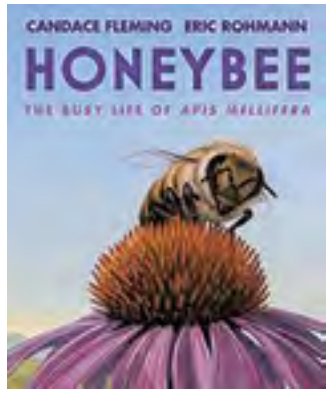
This multiple award-winning duo has published a whole library of children's books about all manner of topics, and this exceptional example should gather them even more awards.

The full-page art is extraordinary in detail and color and design, and it simply and completely describes the life of a bee. She emerges from her cell and begins to eat. After a bit she begins cleaning other cells, then starts taking care of her younger sisters. Next comes queen care until she's about 12 days old. Building waxen combs then is her job, and she's waiting, waiting to fly. But not yet.

Guarding is next, keeping out the bad guys and helping keep her home safe. But finally the day arrives and she can fly, finding millions of flowers and coming home filled with nectar and carrying all the pollen she can muster. And she returns triumphant, sharing what she has found, and where she found it with her very, very happy dance. But, gradually she grows old, becoming thin, losing hair and hardly flying at all. And one warm, sunny morning, Apis is still. But back at the nest a new bee is born, and the life of the colony and cycle of her bees continues.

At the end of the book there is a drawing of a bee showing, and explaining, all of her body parts, and a couple of pages of what people can to do help bees and beekeepers. There's even some references for more of this story. If there is a child in your life, this is a must share story book. And I think maybe even experienced beekeepers will learn something from this up close and personal story.

Kim Flottum



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APIARY INSPECTORS

Joey **Caputo,** Utah

Short History of your state Apiary Program:

In the late 19th century, beekeeping was common in the territory of Utah; foulbrood diseases were too. It became so difficult to control the spread of these pathogens and keep colonies healthy, that the state's beekeepers sought help from the esteemed entomologist A.J. Cook of Michigan Agricultural College. Cook helped organize a statewide beekeeping organization to coordinate disease interventions. The first president of this organization Oliver B. Huntington and newly formed organization lobbied the territorial legislature to pass a bee inspection act. It is believed that the Utah Apiary Program is the longest continuously operating bee inspection program in the United States.

Source: A. Glen Humpherys, "Oliver B. Huntington and His Bees," *Beehive History* 2 (1976).

2-3 Interesting facts about your program:

1) Utah is one of only three states in the U.S. that has county (in addition to state) bee inspectors. The other two being California and Ohio.

2) Southern Utah is home to three unique haplotypes of Africanized honey bee.

Source: Szalanski et al., Undated. Genetic Variation of Honey Bees (*Apis mellifera L.) from Utah. University of Arkansas Division of Agriculture.*

State Inspector Stephen Stanko (r) with a Utah beekeeper.

2) Chalkbrood was first detected in Utah in 1965.

Source: Baker, G.M., Torchio, G.M., 1968. New records of Ascosphaera apis from North America. Mycologia 60, 189–190.

Overview of beekeeping in your state- Honey production, crop pollination etc:

Honey production 2018 – 1,066,000 pounds

Honey bees provide pollination services for Utah's apple, berry, cherry, peach, melon and squash industries.

- **# of Beekeepers:** 2019 - 1,600 registered (UDAF)
- **# of Colonies**: 2018 - 26,000 (USDA NASS)

Upcoming (or recent) events in your state:

2020 SLC Bee Fest (June) **https://catalystmagazine.net/slcbeefest/**

5th Annual Utah Honey Bee Health Conference (November) **https://ag.utah.gov/farmers/plants-industry/apiary-inspection-and-beekeeping/**

Share a short story from an exciting day on the job- (could be a best, worst or anywhere in between):

A few years ago, an elderly lady called a state inspector to request an inspection of a recently installed package. Before the inspector opened the hive, the beekeeper noted that under the advice of another apiarist she had added a box recently so that the bees would not become too crowded. When the inspector opened the lid, he saw that sure enough a box had been added, but there were no frames inside of it! The bees had haphazardly drawn out comb everywhere. The inspector carefully removed the freeform comb, piece by piece and shook the bees into another box with frames. It was a messy and tedious operation, but the bees were safely transferred. BC

Feral colony in southern Utah.

Big beeyard in Utah.

Apiary Inspectors of America

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FOUND IN TRANSLATION

Spring Beauties And The Beast

Jay **Evans**, USDA Beltsville Bee Lab

This was to be an article on May flowers, another expression of my (well hidden, even to me) insights into the plants that are everything to bees and our food chain. Indeed, early garden seeds are in the ground as I write this, trees are attracting bees, and you can taste and smell Spring. When *Bee Culture* comes out in May, the salad greens we've planted will be ready to gulp down, and I can't wait. Nevertheless, I am unable to think of much beyond infectious diseases right now, and viruses in particular. COVID-19 has upended many of our lives and has already brought its share of tragedy to the world. COVID-19 also comes with a worldwide cloud of worry, as we fear infections ourselves, sharing infections with neighbors and loved ones, and the effects this is having on our remarkable species as a whole.

One of the saddest parts of the current pandemic is the imperative for social isolation. I don't mean the "Spring breakers" who are curtailed from Florida beaches. They might well benefit from less sunburn and less indulgence in liquids that are best used to sterilize their hands. I am thinking of our normal circles: contacts with friends and family, caring for neighbors, chats on the street, hugs. My own young-adult daughter is self-isolating at someone else's house, making me long for the days of looking at her eating cereal in the morning, completely undefended against an attack of dad jokes. Thank goodness for the grid of electronic communication. If that falters by the time you read this, just know that the silencing of those jokes will hit hard (the latest was the guy trying to telework saying, "my coworker has just LOST it, she chases the mailman, pees on the neighbor's property, and won't come back inside, I'm calling HR!").

What is truly missed worldwide is the ability to stop by and check on elderly neighbors, the abilities of spouses and friends to visit people in assisted living, rehab, or prison settings, and the million other ways we as a species help each other. All of these are more challenging in the short term, although brave caretakers are doubling down to make sure everyone is emotionally and physically attended to. It is also fine to mourn the silencing of bee clubs, wherein the most senior of the club's members would right now (March) be showing newbies how to install packages, and would in May be arguing about splits, how early they can possibly treat for mites, and how to get a few pounds of honey from those first packages. These meetings will be back, and for now there are many thoughtful translations of this wisdom. I like "Beekeeping: My First Years" which my *Bee Culture* editors seem to think I will need indefinitely, and they are right!.

Enough about our species, this is a bee magazine and there are plenty of smarter people discussing the human predicament. Instead, I am thinking of hopeful signs that honey bees can and do solve their own disease challenges. As beekeepers know, honey bee colonies take the bad with the good. They tower over other pollinators not just through individual smarts (although they have plenty of that, as leading bee researcher Dr. Gene Robinson has shown, **https://lab.igb.illinois.edu/robinson/**) but through their relentless cooperation. While most bee species thrive on solitude, a solitary honey bee would lack purpose in all ways. Bees in a healthy colony can direct thousands of nestmates to flowers or nest sites and can defend against bears that outweigh them by 2,000,000 times (yes, I looked that up). At the same time, honey bees live in close quarters and share microbes in ways that make germophobes cringe. Entire bee colonies can be brought down by disease, and they are, but that is not the norm. Despite being attacked by everything from viruses to bears, honey bees persist. They have even worked out the social isolation thing. As a group, hygienic bees enforce social isolation. This group of bees, appropriately 'nurses' for the most part, protect the mother ship just like our immune cells do within us, and our nurses and doctors do at the group level. At some risk

to themselves, they remove diseased bees, groom parasites and spores from their nestmates, and generally fight back against the biological enemies of the hive. How they do this has been a topic of study since the days of Walter Rothenbuhler and students at Ohio State University, and the subtleties of nurse bee diagnostics and care continue to be revealed. Hygienic behavior depends on bee diagnostics. Not the types that employ bee scientists and commercial outfits, but the kind bees do on their own. Like other animals, honey bees pick up smells from their environment and the perception of these smells primes them to act. If you want a quick review of bee pheromones check out an excellent Youtube lecture on "Applying The Basics Of Honey Bee Biology" by my esteemed colleague Dr. Clarence Collison, from minute "15:00" onward. This lecture (**https://www.youtube.com/watch?v=pULjCfKX8_k**) and several linked ones on bee biology by Dr. Collison are well worth the time, even when you aren't practicing social distancing. Sujin Yi and colleagues at Incheon University, including longtime bee researcher Hyung Wook Kwon, recently updated the world on cues used by bees to sniff out American foulbrood disease (Volatile disease markers of American foulbrood-infected larvae in *Apis mellifera*, *Journal of Insect Physiology*, **https://doi.org/10.1016/j.jinsphys.2020.104040**). Three volatile (smelly) compounds released by sick larvae trigger reactions in nurse bees and presumably help them tend to these larvae while ignoring the many healthy ones. My searching of the internet also shows that two inspiring researchers, Drs. Kaira Wagoner and Olav Rueppell from the University of North Carolina-Greensboro (Dr. Rueppell is now at the University of Alberta), have recent patented "Methods and compositions for inducing hygienic behavior in honey bees", (**https://patents.google.com/patent/US10524455B2/en**). Given these advances there will likely be additional practical outcomes from the decades of studying how bees react to and suppress disease threats from within. That is good news for breeding and medicating, a hopeful sign for a challenging spring.

I am not sure there is a lesson in this for us, as we face our own pandemic, but I have hope. First, our own 'noses' in terms of disease diagnostics are enviable, and the knowledge derived from our ability to identify and act is power. Second, I would put a lot of trust in, and thanks for, our nurses and doctors, and anyone else who is honestly working to calm and help us in this or any crisis. Finally, there is nothing like a crisis to remind us we are all in this together, and our actions, good and bad, impact humanity. There has been an overwhelming amount of shared science during this crisis and that has to prime some solutions. Be well bee friends, Spring is still Spring and beekeepers old and new will get through this. Help a nestmate if you can. BC

Photos courtesy of Peggy Greb, USDA-ARS

What do you need in honey bee diagnostics?

During 2020 our team will conduct a survey of colony management needs for beekeepers of all scales and experiences. This project is supported by the US National Science Foundation under its I-Corps cus-tomer discovery program (**https://www.nsf.gov/news/special_reports/i-corps/teams.jsp**). If you are inter-ested in participating, please send your preferred email to **BeeSurvey2020@gmail.com**. This survey is not related to the long-standing Bee Informed Partnership and USDA-NASS honey bee surveys.

David Hawthorne, Dept of Entomology, University of Maryland
Jay Evans, USDA-ARS Bee Research Lab
Jerry Hayes, Editor, Bee Culture Magazine
Raymond Peterson, Granite Point Ventures

TROUBLED TIMES

Commercial Beekeepers And Unique Challenges

John **Miller**

Here are a few economic impacts beekeepers might anticipate during the remainder of 2020. These are troubled times. Operations providing pollination services, engaged in honey production, honey producers and producer/packers face unique challenges and opportunities.

I'll list a few. Others – please make observations. I have learned that all the good ideas are not John's.

Beekeepers now have their almond checks. These checks are vital to surviving the rest of 2020.

Take care with that cash.

Several opportunities come to mind. Fuel expenses and freight expenses should drop. We know no one ever passes along every saved penny when prices fall. Assume a 75 cent drop in fuel prices. For diesel fuel, this represents a 25% price change from $3.00/gallon to $2.25/gallon. If your operation consumes 50,000 gallons of fuel annually; look forward to $37,500 in savings.

We all contract for freight. Harbor-sourced truck volumes have sharply fallen. Lots of trucks chasing not so many loads. Look for lower shipping costs.

Global sugar prices have fallen. Brazil is a major global producer. In a currency exchange situation, the dollar is now strong; the Brazilian Real is weak, aggravating the recent 20% slide in global sugar prices. In a recent article by Wall Street Journal writer Joe Wallace, traders now estimate over a million tons of sugar will not be consumed in 2020. If your outfit feeds 1.5 Million pounds of feed; and the price drops from .32/lb. to .28/lb.; those four cents = $60,000 in savings. However, never underestimate the power of the Congress to enact stupid public policy. Sugar is protected. Pollination is not.

Beekeepers using the H-2A program [1870 H-2A workers in N.D.] or domestic workers will likely see little wage adjustment relief. Labor is beekeeper's biggest expense.

Perhaps the most important data set beekeepers and almond growers will watch is: Monthly export volume. 2020 began with a very small prior year almond crop carryover. Export sales are a growing majority of the almond market. If export markets lose 100-200 million pounds during 2020, the market should be ok. If exports drop >500mm pounds in 2020 the carryover into 2021 will be significant. What might an almond grower consider? Trees planted prior to 1990 should be harvested in 2020; then pushed out. Growers know 300,000 acres of non-bearing acreage will begin producing in 2020 & 2021. By removing 100,000 acres of end-of-cycle trees, almond growers might blunt the supply increase in 2021.

The important consideration in the U.S. Honey Market: **U.S. produced honey has never been to Asia.** On March 14, 2020 – in Fargo, North Dakota Costco store, where the water shelves were empty – sparkling water from Italy sat ignored. One shopper saying to another, 'Oh don't by Italian water, they have the flu.' A perfect illustration of how markets can remain irrational a lot longer than my bank account can stay solvent.

These are a few thoughts, not all the ideas. Be careful with operating cash, always. The Black Swarm of 2020 is a good reminder. As Kim Flottum said . . . 'Keep your hive tool sharp.' I am not sure what Jerry would say.

Jerry says; "What doesn't kill you, makes you stronger" BC

A Good Diet

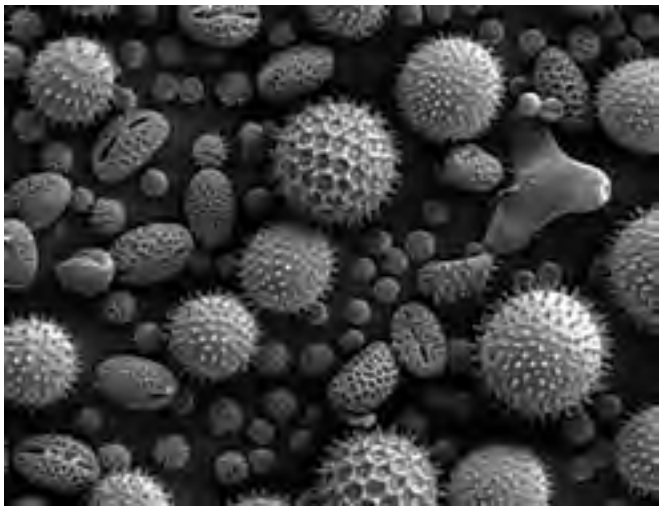
. . . Is More Than Tasty Food

Alexandra Nastasa

A good diet is about more than just good food. Lasagna might be your favorite meal in the world, but after a week straight of eating it you'd start to feel a little sick. And few can survive on fiber bars and nutritional smoothies alone. Life is about sampling flavors, and human beings aren't the only animals who understand that a balanced breakfast means variety. Honey bees may pollinate the food that ends up on our table, but how often do we think about what we're feeding them?

The importance of pollen diversity in colony health has been the subject of discussion for decades now, with most feeling that higher diversity *must* be for the best, according to common sense. But the science is nowhere near so straightforward. Restricting bees' access to only particular types of pollen usually requires confining small groups of bees in the laboratory, and the disconnect between field studies of floral diversity and cage studies of bee survival is large enough that it can be hard to make the leap. Garance Di Pasquale is one of the researchers looking to build a bridge, although her studies remain primarily in the lab. In two consecutive papers, one published in 2013 and the other in 2016, she and her co-authors claimed that pollen diversity doesn't seem to be that big of a boost. Rather, it's quality and quantity that improve worker bees' survival and ability to feed their brood. But what is it about pollen that's so important in the first place?

While nectar is the primary source of nutrition for worker bees, pollen is what provides the hive with protein, lipids, vitamins, minerals, and sterols. Although some nectar has been found to contain low concentrations of amino acids, these are unlikely to contribute substantially to honey bee nutrition, meaning that pollen is the source of everything (besides sugar) that a colony needs to grow (Wright et al., 2018). Of course, not all nutrients can always be found in any one type of pollen, and some pollens contain more of the essential amino acids that bees cannot produce in their own bodies or more valuable sterols, making them ostensibly *healthier* pollens. Di Pasquale's research supports this theory (2013 and 2016).



In her 2013 paper, Di Pasquale and her colleagues compare the survival rates and development of nurse bees fed with pollen from four distinct superspecies/genuses of plants: *Rubus*, *Cistus*, *Erica*, and *Castanea*. *Rubus* pollen (blackberries, raspberries, etc.) had the highest quality by far, high in essential amino acids and with considerably more antioxidants. This increase in quality translated to in increase in survival rates in both healthy bees and those infected with *Nosema*, a common bee pathogen. It also led to more development of the nurse bees' hypopharyngeal glands, which they use to produce food such as royal jelly for larvae. When they mixed all four pollens together, the survival of the bees didn't improve. Healthy bees fed on this more diverse diet actually had shorter lives than those fed on just *Rubus* pollen, so it seems that pollen diversity doesn't matter as long as the pollen in question contains all the nutrients the honey bees need.

Further experiments in 2016 by Di Pasquale et al. confirmed that pollen quality is the key to a healthy honey bee diet. When fed with pollen mixes collected during different flowering seasons, honey bee survival once again correlated with availability of certain pollens and quality and not with diversity. The amount of oilseed rape pollen was found to be important for nurse development, and the late July pollen mix in particular, (although not the lowest in pollen diversity), had an overwhelmingly large proportion of maize pollen and was the worst for bee survival by far because maize pollen is low in essential amino acids. The experiment found that even pesticide content didn't have a noticeable effect on bee survival. The most important factor of all appeared to be simply the quantity of pollen available to the bees: "The more pollen the honey bees received, the longer they lived."

Of course, in an agricultural beekeeping setting, pollen quantity and pollen diversity are not completely disjointed things. A blueberry crop itself provides very small quantities of low quality pollen, while an almond crop provides lots of pollen, leading to an overall lower pollen diversity (Colwell et al., 2016; Topitzhofer et al., 2019). The pollen from an apple crop is collected in large quantities by honey bees and is high in nutritional value, while cranberry is not as plentiful despite being of a similar quality (Colwell et al., 2016). And wildflower (fallow) sites in one field experiment did not provide pollen

with high nutritional content, despite their higher pollen diversity (Colwell et al., 2016). So is it time to stop planting clover patches and bee gardens?

Pollen diversity on its own does not appear to affect the quality of bee nutrition or the likelihood of a healthy colony, but the availability of good food sources and the "bee friendliness" of the landscape does (Barroso-Arévalo et al., 2019). And although one type of pollen may be able to provide all the amino acids a hive needs, there are other important compounds that are a little more plant-species-specific. The fat content of royal jelly depends completely on the floral resources available to nurse bees, and all sterols the honey bees need must come from plants too (Wright et al., 2018). Phytochemicals such as caffeine and *p*-coumaric acid have been found to improve longevity and pathogen resistance in honey bees in certain concentrations, and these phytochemicals are unique to certain flowers (Bernklau et al., 2019). The importance of pollen diversity to the survival of honey bee colonies out in the field is still to be determined, and ensuring access to a variety of pollen resources in case some are difficult to harvest or deficient in particular nutrients is the key to a well-fed hive. If the resources are available, bees will actually bias their foraging sources to things the colony is depleted in nutritionally (Wright et al., 2018).

When a colony cannot adjust to a nutritional deficiency by themselves, there is always beekeeper intervention. Pollen patties and other protein supplements can help drag a hive out of starvation and make up for low pollen yield from their surroundings. However, on average, bees digest 75% of pollen they eat but only 25% of pollen substitutes such as soy protein (Wright et al., 2018), and it's not clear that these supplements can provide the range of additional nutrients that honey bees need. True substitutes for pollen do not exist (Wright et al., 2018). With this in mind, we can recognize the importance of providing more nourishing surroundings for both domesticated honey bees and the wild bees of the world, regardless of the direct effect of pollen diversity. By providing them with a feast to choose from, we ensure they can adjust their diets as they need to and continue to provide us with the variety of crops that add spice to our lives. BC

Reprinted with permission from Science Review.

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U.S. Honey Industry Report – 2019

Released March 19, 2020, by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, United States Department of Agriculture (USDA)

Special Note

Honey price per pound data have been updated to dollars per pound from cents per pound. Before deciding to update this data, NASS reviewed our estimating programs against mission- and user-based criteria requirements to maintain the strongest data in service to U.S. agriculture. Information about all NASS surveys and reports is available online at **www.nass.usda.gov**.

United States Honey Production Up 2 Percent in 2019

United States honey production in 2019 totaled 157 million pounds, up 2 percent from 2018. There were 2.81 million colonies producing honey in 2019, down 1 percent from 2018. Yield per colony averaged 55.8 pounds, up 2 percent from the 54.5 pounds in 2018. Colonies which produced honey in more than one State were counted in each State where the honey was produced. Therefore, at the United States level yield per colony may be understated, but total production would not be impacted. Colonies were not included if honey was not harvested. Producer honey stocks were 41.0 million pounds on December 15, 2019, up 40 percent from a year earlier. Stocks held by producers exclude those held under the commodity loan program.

Honey Prices Down 11 Percent in 2019

United States honey prices decreased 11 percent during 2019 to $1.97 per pound, compared to $2.21 per pound in 2018. United States and State level prices reflect the portions of honey sold through cooperatives, private, and retail channels. Prices for each color class are derived by weighting the quantities sold for each marketing channel. Prices for the 2018 crop reflect honey sold in 2018 and 2019. Some 2018 crop honey was sold in 2019, which caused some revisions to the 2018 crop prices.

Price Paid per Queen was 18 Dollars in 2019

The average prices paid in 2019 for honey bee queens, packages, and nucs were $18, $85, and $100 respectively. Pollination income for 2019 was $310 million, up 3 percent from 2018. Other income from honey bees in 2019 was $77.7 million, down 18 percent from 2018.

One thing we would like you to note is that this year we have provided the updated 2018 Honey Report for two reasons. First, NASS always has updated data provided by beekeepers, packers, importers, exporters and the like as some data wasn't collected due to be in transit, under or over reported initially, or other reasons. For this reason, when the next report is due out, the unreported or corrected data is added to the previous report so the historical data is then correct. We note this as there are changes in last years data that bear noting.

Honey: Number of Colonies, Yield, Production, Stocks, Price, and Value by State and United States, 2019

State	Honey Producing Colonies[1]	Yield per Colony	Production	Stocks, Pounds Dec 15[2]	Average Price per Pound[3]	Value of Production[4]
	x1,000	Pounds	x1,000	x1,000	Cents	1,000 Dollars
AL	7	42	29	44	3.20	941
AZ	23	46	1,058	201	1.97	2,084
AR	20	55	1,100	176	1.53	1,683
CA	335	48	16,080	3,216	1.56	25,085
CO	32	46	1,472	500	2.14	3,150
FL	205	45	9,225	830	2.48	22,878
GA	102	33	3,366	370	2.61	8,785
HI	16	80	1,280	51	1.28	1,638
ID	92	32	2,944	677	1.67	4,916
IL	11	39	429	116	4.31	1,849
IN	9	55	495	198	3.95	1,955
IA	38	55	2,090	1,170	2.24	4,682
KS	7	79	553	171	2.95	1,631
KY	6	41	246	44	4.50	1,107
LA	54	72	3,888	428	2.04	7,932
ME	15	35	525	110	2.92	1,533
MI	94	50	4,700	1,363	2.36	11,092
MN	118	59	6,962	3,063	1.63	11,348
MS	22	80	1,760	141	1.85	3,256
MS	10	43	430	73	3.32	1,428
MT	173	86	14,878	5,802	1.48	22,019
NE	39	52	2,028	223	1.46	2,961
NJ	15	28	420	155	3.33	1,399
NY	59	58	3,422	1,027	4.49	15,365
NC	14	42	588	118	4.06	2,387
ND	520	65	33,800	6,422	1.40	47,320
OH	15	67	1,005	442	3.42	3,437
OR	87	32	2,784	1,141	2.07	5,763
PA	19	50	950	409	4.24	4,028
SC	16	47	752	45	5.01	3,768
SD	270	72	19,440	7,582	1.53	29,743
TN	8	57	456	91	4.65	2,120
TX	126	60	7,560	1,814	2.30	17,388
UT	22	29	638	89	2.06	1,314
VT	6	48	288	84	4.34	1,250
VA	5	39	195	49	7.51	1,464
WA	81	35	2,835	1,191	2.12	6,010
WV	6	37	222	47	4.50	999
WI	46	47	2,162	692	2.99	6,464
WY	39	56	2,184	306	1.35	2,948
Other States[5,6]	30	47	1,418	351	5.91	8,380
US[6,7]	2,812	55.8	156,922	41,022	1.97	309,136

[1]Honey producing colonies are the maximum number of colonies from which honey was harvested during the year. It is possible to harvest honey from colonies which did not survive the entire year.
[2]Stocks held by producers.
[3]Average price per pound based on expanded sales.
[4]Value of production is equal to production multiplied by average price per pound.
[5]Alaska, Connecticut, Delaware, Maryland, Massachusetts, Nevada, New Hampshire, New Mexico, Oklahoma, and Rhode Island not published separately to avoid disclosing data for individual operations.
[6]Due to rounding, total colonies multiplied by total yield may not exactly equal production.
[7]United States value of production will not equal summation of States.

Recall that the report last year was delayed due to the government shut down and wasn't released until May instead of the traditional March release. Some confusion and reporting errors resulted. We wanted to make sure the you are aware of these corrections, and that you can now see what your state, and the whole of the industry did last year. Some states had significant changes,

Honey: Number of Colonies, Yield, Production, Stocks, Price, and Value by State and United States, 2018

State	Honey Producing Colonies[1]	Yield per Colony	Production	Stocks, Pounds Dec 15[2]	Average Price per Pound[3]	Value of Production[4]
	x1,000	Pounds	x1,000	x1,000	Cents	1,000 Dollars
AL	6	45	270	14	3.72	1,004
AZ	24	38	912	109	3.01	2,745
AR	28	50	1,400	84	1.88	2,632
CA	335	41	13,735	3,022	2.11	28,981
CO	31	48	1,488	283	2.05	3,050
FL	215	49	10,535	737	2.40	25,284
GA	98	34	3,332	200	2.76	9,196
HI	17	103	1,751	18	1.92	3,362
ID	96	31	2,976	655	1.96	5,833
IL	11	41	451	108	4.83	2,178
IN	7	46	322	106	3.58	1,153
IA	38	49	1,862	1,005	2.40	4,469
KS	5	73	365	95	3.10	1,132
KY	4	41	164	34	5.43	891
LA	45	83	3,735	261	1.91	7,134
ME	12	32	384	92	2.98	1,144
MI	97	44	4,268	768	2.49	10,627
MN	119	61	7,259	1,161	1.94	14,082
MS	20	87	1,740	70	2.07	3,602
MO	9	45	405	36	2.83	1,146
MT	160	92	14,720	3,680	1.90	27,968
NE	40	59	2,360	850	2.01	4,744
NJ	13	31	403	165	7.47	3,010
NY	56	48	2,688	833	3.24	8,709
NC	10	33	330	63	5.76	1,901
ND	550	72	39,600	4,752	1.87	74,052
OH	14	73	1,022	491	3.72	3,802
OR	93	35	3,255	1,009	2.36	7,682
PA	19	44	836	309	3.89	3,252
SC	16	48	768	15	3.17	2,435
SD	255	47	11,985	5,154	1.91	22,891
TN	7	46	322	84	4.11	1,323
TX	132	56	7,392	1,035	2.12	15,671
UT	26	41	1,066	75	2.10	2,239
VT	7	48	336	94	3.76	1,263
VA	4	40	160	35	7.24	1,158
WA	77	43	3,311	563	2.15	7,119
WV	6	37	222	38	4.33	961
WI	51	45	2,295	711	2.95	6,770
WY	39	56	2,184	175	1.91	4,171
Other States[5,6]	36	39	1,399	314	6.02	8,422
US[6,7]	2,828	54.5	154,008	29,303	2.21	340,358
Adjust[8]	+1%	0%	+1%	+1%	+2%	+2%

[1]Honey producing colonies are the maximum number of colonies from which honey was harvested during the year. It is possible to harvest honey from colonies which did not survive the entire year.
[2]Stocks held by producers.
[3]Average price per pound based on expanded sales.
[4]Value of production is equal to production multiplied by average price per pound.
[5]Alaska, Connecticut, Delaware, Maryland, Massachusetts, Nevada, New Hampshire, New Mexico, Oklahoma, and Rhode Island not published separately to avoid disclosing data for individual operations.
[6]Due to rounding, total colonies multiplied by total yield may not exactly equal production.
[7]United States value of production will not equal summation of States.
[8]Adjustment made from report released previously

many hardly any, but the two columns to note for certain are the Average price per pound, and the value of production. This is how the 11% drop in average price per pound between 2018 and 2019 showed up. 11% is a significant drop in just one year, and one that will affect markets next season when it comes to honey production decisions. `

USDA Honey Prices by color class 2014 – 1019

Look closely at the prices by where honey is sold over the past five years. From the 5,000 foot view, retail seems to be doing well, while co-op over all color classes averages a 15% drop, with water-white and extra light amber down over 20%, and all honey prices are down 11%.

But consider again retail prices, up 16% overall, and then review the amount of imported honey sold, last year making up 68% of all honey sold in the U.S. in 2019. The difference in wholesale price of imported honey, with some selling for as little as less that $1/lb, and retailing, overall, for almost $5/lb. What's wrong with this picture?

Honey Price by Color Class - U.S.: 2014 - 2018
[Producers with 5 or more colonies that also qualify as a farm]

Price							
Color class	Co-op and private						
	2014	2015	2016	2017	2018	2019	% Change in 5 years
	per pound						
Water white, extra white, white	2.05	1.89	1.85	1.89	1.98	1.61	-21%
Extra light amber	2.10	1.89	1.85	1.89	2.01	1.63	-22%
Light amber, amber, dark amber	2.09	1.99	1.89	1.95	2.10	1.93	-8%
All other honey, area specialties	2.55	2.38	2.44	2.46	2.64	2.40	-6%
All honey	2.07	1.96	1.88	1.92	2.03	1.70	-18%

Price							
Color class	Retail						
	2014	2015	2016	2017	2018	2019	% Change in 5 years
	per pound						
Water white, extra white, white	3.29	3.54	4.91	3.80	3.63	3.99	+18%
Extra light amber	3.92	4.12	3.78	4.59	3.44	3.55	-10%
Light amber, amber, dark amber	4.17	3.98	4.36	4.84	4.89	5.63	+26%
All other honey, area specialties	5.35	6.47	7.93	6.24	7.17	7.77	+31%
All honey	4.05	4.09	4.62	4.78	4.38	4.85	+16%

Price							
Color class	All Honey						
	2014	2015	2016	2017	2018	2019	% Change in 5 years
	per pound						
Water white, extra white, white	2.06	1.91	1.93	2.02	2.01	1.67	-19%
Extra light amber	2.18	2.15	1.95	2.14	2.12	1.85	-15%
Light amber, amber, dark amber	2.34	2.31	2.25	2.32	2.51	2.54	+8%
All other honey, area specialties	3.12	3.30	3.86	3.74	3.62	3.84	+19%
All honey	2.17	2.09	2.08	2.16	2.21	1.97	+11%

Per Capita Honey Consumption, 2019

This figure is arrived at each year, using data from USDA NASS, USDA ERS, the FARM SERVICE AGENCY, and the US CENSUS BUREAU. From these sources we calculate the amount of honey that was produced in the U.S. during 2019, how much was imported from off shore, what stocks were left over from the previous year, and how much of the 2019 crop was put under loan, and, though rarely, how much was on loan from the previous year.

Once we have that figure, which we call "Honey In" we calculate how much of this was used somewhere besides the U.S. Exports play into this certainly, how much honey beekeepers and packers have sitting in their warehouses, and how much beekeepers put under loan for this year's crop. This figure is what we call "Honey Out".

If we subtract the Honey Out figure from the Honey In figure, what's left is what was consumed during the year. It's the same formula we use every year, and we gather our data from the same sources every year. There are some caveats you should be aware of every year though. The USDA makes a similar analysis every year on a wide variety of commodities using somewhat more sophisticated resources than we have available. After all, they are the Federal Government. But we won't hold that against them. What they are able to do is look at things like honey purchased but not consumed, the waste that occurs (ever know anybody that throws away a jar of crystalized honey because it went bad?), export and import shipments that are between here and there when the count is taken.

Our argument is that our numbers are pretty straight forward in that we gather everything we can, the same way every year and make the same calculations every year. We strongly believe that, like our monthly honey report, if our numbers aren't exact spot on, the trends you see here over the months and years are as good as, if not better than the exact numbers of other reports. So, look at the patterns of honey in and honey out and amounts put under loan and imports each year to see a bigger story than just how much.

Honey Consumption, Population, Prices 2010 – 2019

Year	Million lbs Honey in	Million lbs honey out	millions population	lbs/person	Price/lb$
2010	398	29	307	1.20	$1.60
2011	470	80	309	1.27	$1.73
2012	487	53	312	1.26	$1.95
2013	500	49	314	1.44	$2.13
2014	547	56	318	1.55	$2.17
2015	544	58	321	1.51	$2.09
2016	573	55	323	1.62	$2.12
2017	600	43	325	1.71	$2.19
2018	594	46	327	1.70	$2.17
2019	585	60	328	1.60	$1.97

Figures this year for HONEY IN:

U.S. beekeepers, with more than five colonies, produced this year 156.9 million pounds of honey. Right off you can see that the final figure is going to be a little less than it should be because none of the honey produced by backyard beekeepers – those with fewer than five colonies – gets counted. That includes a lot of Farm Market honey, back door and sold at work honey, and honey consumed at home. And, of course, you realize that not every single person in this country eats as much honey as the figures say they do, so take some, give some, the numbers are what they are, but at least they are consistent. In 2018 US producers with more than five colonies made 154.0 million pounds, which comes to an increase in 2019 of 2.9 million pounds, and with 14,000 fewer colonies in 2019 than 2018. Then add in the stocks of honey produced in 2018 carried into 2019, which came to 29.3 million pounds, plus honey under loan from 2018 that came out for sale of 7.4 million pounds. One last input here, imports during 2019 came to 416.3 million pounds (compared to 442.6 million pounds in 2018, a 6% drop), which we'll look at in a bit. So total "Honey In" during 2019 came to 156.9 million + 29.3 million + 7.4 million + 416.3 million pounds for a total of 609.9 million pounds of Honey In in 2019 (about 15 million pounds more this year than last).

Figures this year for HONEY OUT:

U.S. sellers exported 4.2 million pounds of honey to various countries this past year continuing a downward trend (compared to 9.7 million pounds in 2018), and put 9.8 million pounds under loan, plus another 41 million pounds are still unsold so are sitting in producers or packers warehouses (compared to 29.1 million pounds in 2018). This comes to 70 million pounds of honey produced but not consumed last year, up from the 46 million pounds last year.

Now, total consumption is calculated by taking all the honey in, subtracting all the honey out, resulting in the amount of honey consumed during the year.

Honey In = 609.9 million pounds (up 35% in a decade)
Honey out = 55 million pounds
Total consumption then = 609.9 million – 55 million = 554 million pounds consumed
U.S. population on July 1, 2019 = 328.7 million people (up 21 million, or 7% in a decade). We use the July 1 population each year for consistency.

Per Capita consumption = 554 million pounds divided by 328 million people = 1.69 pounds of honey consumed by each person in the US during 2019, which is, actually, a 30% increase in a decade). This is 27.2 ounces per person, which was the same amount per person as last year. No gain, but, no loss either.

Now, look at this another way. We consumed 609.9 million pounds last year. Of that, 193.6 million pounds were produced, in either 2019 or 2018, in the US. This means imports amounted to 68% of the honey consumed in the US in 2019. This is actually down from the 75% of honey consumed in the US in 2018, which is a pleasant turn of events.

Some of this may be due to the price of US honey, as an overall average figure by USDA that is only $1.97, dropping significantly from the 2018 price of $2.17. That's a $0.20/lb drop, which adds up when you look at the 156 million pounds produced last year. Actually it adds up to about $31.2 million less income for U.S. beekeepers in 2019.

Top Ten Producing States Each Year

2013			2014			2015			2016			2017			2018			2019		
State	x1000 Col	x1000 Prod lbs	State	x1000 Col	x1000 Prod lbs	State	x1000 Col	x1000 Prod lbs	State	x1000 Col	x1000 Prod lbs	State	X1000 Col	X1000 Prod lbs	State	X1000 Col	X1000 Prod lbs	State	X1000 Col	X1000 Prod lbs
ND	480	33.2	ND	490	42.1	ND	490	36.2	ND	485	37.7	ND	455	33.7	ND	530	38.2	ND	520	33.8
MT	159	14.9	SD	230	24.4	SD	290	19.1	SD	280	19.9	SD	255	14.3	CA	335	13.7	SD	270	19.4
SD	265	14.8	FL	245	14.7	MT	146	12.1	MT	159	12.2	CA	335	13.7	SD	255	12.0	CA	335	16.0
FL	220	13.4	MT	162	14.3	FL	220	11.8	CA	310	11.2	MT	145	10.4	FL	215	10.5	MT	173	14.9
CA	330	10.8	CA	320	12.5	TX	126	8.3	FL	215	10.8	FL	205	8.8	MT	160	14.7	FL	205	9.2
MN	130	7.5	TX	116	9.0	MN	122	8.2	TX	133	9.3	TX	120	7.9	TX	132	7.4	TX	126	7.6
TX	106	6.2	MN	132	7.9	CA	275	8.2	MN	124	7.3	MN	126	7.8	MN	119	7.3	MN	118	7.0
LA	50	4.9	MI	91	5.7	MI	90	5.2	MI	89	5.3	ID	95	4.2	GA	98	3.3	MI	94	4.7
WI	59	3.5	GA	73	4.5	LA	44	4.3	LA	50	4.3	LA	43	3.5	ID	96	2.9	LA	54	3.9
GA	67	3.3	LA	48	4.0	NY	58	3.5	GA	96	3.7	WA	77	3.5	OR	93	3.3	NY	59	3.4
Total	1866	112.5		1957	139.1		1861	117.4		1941	121.8		1850	107.8		2033	110.4		1954	119.9
All Sts.	2640	149.5		2740	178.3		2660	156.5		2775	161.8		2669	147.6		2803	139.9		2812	156.9
% of Tot.	71%	75%		71%	78%		70%	75%		70%	75%		69%	73%		73%	75%		69%	76%

The top 10 honey producing states don't change much year to year, but they do change some, especially the bottom five or so. Almost every year North and South Dakota lead the pack, and this year is no exception, with just those two states producing over 18% of the whole U.S. honey crop, and SD almost 10% of the U.S. crop. Combined, these 10 ammounted to more than a quarter of the U.S. crop last year.

All told, the top ten housed 69% of all the colonies in the US last year, and produced 76% of all the honey produced in the U.S. last year. Oregon made the list for the first time in the last eight years this time, and New York only the second time in the last eight. The rain in California last season spiked honey production there, producing the biggest crop, and having the most colonies in the last seven years. This year, 2020 will be interesting with good moisture again this Spring.

COST & INCOME				
	2016	2017	2018	2019
	5+	5+	5+	5+
Queen Costs	19	19	18	18
Pkg. Cost $	89	88	92	85
Nuc Cost $	117	138	110	100
Varroa Control Cost/ Colony $	-	17.20	17.80	16.40
Workers x 1000	24	22	23	25
Feed Cost/Colony $	-	-	65.20	58.00
Pollination Income	-	-	301.8	309.6
Other Income x 1000	-	-	94.6	77.7

Having a four-year picture of these elements of doing business gives a better picture of the game we all play. Package and nuc costs are interesting, as is the labor picture. The most telling number, however, is the 'Other Income' numbers, down almost $17 million for U.S. beekeepers this past year.

Colonies and Value of Production		
Year	Colonies (million)	Value (million US$)
2000	2.620	132.8
2001	2.506	133.1
2002	2.574	228.3
2003	2.599	252.1
2004	2.556	199.6
2005	2.413	161.0
2006	2.393	158.4
2007	2.443	159.8
2008	2.342	232.7
2009	2.498	215.1
2010	2.692	285.7
2011	2.491	261.9
2012	2.539	283.5
2013	2.640	320.1
2014	2.740	387.4
2015	2.660	329.7
2016	2.775	343.0
2017	2.683	334.2
2018	2.803	333.5
2019	2.812	309.1

Honey Prices 2001-2019

Cents/lb.	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
All Honey	70.4	132.7	138.7	108.5	90.4	104.2	103.2	141	144.5	160.3	172.9	195.1	212.6	216.1	209.0	207.5	215.6	216.6	197.0
Retail Shelf	142.2	152.5	188.5	188.7	183.3	191.0	196.1	197.6	278.4	305.4	328.4	340.5	373.5	406.6	409.6	462.	477.7	421.2	485.0
%Difference	51%	13%	26%	42%	51%	46%	29%	28%	48%	48%	48%	43%	43%	47%	51%	45%	45%	51%	41%

We provide a three-year picture of colonies and honey production by region for the first time to show how they stack up, and how consistent they are, or aren't.

Regional Colony Count And Honey Production

Region	1		2		3		4		5		6		7	
	x1000		x1000		x1000		x1000		x1000		x1000		x1000	
Year	lbs honey	#col	lbs honey	#col	lbs honey	#col	lbs honey	#col	lbs honey	#col	lbs honey	#col	lbs honey	#col
2017	5,948	123	1,922	51	19,301	401	19,202	343	63,908	943	11,350	208	24,647	588
2018	5,487	131	1,171	47	21,020	412	17,669	341	69,774	1,029	11,138	221	23,016	605
2019	6,457	132	2,495	55	19,633	410	18,273	321	72,883	1,048	9,724	206	24,785	598

Just for comparison's sake, here are year to year prices paid for domestic and imported honey according to USDA AMS National Honey Report, released March 27, 2020

Honey Market For The Month Of **FEBRUARY 2020** In Volumes Of 10,000 Pounds Or Greater Unless Otherwise Stated. Prices paid to beekeepers for extracted, unprocessed honey in major producing states by packers, handlers & other large users, cents per pound, f.o.b. or delivered nearby, containers exchanged or returned, prompt delivery & payment unless otherwise stated. Report includes both new and old crop honey – (#Some in Small Lot – +Some delayed payments or previous commitment)

CALIFORNIA
Buckwheat Amber $1.60
Mixed Flower Amber $1.60
Valley Amber $1.60

DAKOTAS
Canola White $1.55
Clover White $1.45 - $1.70
Clover Extra Light Amber $1.45
Clover Light Amber $1.45
Sunflower Extra Light Amber $1.55

FLORIDA
Brazilian Pepper Light Amber $1.60
Brazilian Pepper Amber $1.60

MARYLAND
Mixed Flower Extra Light Amber $1.52

MINNESOTA
Basswood Light Amber $1.72

MONTANA
Clover White $1.55
Mixed Flower Extra Light Amber $1.55

NEBRASKA
Clover White $1.45 - $1.55
Clover Extra Light Amber $1.45

TEXAS
Clover White $1.65

Prices paid to importers for bulk honey, duty paid, containers included, cents per pound, ex-dock or point of entry unless otherwise stated.

ARGENTINA
Clover White $1.13 - $1.17
Mixed Flowers White $1.13 - $1.22
Mixed Flowers Extra Light $1.10 - $1.22
Mixed Flowers Light Amber $1.11 - $1.18
BRAZIL ORGANIC Extra Light $.95
ORGANIC Light Amber $.95 - $1.02
Orange Extra Light $1.79
Mixed Flower Light Amber $.82 - $.85
Mixed Flower Amber $.84

INDIA
Mixed Flower White $.78
Mixed Flower Extra Light $.77 - $.79
Mixed Flower Light Amber $.76 - $.84
Mustard Extra Light $.83 - .89
Mustard Light Amber $.83
Mustard Amber $.78

UKRAINE
Sunflower White $.95 - $.97
Sunflower Extra Light $.84 - $.97

URUGUAY
Mixed Flower Light Amber $.81
Mixed Flower Amber $.81

VIETNAM
Mixed Flower Light Amber $.74 - $.80
Mixed Flower Amber $.63 - $.68

Honey Market For The Month Of **JANUARY 2019** In Volumes Of 10,000 Pounds Or Greater Unless Otherwise Stated. Prices paid to beekeepers for extracted, unprocessed honey in major producing states by packers, handlers & other large users, cents per pound, f.o.b. or delivered nearby, containers exchanged or returned, prompt delivery & payment unless otherwise stated. Report includes both new and old crop honey – (#Some in Small Lot – +Some delayed payments or previous commitment)

DAKOTAS
Canola White $1.83
Clover White $1.83 - $2.15
Clover Extra Light Amber $1.80 - $2.05
Clover Light Amber $1.93 - $2.00
Mixed Flower White $1.83
Sunflower Extra Light Amber $1.80
Sunflower Light Amber $1.75

FLORIDA
Mixed Flower Extra Light Amber $1.70
Pepper Light Amber $1.55 - $1.65

GEORGIA
Pepper Light Amber $1.65

MINNESOTA
Clover White $1.95
Clover Extra Light Amber $1.95
MISSISSIPPI Soybean Amber $1.80

NEW YORK
Basswood Extra Light Amber $2.35

TEXAS
Cotton Light Amber $2.05

Prices paid to Canadian Beekeepers for unprocessed, bulk honey by packers and importers in U.S. currency, f.o.b. shipping point, containers included unless otherwise stated. Duty and crossing charges extra. Cents per pound. Clover White $1.36 Mixed Flower White $1.37 - $1.39

Prices paid to importers for bulk honey, duty paid, containers included, cents per pound, ex-dock or point of entry unless otherwise stated.

ARGENTINA
Clover White $1.30
Clover Light Amber $1.04 - $1.05
Mixed Flowers White $1.10 - $1.21
Mixed Flowers Extra Light $1.10 - $1.21
Mixed Flowers Light Amber $.99 - $1.20

BRAZIL
ORGANIC Extra Light $1.35
ORGANIC Light Amber $1.25 - $1.39
ORGANIC Amber $1.25

INDIA
Mixed Flower Extra Light $.86 - $.95
Mixed Flower Light Amber $.87 - $.93
Mustard Extra Light $.90
Mustard Light Amber $.90

MEXICO
Orange Blossom Extra Light $2.15

UKRAINE
Mixed Flower White $1.03
Sunflower White $.93
Sunflower Extra Amber $.93

URUGUAY
Mixed Flower Light Amber $.93

VIETNAM
Mixed Flowers Light Amber $.81 - $.90
Mixed Flowers Amber $.68

A Silver Bullet

M.E.A. **McNeil**

OR A BRILLIANT DEAD END

"Brilliant. Just brilliant." Oregon State University microbiologist Maude David was speaking about a honey bee gut bacterium engineered to defend against *Varroa* and a virus. It was the cover story (January 31) in Science, the oldest and largest peer-reviewed American academic journal, not prone to hyperbole. The editors had to have thought there is evidence for a real breakthrough. Here, their title is repeated more from hope.

We beekeepers are inured to reports of the latest cure for the pests and pathogens that ail our bees. Mostly, those silver bullets have turned out to be lead. We heard the claims and bought into a lot of them, but the remedies we have are either ineffective, short-term, expensive, cause for escalating resistance, damaging – or all of that. Even our wax is saturated with chemicals. So, sure, we're ready to pay attention to a solution with the potential for being effective, cheap and easy to apply.

Nancy Moran, a professor and researcher at the University of Texas at Austin is a foremost expert on the microbiome of insects, an elected member of the National Academy of Science and a MacArthur Fellow. Moran pioneered the field, documenting the evolution of relationships between bacteria and white flies, spittlebugs, cicadas, leafhoppers, and psyllids. She has done extensive research on honey bees and logged, for the first time, the core bacteria of the bee gut. Following a quarter century of related papers, she has published a study concluding that the agrichemical glyphosate perturbs the gut microbiota of honey bees.

Nancy Moran is the preeminent authority on the honey bee gut biome, a professor at the University of Texas at Austin. She is lead researcher for a project that genetically modified symbiotic bee gut bacteria to release specific RNAi to trigger an immune response in the host.
Photo courtesy Moran Lab

Colleagues have been curious to see what Moran learns next from the insect biome. "She's not just a one-hit wonder," said German researcher Ute Hentschel. "She has an amazing capacity to focus things so that [new insights] precipitate out."

Moran was looking for a microbiological key to activate honey bee immunity and limit pathogens. She and her lab team, headed by Sean Leonard, have come up with a **genetically modified** honey bee gut bacterium tailored to induce host RNAi-based defense.

What does that mean? They have induced bees' natural biological factories to create protection against *Varroa* mites and deformed wing virus.

How does that work? To begin with, DNA is a structure that encodes biological information in all living organisms – the recipe book to create an animal, plant, bacteria or virus. RNA is mostly a messenger carrying instructions from DNA for building proteins. Like humans, honey bees have an antiviral defense mechanism called RNA interference (RNAi) that plays a natural role in regulating that process: Small pieces of RNA bind to the messenger RNAs and interfere – possibly an ancient antiviral mechanism that effectively leaves the message lost in translation.

RNAi helps fight off certain viruses, called RNA viruses. After an RNA virus is introduced, it creates molecules called double-stranded RNA (dsRNA) that a healthy cell detects as foreign. "You usually only get signs of these molecules when an RNA virus is replicating," Moran said. "It's a signal that this might be an evil thing and you should attack it." The triggered RNAi immune response causes the degradation of any like-sequenced RNA that's present.

This antiviral immune process can be used to set RNAi to work by feeding or injecting dsRNA. But so far, as a tool, that's been elusive. When administered to bees, dsRNA has been seen to suppress varroa and Nosema, but it is expensive, unstable, and difficult to work with, although it had no negative effect on bee survival.

Here's what the Moran lab has done: Leonard and the team engineered one of the core honey bee symbiotic gut bacterium, *Snodgrassella alvi*, to induce RNAi immune responses. To address each problem, the team engineered one strain of bacteria to target the virus and another for the mites. The

The cover of the January 31, 2020 Science Magazine, the world's oldest and largest magazine with peer-reviewed papers, announcing what it calls "A microbiome silver bullet for honey bees" – RNAi research.

Bees in the Moran lab during testing for the RNAi project. Photo courtesy Moran Lab.

Rooftop hives at the University of Texas Austin used for the Moran Lab study of RNAi. Photo courtesy Moran Lab.

engineered *S. alvi* was sprayed on the bees in a sugar syrup for them to groom off. The bacteria they ingested stably recolonized in the bees and produced double-stranded RNA to activate RNAi.

Results: *Varroa* mites feeding on bees treated with the mite-targeting strain of bacteria were about 70% more likely to die by day 10 than mites feeding on control bees. Bees treated with the strain of bacteria targeting the virus were 36.5% more likely to survive to day 10. The engineered *S. alvi* killed varroa mites by triggering the mite RNAi response. The bees with the GM (**Genetically Modified**) bacteria also successfully challenged Deformed Wing Virus. Leonard's paper also reports that 11 days after colonization, the engineered *S. alvi* was found along the bee gut wall with the same localization as the wild type strain. So the GM gut bacteria persistently produce dsRNA and the bee host responds by activating immune pathway genes.

"It lasted!" said David, the OSU microbiologist, who, as an outside observer, found that remarkable, noting that the engineered *S. alvi* cells remained functional for well over a week. The reason that is unusual, according to Leonard, is that dsRNA previously administered to individual bees resulted in patchy and transient gene knockdown, and it degrades rapidly in the environment.

It appears that bee-symbiont-mediated RNAi has the potential for protecting honey bees from pests and pathogens in a targeted manner.

Where are we now? However promising, this work was done with bees housed in a lab. So the next step is to do a field study, which is in the planning stages. But the question with any genetically modified organism is whether it will spread into the environment. It was observed that engineered *S. alvi* strains were transferred between cohoused bees. What about spreading a *FrankenSnodgrassella* further? Although the experiments were carried out under the strict biocontainment protocols used with genetic engineering, Moran said that even without those cautions, the risk of the engineered bacteria escaping into the wild and infecting other insects is not a risk. "It lives only in bees," she said. Such symbionts have evolved over millennia, trading off genes to function in narrow, mutualistic relationships so specialized that they can't survive outside of the bee gut. The bacterium "doesn't go outside of bees and doesn't recombine. I'm confident that it won't move into another host."

Moran said, "Most biologists and environmental scientists are not afraid of **GMO** genes. The main thing that people underestimate is the damage done by agrochemicals. People accept the chemicals but not **GM**." Still, the paper says, further research will be needed to determine the effectiveness and safety of the treatments in agricultural settings.

The use of RNAi against honey bee pests and pathogens has been explored before. Beeologics was a firm that was working toward developing RNAi to protect honey bees from Israeli Acute Paralysis Virus. Leonard Foster, a University of British Columbia biochemistry professor who worked on the project, said that the company had developed a process to scale up and reduce the cost of synthesizing double stranded RNA, which they considered to be the commercial product in RNAi technology. After Monsanto acquired

New bee suits, new research: Working with hives for the Moran Lab study of RNAi at the University of Texas, Austin. Photo courtesy Moran Lab.

Sean Leonard is the lead researcher in the Moran Lab for the RNAi project, which took several years to develop. Photo courtesy Sean Leonard

Beeologics, Jerry Hayes, editor of this magazine, spent eight years there in pursuit of a game-changing chemical-free product. "I left because we couldn't deliver it in a field setting consistently. Monsanto spent about $14 million, and we couldn't get it done." There is no indication that the project will be pursued, now that the company has been bought by Bayer.

The Moran lab may have come up with a microbiological key – mediating RNAi with a bee gut symbiont. Their goal is to improve honey bee resilience, but at the very least they have provided a new tool to study bee biology, enabling new insight into the bee genome that could inform breeding choices.

The researchers believe their method could one day scale up for agricultural use because the engineered bacteria are easy to grow, inoculating the bees is practical for the beekeeper, and the engineered bacteria are unlikely to spread beyond bees. BC

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"The honey bee queen during reproduction transmits to the progeny her own characteristics as well as those of the drones which mated with her and thereby determines the good and bad characters of her colony. Under such conditions, it is easy to understand that the entire bee colony is adversely affected when the queen is affected with hereditary or structural defects, or becomes ill and ceases egg laying (Fyg 1964)."

Two major studies have investigated anomalies and diseases associated with honey bee queens (Fyg 1964; Porporato et al. 2015). "Fyg (1964) upon examining and dissecting some 5,000 normal and abnormal queens became familiar with many anomalies and diseases which impacted her reproductive potential. They were concerned with malformations, infections, disturbances of mating and metabolism, as well as hereditary disturbances of development and anomalies which occur either within the queen herself or in her progeny."

"While observing: non-acceptance, frequent replacements, and reduced performance in honey bee queens, Porporato et al. (2015) proceeded to analyze a certain number of queens to detect the causes. For this purpose, 99 newly mated queens were bought from 20 Italian queen breeders. In addition, 109 older or at-the-end-of-their-career queens, that showed poor productivity, were collected from honey production hives throughout Italy. All the queens were dissected to check the status of their reproductive system and/or the presence of various anomalies and diseases. Anatomical and functional anomalies, pertaining to ovaries and spermatheca, also in association with tissue alterations and microorganisms like *Nosema* spp. and protozoa, were common in both newly mated and older queens, but they were more prevalent in the latter. Observed differences permitted them to highlight the causes of the reduced performance of the queens."

"Porporato et al. (2015) found that the sum of queen defects was greater than the number of defective queens because many queens showed more than one anomaly. Up to six defects per queen were observed in old queens, who altogether showed many more anomalies than newly mated queens. Most of the newly mated queens had no defects and only 20.5% of the defective, newly mated queens showed two defects."

A Closer Look

HONEY BEE QUEENS

Clarence **Collison**

They Aren't Perfect

"Dwarf Queens – One of the principal external anomalies of the queen bee may be seen in the so called "dwarf queens" that are occasionally reared by the bees when insufficient pollen and nectar are available, and which seldom ever attain the size of the worker bee. One should not confuse them with egg-laying workers, because dwarf queens possess small but otherwise normally developed sex organs. Usually, however, they remain unmated and sterile. The dwarfism should not be attributed to a hereditary factor in such cases but, to insufficient nutrition during the larval stage (Fyg 1964)."

Ovarian Anomalies – "The queen may have a variety of internal anomalies and malformations. First there is developmental failure or hypoplasia (underdeveloped or incomplete development of a tissue or organ) of the ovaries (Fyg 1964). This condition was found in two queens that appeared normal externally but were sterile breeding queens. The gonads were quite rudimentary but all other parts of the reproductive organs were well developed. The few ovarioles in the rudimentary ovaries contained only degenerated germ cells."

In 22 queens, protozoa were observed in the spermatheca.

"Another frequent queen disease, which also causes a permanent sterility, is the atrophy of the ovaries. It attacks young as well as older, prolific queens and is characterized by a rapid disintegrating of the contents of the ovarioles. The degeneration products of the germ cells, egg cells, and nutritive cells are absorbed somehow, so that the ovarioles shrivel completely (Fyg 1964)."

"Porporato et al. (2015) also frequently found ovarian atrophy in queens. It was observed in young as well as in older queens. Ovarian atrophy was characterized by a rapid disintegration of the contents of the ovarioles, with relative withering and volume reduction. A yellow coloration was frequently found in the terminal parts of the ovaries and corresponded with the presence of dead tissues."

"Melanosis, another very important pathological effect on the queen's ovaries, was observed in 42 of the 109 older queens, but in not one of the newly mated queens (Porporato et al. 2015).

Melanosis is characterized by discoloration of the egg cells and trophocytes which turn from yellow-brown to black." "Fyg (1964) while examining sterile queens found two similar infectious diseases which affect mainly the reproductive apparatus. H-melanosis is caused by a yeast-like microorganism. The causative organism, probably enters from outside via the sting chamber, through the vaginal orifice into the reproductive organs and produces in the oviducts and ovaries, typical lumpy foci of infection of brownish-black or black coloration. The affected queens cease egg-laying within few days and become sterile. Healthy queens can be infected by vaginal inoculations in the laboratory. After six to eight days their reproductive organs show aspects of the disease, which do not differ from those exhibited by the naturally diseased queen. The other, equally frequent type of parasitic melanosis which affects the reproductive organs of young queens exclusively, is caused by a bacterium and is therefore called B-melanosis. The foci of infection caused by the pathogen in the ovaries are also black but they are distinguishable from the knobby necrosis occurring in H-melanosis."

Imperfectly developed oviducts – "Frequently imperfectly developed oviducts are found. The genital ducts of the queen are formed during postembryonic development from paired imaginal discs on the ventral side of the tenth segment and initially are not connected with the ovaries. During the prepupal and pupal stages, the lateral oviducts extend into the body cavity towards the gonads as hollow ectodermal invaginations and connect with the ovaries generally at the third day of the pupal period. Occasionally, the oviducts may stop growing before they have reached the ovaries, in which case there will be no connection between the normally developed ovaries, which are closed at the posterior ends, and the vagina. Oviposition is impossible under such conditions. Occasionally, only one of the oviducts is malformed. Such queens are able to lay eggs to a limited extent. As far as Fyg (1964) could observe, these defects of the oviducts did not exclude successful mating."

Accessory ovarioles – "Another interesting anomaly is that of accessory ovarioles, which are not infrequently found in the queen in various places in the abdomen. Involved are ovarioles which develop independently of the ovaries at abnormal positions. Probably they are derived from misplaced germ cells which, in a very early stage of embryonic development, have not immigrated into the gonads. Most frequently, the accessory ovarioles lie more or less coiled together beside the cardiac tube (heart, aorta) in the pericardial sinus (Fyg 1964)."

Multiple spermathecae – "Normally, the queen possesses only one spermatheca for the storage of the spermatozoa. A rare exception, is finding a queen with two spermathecae. In the case examined by Fyg (1964), the two spermathecae, which contained many sperm, laid closely together and led separately into the vagina. Since the spermatheca is formed in the prepupal stage from two separated anlagen (initial clustering of embryonic cells from which an organ develops), one must assume that they did not unite during this stage, but continued to develop independently."

"Queens with two spermathecae appeared twice out of 208 queens (Porporato et al. 2015). In these cases, the two spermathecae were always in a single tracheal wrapping. It was possible to observe spermathecae only after the removal of the tracheae; the average number of sperm was 2,005 and 208. Other interesting anomalies of the spermatheca were: the absence of the spermatheca, the small size of the spermatheca compared to average dimensions, and an abnormal spermathecal shape. The average number of sperm inside these irregularly shaped spermathecae was 9, 560, and 417. The spermatheca is characterized as having an external pearl color, but they found different kinds of colors with relative differences. In all of their findings, white spermathecae never had sperm inside. Queens with white spermathecae were always replaced; they were not accepted, and they failed to lay eggs. Transparent spermathecae were found in a number of queens. The transparent spermathecae were without sperm. In one case, a black spermatheca was found. This queen was characterized by nonacceptance and she failed to lay eggs, yet she presented a high number of vital sperm inside the spermatheca."

"In 22 queens, protozoa were observed in the spermatheca. Two different kinds of protozoa were identified: ciliate and flagellate protozoa. The ciliate protozoa are representatives of the order Hymenostomatida, genus *Tetrahymena*, probably *T. rostrata*. The flagellate protozoa could not be identified (Porporato et al. 2015)."

Mating disturbances – "In natural mating of the queen, the semen from the copulating drone does not immediately reach the spermatheca from the female genital ducts. The vagina and the oviduct are more or less enlarged by the introduced mass of the semen. The quantity of semen taken in is usually so great that only a small part of it may enter the spermatheca. When the spermatheca is filled, the excess is usually expelled. It sometimes happens that a mass of semen remains

An occasional queen will stiffen up and fall over on her side as if she had been stung.

in the genital duct and becomes a viscous plug which permanently impedes oviposition. Sometimes the "mating sign" remains fixed in the genital opening and protrudes from the sting chamber. In such queens, normal, motile spermatozoa are found in the spermatheca, whereas those in the vagina and oviducts are dead or very often peculiarly curled (Fyg 1964)."

Drone-laying – "The most common disturbance of the normal reproductive function of the queen is drone laying, i.e., her inability to produce female progeny. Colonies are often seriously weakened due to this and their existence threatened by the lack of young worker bees. The drone-laying may be attributable to many causes. She is able to only produce drones because she is unable to fertilize the eggs. This results from the lack of successful mating trips or as she ages, she runs out of semen stored in the spermatheca. The most frequent cause of drone-laying is a very severe disease of the queen which does not depend on mating and is described as morbid drone-laying. It manifests itself quite suddenly in properly mated queens, in the first or second year of life and long before the reserves of semen are depleted, become drone layers and lay unfertilized eggs into the comb cells reserved for the worker brood. Usually the afflicted queens cease egg-laying after some time. A peculiar anomaly of the spermatozoa has been described, and is often observed in affected queens. Beside normal, motile spermatozoa, the spermatheca contains distinctively degenerated spermatozoa which are curled into ringlets (Fyg 1964; Porporato et al. 2015). Each ring consists of only one spermatozoa. Fyg (1964) has shown that morbid drone-laying is a disease of the queen which is characterized by the appearance of specific intranuclear inclusions in all ectodermal organs and tissues. The degeneration of the spermatozoa in the spermatheca is not the primary cause, but rather a secondary phenomenon associated with the disease. The queens often become drone layers before the spermatozoa have visibly degenerated. This disease also occurs in unmated queens that have never come in contact with drones which prove that the disease is not transferred from the drones and does not depend on mating."

"Another interesting anomaly were the pathological stone formations or enteroliths found in the rectum of the queens. These enteroliths were reminiscent, in many cases, of gall-stones, renal and urinary calculi of human and domestic animals. The enteroliths appeared in the rectum as single or several hard, spherical or polymorphus concretions (ovid or spherical in shape, hard compact mass), which often formed agglomerations (clump of material) (Porporato et al. 2015). Four of the examined queens had enteroliths. The average diameter of the enteroliths was 409.6 µm. The color was quite variable: from brick red to grey-brown or brownish-black. The majority of enteroliths showed a distinct concentric stratification and an outward radiating structure."

Queen Fainting – "Queens rarely faint, but they have been observed to do so by beekeepers who have handled large numbers of queens. An occasional queen will stiffen up and fall over on her side as if she had been stung. She remains motionless for several minutes. This condition has been called catalepsy (Brunnich 1922), epilepsis (Laidlaw and Eckert 1962), fainting (Miles 1922), or shock (Latham 1922). When it happens it occurs just after a queen is picked off the comb by her wings. According to Latham (1922) the queen hooks her abdomen by the sternite with a hind leg, pulls the tip of the abdomen forward, then stiffens momentarily, next becomes motionless for a few minutes, and then gradually revives and returns to normal activity. Not every queen who hooks her abdomen is so affected, but Latham believed it most likely in large queens with enlarged abdomens that are laying heavily. In Mile's (1922) experience, catalepsy happened to only young queens; moreover, most of the cases described by Brunnich (1922) were also young queens. In some cases, the queen does not revive, but dies (Miles 1922). Catalepsy is apparently due to a temporary nervous disorder (Reviewed by Tucker 1978)." BC

Another frequent queen disease, which also causes a permanent sterility, is the atrophy of the ovaries.

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Farmer Keith

Don't Villanize . . . Collaborate

Becky **Masterson**

Farmer Keith preparing the soil for planting at a Bee Squad pollinator habitat project.
Photo, Judy Griesedieck

I remember the Spring day in 2013 when Keith Johnson motorcycled into our honey house parking lot and introduced himself as a conventional corn and soybean farmer and new beekeeper who had just established an eight-colony apiary. I was surprised at his ambitious start to beekeeping but quickly learned that his new apiary size met the requirements for a pollinator habitat program he had just established. Keith's passion for bee-friendly flowers and including honey bee management into his already successful framework of livestock management changed my approach to teaching beekeeping. After a few classes with the Bee Squad, Farmer Keith transitioned from student to mentor and our bees benefited from this relationship.

That Summer in our ongoing "Mentoring Apiary" classes Keith and I observed a major barrier to beekeepers managing populations of the parasitic mite, *Varroa destructor*. Throughout the season, we encouraged students to monitor *Varroa* using the powdered sugar roll technique researched by the University of Nebraska (Ellis and Macedo, 2001). At season end when we asked students if they had assembled their own jars with screened lids, measuring cups, and powdered sugar, they had not. Farmer Keith quickly recognized the need for a reusable test kit to be sourced and marketed, making it easy for beekeepers to monitor varroa populations. Months after Farmer Keith signed up for beekeeping classes, he showed up in my office having sourced and priced the necessary components for the Bee Squad *Varroa* Mite Testing Kit (now the MiteCheck Kit the starting point for **www.mitecheck.com**). Six years later, the Bee Squad has sold over 4000 kits to beekeepers and beekeeping supply stores.

I wonder if readers are stuck on the introduction of Keith as a soybean and corn farmer? When Keith told me that he was a farmer, it was at a time when many were debating the use of neonicotinoid insecticides. Keith was eager to discuss pesticide use decisions and why farmers planted specific crops, like soybeans and corn. He explained the business of farming and how it was the public and governmental policies that directed which seeds farmers sowed each spring. Keith's suggestion was for everyone to curl up with a cup of tea and the Farm Bill to learn how it impacted people and pollinators. It was simple to Keith: If people were concerned about the amount of corn and soybeans planted, they needed to direct change with their dollars and input to elected officials.

How do you install pollinator habitat? Farmer Keith shows up ready to plant a lot of flowers. Photo Judy Griesedieck.

Farmer Keith talking about pollinator habitat installation at the Plant Seeds Field Day. Photo Judy Griesedieck

Instead of villainizing farmers, Keith called for collaboration. The Bee Squad has connected with other conventional farmers who were grateful for opportunities to support pollinators. These relationships can result in more bee friendly flowers. Farmer Keith strategically places pollinator habitat throughout his farming operation and makes decisions that support soil, water, pollinators, and the environment. His diversified farm business includes installations of solar panels with surrounding pollinator habitat plantings, successful government habitat programs and the exploration of organic and conventional farming methods.

A common thread when talking to groups about bees is where we should put the blame for issues that impact bee health. From urban and suburban areas, audiences express concerns about agriculture, specifically corn and soybean farming. In rural areas, there are concerns about amateur growers (homeowners) who purchase and apply chemicals to beautify their lawns, save their trees and protect flowers from powdery mildew. I hear about ineffective backyard beekeepers and their pest management practices from those with larger operations. Conversely, small scale beekeepers often report their concerns about commercial beekeepers and their practices. I hear from homeowners, who have decided to fire their lawn service and let the dandelions, creeping-charlie and clover bloom in their yards, that the manicured lawns of their neighbors are harming bees. Everyone who cares about bees seems to have their list of what practices need to be changed by others in order to create solutions. I admit to having a list too. Farmer Keith's playbook doesn't focus on lists, but forges ahead to making connections among groups with different needs and practices. It is a brave and novel way to effect change. Are we wasting our time expressing concerns to those who hold similar beliefs? Keith's way encourages us to know the perceived enemy, understand their motivations and find common ground.

Farmer Keith leading a group through his newly installed pollinator habitat at one of his solar farms. Photo Judy Griesedieck

Farmer Keith played a critical role in designing one of Bee Squad's most successful field days that was defined by its diverse audience and focused on finding connections. Our Plant Seeds Field Day was funded by a North Central Region SARE Grant. We brought together backyard and commercial beekeepers, farmers, scientists, extension professionals and the bee-supporting public for a day of education. Sixty attendees learned about bee health challenges, integrated pest management, *Varroa* management (beekeepers received a free MiteCheck Kit), and pollinator habitat installation from Farmer Keith, governmental programs, and the Bee and Butterfly Habitat program (**bee and butterfly fund.org**). Presenters were faced with the difficult but productive task of gearing their presentations to a diverse audience. Who received and installed the free flower seed? Those with an acre or more of land available for new pollinator habitat received free seed from the Bee and Butterfly Habitat Fund. Backyard and commercial beekeepers, farmers and the bee supporting public all installed new bee habitat.

Attendees noted that the highlight of the Plant Seeds Field Day was making connections to people.

Meeting with people with different ways of earning a living and with diverse practices and beliefs about bee health was energizing for our field day attendees. Providing a space for groups to learn about one another's challenges and successes made for a day where the attendees still ask about when the next field day will happen. While we would love the opportunity to bring together another sixty people from diverse perspectives to explore bee health opportunities, we encourage beekeeping clubs to hold these field days. Inviting a diverse community of beekeepers, farmers, scientists, outreach experts and the public to an educational day about bee health and habitat might help your bees and their many supporters. Remember to include opportunities for the groups to make connections with each other.

Farmer Keith says, "If you plant it, they will come." While he was referring to feeding bees, his vision has always been greater. When Keith plants flowers, he is trying to support all flower visiting pollinators, and while there, he is trying to improve soil and clean water. He is asking everyone to include farmers in conversations and opportunities to improve bee health through better nutrition. Planting seeds for Farmer Keith has been about creating a network that supports bees and conversations. I am grateful that I listened to a new beekeeper who eagerly showed up to our beekeeping classes. Based on who learned and benefited the most, we might just have to issue Keith a refund for those sessions. BC

Becky Masterson

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Becky Masterman earned a Ph.D. in Entomology at the Univ of MN under the direction of Dr. Marla Spivak studying honey bee hygienic behavior and neurobiology. She led the UMN Bee Squad from 2013-2019 and currently alternates between acting as an advisor and worker bee for the program.

HORIZONTAL BEEKEEPING – PART IV

Tina **Sebestyen**

It is May, the month that portends how the beekeeping season will go. Here in Southwestern Colorado, we will have dandelion blooming, the apple and pear trees bloom, and it still freezes and snows occasionally. As soon as willow and maple pollen start coming into the hive in abundance in March, the bees really ramp up their brood production. There isn't much nectar coming in during most of April, and it comes in fits and starts in May. For colonies that were just installed in April or May, feeding sugar water is very important, as it may also be for colonies that have gotten ahead of themselves raising brood without enough stored honey.

It may be tempting not to feed sugar water, since we see spring blooms everywhere, and think there is plenty of food for the bees. Feeding allows the bees to rapidly build the comb they need for brood and for honey. It sets the stage for the entire rest of the year. Without supplemental feed, new colonies will struggle to take advantage of honey flows. One of the first real quandaries a new beekeeper encounters is when to stop feeding. Every beginning beekeeping book has a different answer. Here is the one that makes sense to me… feed until the bees have at least some capped honey. They only cap honey when they feel like they have an abundance of it. This answer comes from our understanding of bee behavior, and making decisions in this way rather than following someone else's calendar is a better way to go.

The first of May is a great time to ensure that the new package of bees starts off without a heavy mite load. An oxalic acid dribble on a new, broodless colony gets them off to the right start. Oxalic acid does not penetrate brood cappings, so this only works without capped brood. Once the package has been installed, and the queen released from her cage after three days, she begins laying eggs soon after. Those first eggs will be capped on day nine. This gives us time to leave the colony undisturbed while they get comb started, and once the queen begins laying eggs, the colony will not abscond. Then we apply an OA dribble on the eighth day after the queen is released. The oxalic acid dribble is delivered with a syringe for accurate dosing, five ml per seam of bees. First check to make sure there is a live, viable queen by looking for eggs. Do not spend a lot of time disturbing a new colony while looking for the queen. Once her presence is assured by the sighting of eggs, put the frames back with shoulders touching. Run the OA down the seams of bees. In a top bar hive, move the bars apart just enough to allow the tip of the syringe to fit between them and deliver the 5 ml each. There will be enough bees to catch the liquid and distribute it amongst them all.

Whether a new or an established colony, it is critical at this time of year that we guard against the colony becoming honey bound. The queen will be laying as many eggs as the bees can cover and keep warm. Soon, it will be warm enough and there will be enough bees for a sizeable foraging contingent to begin bringing in more

honey than is immediately needed by the colony. When this occurs, a full sheet of honey comb will be drawn and filled right behind the brood combs, limiting the queen to the few combs in front of the honey. This is called being honey bound. When all of the brood cells are filled with developing larvae, and there is no room for the queen to lay more eggs, the colony begins to think about swarming.

In established colonies, it might be necessary to remove some honey if it is clogging the brood nest. It is important not to remove all of the honey from a colony. A good rule of thumb is to leave 10 pounds of honey (two frames or bars). This is a nice advantage of horizontal beekeeping. We can simply move honey frames or bars toward the back, inserting drawn comb or empty bars behind the brood, and in front of the honey. The bees will continue to grow the brood nest and be better able to take advantage of nectar flows.

Swarm management is one of the most challenging, and one of the most important parts of being a beekeeper. One of the biggest mistakes I made as a new beekeeper (and for about the first six years) was in trying to manage to bees to avoid the necessity of splitting. I thought I was just trying to keep them from swarming through management, but splitting would have been a much easier and more sure way of accomplishing this goal. The next mistake beekeepers make is to try to wait until the last minute before the colony swarms to split it.

Let's take a minute here and think like the super-organism that is a honey bee colony. In spring, like most other creatures, their main goal is to reproduce. Look around at the bunnies, kittens, and calves. Honey bees would like to send more colonies into the world, and they do this by swarming. That is why it is almost impossible to stop the swarming instinct. Rather than waiting to split until it is so late in the season, we might better serve our bees by splitting them early enough that they have plenty of time to raise a new queen and recover population numbers for the main nectar flow. Splitting the colony has the added and very important benefit if providing a brood break to the part(s) that raise a new queen. Rather than waiting to see if the colony "needs" to be split, it should be our plan from the start, every year, for every colony that is strong enough. If the beekeeper doesn't want or need more colonies, re-combining is always an option after the new queen is well established. Even better would be to sell the resulting nuc to a fellow beekeeper, reducing the movement of bees, mites, and pathogens around the country. Colonies not strong enough to be split probably have a problem that needs to be investigated, and should probably be re-queened.

So, we have established that it is important to split colonies, and to do it early. The right time is when the colony is strong enough, and there is a good nectar and pollen flow coming in. This should be long before the colony has decided to swarm on its own. The colony will start out with a few queen cups, then there will be lots of queen cups, then lots of drones, then back-filling of the brood chamber, then larvae in queen cells. The right time to split is at step two; when there are tons and tons of drones. This will ensure good mating for our new queen, and should be at least a couple of weeks before back-filling begins. The colony should have at least six frames of brood, and eight is better.

One of the best ways to split a colony is to find the queen and move her and three or four frames of brood and bees, and over half of the honey and bee bread into a new hive in another location. This way, the queen gets what she wants, to move with a few bees and start a new colony. The old colony gets what it wants, a new queen. The balance between foragers and nurse bees is preserved in both colonies.

Using a syringe, deliver 5ml per seam of bees, eight days after queen release in package; or to split containing only open brood, immediately after splitting; and to queen-raising split three weeks after queen emergence. Randy Oliver photo

It is a fact, though, that many beekeepers cannot find their queen, or are not patient enough to do so, especially in Spring when the population is high. And, many backyard beekeepers do not have another apiary location, and the split must stay in the same yard. In that case, the Reverse Doolittle is very easy and effective. It moves the queen and all of the nurse bees to a new hive across the yard, and leaves the foragers and emerging brood to raise a new queen. There will be enough bees with the queen to support her, and few enough that she won't get back to swarming size until after the main flow. This can be done in a new box, or in the unoccupied end of a long Langstroth or top bar hive. Simply move the open brood to the new location, shake the bees off of the frames

This is a getting-ready-to-go beard. Once they have decided to swarm, it is too late.

containing capped brood into the new end, and give more than half of the honey and bee bread to the queen, who has few foragers and a lot of mouths to feed. The frames containing capped brood go back in the original location along with one frame of eggs. The foragers will return to their accustomed home to cover the emerging brood and raise a new queen. Nurse bees don't like to fly, so won't abandon the queen, and will be available to care for the open brood. We have helped the bees do what they wanted to do, and have saved our honey production, while providing the brood break essential to reduce mite numbers and miticide use.

This same method, the Reverse Doolittle split, can be used to split a framed hive into a top bar hive. Simply shake all of the bees out of the parent colony into the top bar hive. The queen and nurse bees will stay while the foragers go back to the original hive. The capped brood and at least one frame of open brood stay in the parent colony, while two frames of mixed brood should be left in the new colony as an anchor to keep the bees from absconding. If the frames are left standing on their tops, upside-down, the brood will emerge, but the queen will not lay eggs in them. By then the bees will have drawn some comb on the top bars, and the queen will migrate to the new comb. The now-empty frames can be removed. Also be sure to leave honey and bee bread with the new colony, as they have no foragers. Feeding is critical for just-split colonies, to help them build new comb and grow the colony in time to take advantage of the coming nectar flow.

If swarm cells are found, the colony has decided to go, and they will do so, even if all of the cells are removed, potentially leaving the colony hopelessly queenless. Move the queen to the far end of the horizontal hive and keep the swarm cells in the original location. Remember to brush the bees off of comb containing swarm cells if necessary, never shake queen cells. We have helped them do what they wanted to do. If they still swarm, or one side ends up queenless for any reason, simply slide the frames or bars containing bees together. I like to play it safe, and usually take some kind of precautionary step to ensure happy combining like using duct tape to affix a piece of newspaper to the sides and bottom of the top bar hive. Cut a few half inch slits in it, so that two colonies can smell each other and the queen, they remove the paper in a few days and go on about their business without killing the queen. Another simple way of helping them be happy with a re-combine is to spray everyone with a 4 times concentration of Honey-B-Healthy. By the time they get done licking each other off, they have forgotten who the enemy was.

I like to use a follower board in a top bar hive or long langstroth that houses a new or smaller colony. The follower board may not be necessary, but can be helpful in making the bees feel that they have a defensible space. A honey bee colony in a space the right size grows faster than one with too much space. In a new colony, the follower board should start in about the number 10 position, counting from the entrance. As the colony grows, there should always be three to five empty frames in place for the bees to work. Move the honey back, and insert frames with or without foundation , or bars with guiding foundation strips behind the brood nest. Most top bar and long Langstroth hives hold about 32 bars or frames. Once the colony is occupying half of this space, remove the follower board completely.

So now, we have helped guide our new colony to grow quickly by feeding and providing a properly sized, defensible space, and helped keep both the new and the established colony from becoming honey bound. We have split our colonies early enough that they can recover and take advantage of the flow, or we have re-queened the colony that was too weak to split. Next month, we'll discuss better ways to count for mites in foundationless situations like top bar hives, how to treat for mites using treatments meant for regular Langstroth hives, and how a two queen system works in a long Langstroth hive. BC

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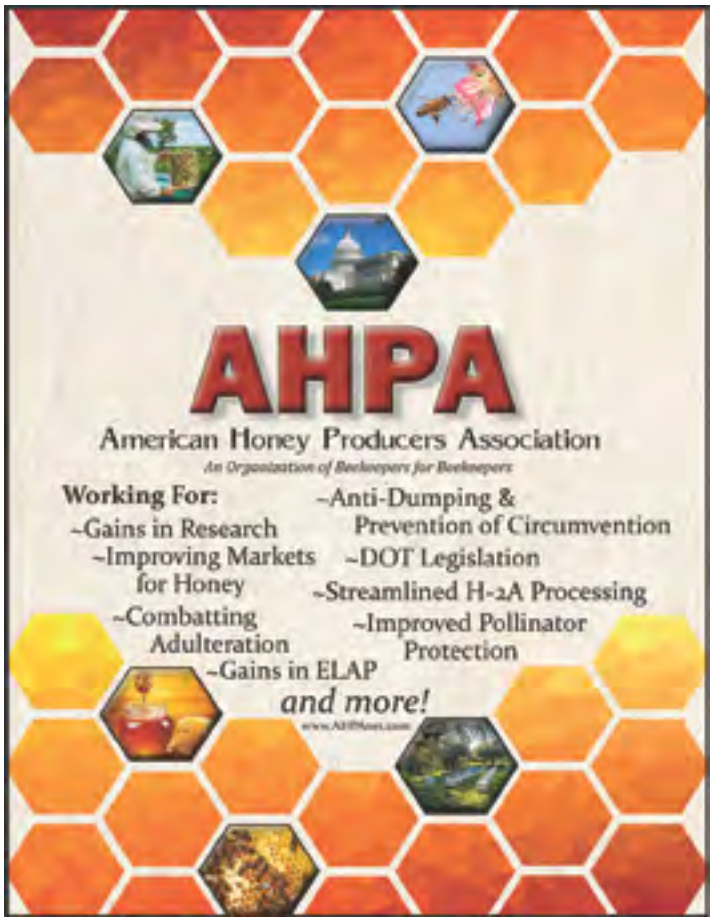
http://scientificbeekeeping.com/the-learning-curve-part-3-the-natural-miticides/ *Mixing proportions for OA and tips for use. Randy Oliver; July, 2009*



Almond Set Vs. Final Yield

Joe **Traynor**

Honey Bee Pollination

The sole purpose of plant and animal species is to pass on their genes to the next generation and to future generations. For almonds, it is the seed or kernel that transmits these genes. Before modern farming, isolated almond trees produced maybe 100 almonds per tree. Today, with ample compatible pollinizer varieties for cross pollination and with good populations of pollinating insects (mainly honey bees) an almond tree can produce 14,000 almonds (aka kernels or meats) per tree, which translates to roughly 3,000#/acre.

Almond flower production can vary from 40,000 to 90,000 blossoms per tree so all it takes in most years is a 25% set to get a 3000#/acre crop. Individual almond flowers produce 40,000+ pollen grains per flower. Since all it takes is one pollen grain to set an almond, accomplishing a 25% set is not an unreasonable task for bees. Barring catastrophic weather, many more almonds will be set from pollinated flowers than the trees can hold. Drop of pollinated nuts starts after petal fall in March and continues through June. The tiny nutlets from flowers that were not pollinated start dropping within a few weeks after petal fall and can be distinguished from pollinated nutlets by pushing them with your thumb – pollinated nuts will remain on the branch or spur, those that weren't pollinated won't. A significant drop of pollinated nutlets occurs every year. This drop can be discouraging but is Nature's way of balancing crop load with overall tree health.

An almond tree not only has to bring it's kernels to the finish line (to harvest), but must also drag the hulls and shells along with them. Because green almonds are 52% hull (vs. 14% kernel and 32% shell) bringing hulls to harvest represents a significant drain on a tree's resources. The hull burden on almond trees is analogous to requiring a runner to carry 50# weights during a one-mile race – the runner can discard the weights before reaching the finish line, the almond tree cannot. The almond tree compensates by shedding green almonds – hulls, shells and kernels.

Almond trees and peach trees are closely related. Peaches command a high price (around $500/ton) because of their tasty flesh (called "endocarp") that surrounds the seed-containing pit. The endocarps (hulls) of almonds are, like peaches, high in sugar and nutrients making them an excellent and tasty feed for dairy cattle. With current problems in the dairy industry plus more hulls from increased almond acreage, hull prices have dropped from $120 to $60/ton in recent years. Income from almond hull sales is a nice source of extra income for almond growers; it used to be enough to cover hulling costs, but not anymore. The almond industry is working on and is optimistic about developing new markets for their nutritious almond hulls.

Like almond trees, peach trees also drop pollinated fruit after petal fall, but not enough for the remaining peaches to reach optimum marketable sizes. As a result, peach growers spend up to $1400/acre to thin peaches, a major expense not incurred by almond growers. Unlike almond growers, peach growers get little or nothing for their peach pits or for the seeds within the pits.

During almond bloom in 2013, USDA workers counted the number of pollinated almonds set on limbs in a Kern County almond orchard stocked at three bee colonies/acre and compared them with those from an orchard stocked at 1.5 colonies/acre. The almond set was determined after petal fall and was significantly higher (around 80%) at the higher stocking rate. This higher initial set did not translate into higher yields because of the higher drop of green almonds – the higher the initial set, the greater the later drop. Final yields on both plots were about the same. The take-home message: *higher bee stocking rates will increase the number of almonds that are set, but will have no effect on final almond yields.*

Current bee recommendations for almonds are to use two colonies of bees per acre, with the colonies to average eight frames of bees per colony. Some crop insurance companies accept 16 frames of bees per acre, which can be supplied by 1.5 colonies of 12-frame strength. two colonies/acre has been and currently

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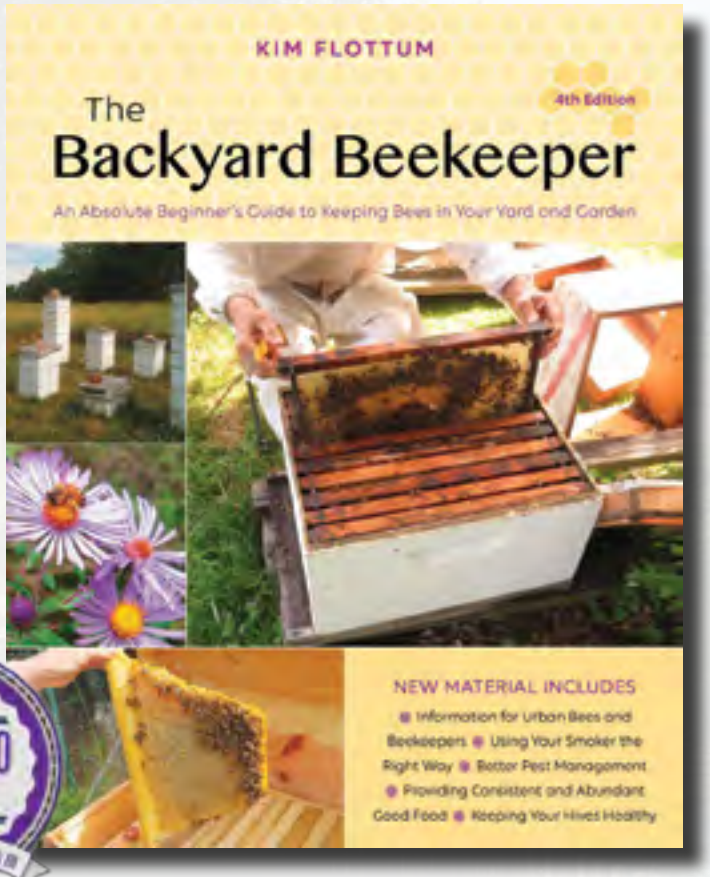

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is, the accepted bee stocking rate for almonds, in spite of the fact that there is no solid data to back up this recommendation. Because the flight range of bees is two+ miles, an adequate test for bee stocking rates would require comparing yields on an isolated orchard stocked at two colonies per acre with one or more orchards at least two miles away stocked at one colony per acre or less – both orchards would need to have identical cultural practices. Such isolated orchards have never been found, which is why there never has been, and probably never will be, an acceptable study on bee stocking rates.

The original bee-stocking rate was published by UC in 1947 in Circular 103 on almond culture: "*In general, one hive per acre is ample, even in adverse seasons."* One could quibble about the use of the term "hive" (rather than colony or frames of bees), but this recommendation should still hold today. A number of growers use only one strong bee colony per acre and are happy with their excellent yields.

The cool, rainy 2019 almond bloom certainly qualifies as an "adverse season" for almond pollination, yet final almond yields were far better than many expected or predicted in March – a good indication that bee stocking rates were more than ample. Most almond growers could trim their operating budgets significantly by using half as many bee colonies as they currently use. They may have to show their crop insurance agent that they are renting strong bee colonies and spend time convincing these agents that they are supplying their orchards with ample numbers of bees, even at a stocking rate of one colony/acre. Crop insurance requirements are the biggest impediment to growers that would like to cut back on their bee numbers. Almond growers should enlist the support of UC and the Almond Board to convince crop insurance people that current bee requirements are excessive. BC

References: *Almond Pollination Math.* PNP January 2013; *Flower Density and Almond Yield.* PNP December 2015; *Cutting Bee Rental Costs.* PNP July 2018

Photos courtesy of Kim Flottum

Requeening: A Spiritual Perspective

Our Everyday Lives

I received and interesting message on my voice mail this Winter. After a round of phone tag I finally connected with the caller who turned out to be a fellow from Ohio who was relatively new to beekeeping. He apologized for the difficulty I had reaching him and explained that his family only had a single phone in their household. He said he loved working with the bees. It fit right in with his farm plan that included fruit trees and chickens. Unfortunately, he had lost his hives in both of the last two Winters and had some questions for me. During our conversation he mentioned that he was being mentored by a neighbor down the road which he greatly appreciated, but it was a bit of a chore to visit him, as he had to hook up his horse and carriage in order to make the several mile journey to see his beekeeping neighbor. Judging from our conversation I am guessing he was a god-fearing religious man who was a member of a Mennonite community.

He mentioned that one of the things he was planning on doing in the future was to requeen his hive every year. When I asked him why he felt a need to do so, he said that requeening is what his mentor does and recommends. When I pointed out to him that these are God's creatures and asked him why he thought it was a good idea to kill off his queens just because they were a certain age, his voice changed and I could tell I had got him to stop and think more about this plan and how he might bring his spiritual values to his beekeeping.

Special treatment

We beekeepers are a peculiar bunch. While it may exist, I cannot think of any other animal kept by humans that we kill just because it reaches a certain age, unless they are being harvested for food, are incurably sick, or injured beyond repair. A two-year old queen does not fit into any of these categories, and yet we consider it normal and even "proper management" to destroy this perfectly healthy queen.

We rationalize the killing of a queen due to characteristics of her performance that are judged undesirable. "Poor brood pattern" we say; or "need to stop the colony from swarming." And yet, this type of rationalization seems particular to beekeeping, since it is not typical for folks to kill off animals in their care just because they don't like the way they act. The exception is when an animal is no longer productive, or they present danger to the health and safely of other people, animals, or crops. So why do we beekeepers not share a similar benevolence towards the pollinators in our care?

Symptom of a larger issue

When contemplating why we beekeepers have this idiosyncrasy there are several possible explanations. They include the perception that we are separate and apart from nature, as well as our general negative attitude toward insects that we tend to consider pests and a threat. These attitudes, reinforced by sensationalism in the media, have resulted in a society that goes to great lengths to kill off most insects and remove them from our daily lives.

Another contributing factor is that the economic penalty for destroying the part of a honey bee colony that carries the super organism's genetic information is low. Queens are widely available at certain times of the year and are relatively inexpensive, usually costing from $20-$35 each.

Honey Bees as a resource

A root cause of our requeening behavior appears to be a world view that prioritizes the world around us by what it can do for us, valuing most the things that we can use to earn money. We have even codified this

Genetic resistance to diseases that have yet to appear in North America is one example of the vast amount of information we lack when we judge a queen bee solely on her age."

Virgin unhatched queens have the potential to lead a new super-organism we call a honey bee colony. It is not until she successfully mates that this potential has the ability to be fully realized upon her re-joining the rest of the colony that raised her and will allow the development of a new individual colony that is genetically unique from all others."

thought process in our language by referring to the things found in the natural world as "natural resources," as if the entire planet exists simply to supply people with the raw materials for economic activity.

This "nature as resource" world view forms the basis of our economy which tends to value the destruction of the natural world over its protection. There is simply more money to be made destroying nature than preserving it. Things that are not managed are considered a "wasted resource." All this leads to the degradation and exploitation of our natural world for human convenience and profit.

The term "resource" negates the inherent value of the plants and animals that exist in our world. It converts them from living organisms that are intrinsically valuable to maintaining the life support systems of our planet, into things whose value is judged by its usefulness to humans. For believers, it represents a failure to carry forward the Christian values of putting others before oneself. For non-believers, it is simply a perspective that ignores all the host of environmental services that non-human beings provide. All too often when we treat non-human entities as a resource and prioritize our needs over theirs, the other is treated disrespectfully and the long-term health and well-being of that organism and our ecosystems suffer.

Beekeeping is no exception

The idea of exploiting bees for money may conjure up the image of large-scale commercial beekeepers, however, the harm referred to and caused by the "resource" state of mind is just as easily implemented by the backyard beekeeper. Even some beekeeping best management practices fall into this category.

Feeding of sugar syrup not to prevent colony starvation, but to replace honey needed by the bees but taken from the hive to maximize profit is an example of the commodification of beekeeping. Becoming comfortable with allowing large numbers of bees to die each year knowing the survivors can be split and losses made up is another. Some rationalize such behavior by claiming that we are perpetuating the strongest survivor colonies. While this motivation appears sincere, American bee breeders have been working to produce mite resistant bees for decades, and yet a truly resistant commercially available bee remains elusive. Honey bee colonies end up being treated as a resource to be exploited for maximum economic potential.

In a similar vein is the practice of viewing nucleus colonies as a "half a hive" and regularly "harvesting" their brood, bees, queens, honey, etc., thereby cannibalizing the nucs for use in other colonies throughout the season, or when a colony needs re-queening. We create all kinds of rationales for killing the queen and replacing her: from poor brood pattern or colony performance, to disease issues, or simply blame the hive's instinctual drive to swarm. What is rarely acknowledged after re-queening is that the hive cavity is now occupied by a different colony.

Scientists base the definition of an individual honey bee colony on the unique set of DNA held by the queen that carries the genetic code for the super organism. As such, the queen defines the colony. Each queen-right colony whether full size, or nuc, is an individual in its own right. The old colony is killed when the original queen dies, and even though the bees inhabiting the hive are the same (for a few more weeks) the superorganism becomes a new one with different DNA.

Biodiversity

The honey bee like the rest of nature, is not a passive substrate to be endlessly appropriated, manipulated, and controlled. The importance of the interdependent and dynamic relationships between human beings and nature and the values we ascribe to nonhuman entities deserve serious reconsideration. Nature and natural entities have their own particular goods and services that they provide for the world. Such gifts are independent of human purposes, and deserve a certain kind of moral and spiritual respect.

What actually constitutes respect toward nonhuman entities like honey bees? The answer for each organism certainly has to do with supporting its ability to live, thrive, and reproduce at will. But how can we know what is good for a species or ecosystem? And additionally, how do we balance our divergent responsibilities toward multiple human and nonhuman entities? Nature and natural entities cannot speak for themselves.

A good place to start is to admit that interests other than human ones should be considered. Since we face huge uncertainties about how to respect and enhance opportunities for the rest of creation, collective exploration, experimentation, and deliberation is called for. The biophysical and ecological limits of the planet provide both a moral imperative for respecting nature. The present unstable condition of the biosphere symbolizes our troubled relationship with non-human organisms and, at the same time, is an indicator of how we might rebalance this relationship and achieve a renewed respect for the natural world which we rely on for our survival.

Unfortunately, a combination of denial, uncritical faith in technology, and the deadening effect of our comfortable modern lives results in a psychological weakening that prevents a decisive shift from the current age of plunder toward an age of respect.

Gaia Hypothesis

In the early 1970s, James Lovelock proposed the Gaia hypothesis that theorizes "that living **organisms** interact with their inorganic surroundings on Earth to form a synergistic and self-regulating, **complex system** that helps to maintain and perpetuate the conditions for **life** on the planet." (Wikipedia) Similar to a honey bee colony, the Earth itself may be a vast super-organism. This concept echoes the words of Aldo Leopold who wrote that it is possible "to regard the earth's parts – soil, mountains, rivers, atmosphere etc, – as organs or parts of organs of a coordinated whole, each part with its definite function . . . In such case we would have all the visible attributes of a living thing, which we do not realize to be such because it is too big, and its life processes too slow." Such perspectives resonate with the Christian view that each believer is a part of the body of Christ.

We keep destroying perfectly developed organisms that make up our world in order to make relatively basic and crude tools and knickknacks, while congratulating ourselves on our skill. That tree growing outside feeds and creates living soil, prevents soil run off, and provides carbohydrates so soil micro-organisms can thrive. That tree provides food and habitat for countless insects and animals, helps purify the water and air, while helping to stabilize the atmosphere and climate. If the tree is injured it has the capacity to heal itself. That tree also has that potential to live on indefinitely through the act of reproduction. All this without any human involvement whatsoever. The tree is more perfect than anything we humans have ever produced (with the exception of another human being), and yet we think nothing of cutting down this incredibly valuable and perfectly developed being to create things like tables, telephone poles and paper to write on. Even though they may not be as perfect and some things we create are very useful and even necessary, too often we create in a wasteful, inefficient and unnecessary way. We now understand that when such activity is carried on with little thought to the effects on the non-human organisms and ecosystems, instead focusing in on profits, growth and development, serious problems arise.

Researchers have discovered that not only can some colonies identify mites reproducing in sealed brood cells and remove them opening up cells in the brood area, but under certain conditions bees will also intentionally leave come cells empty in the brood nest in order to be able to more effectively in-cubate their developing young. This makes re-queening a colony based upon a "poor brood pattern" a questionable practice."

Humanity can be compared to astronauts on a spaceship traveling among the stars and we passengers keep tearing off parts of the spaceship and using them to manufacture simple tools while congratulating themselves on how industrious they are. One can imagine that this behavior will eventually compromise the ability of the spaceship to maintain its life support systems and trajectory dooming its occupants.

Today we find ourselves on spaceship Earth. In order for us to continue safely on our journey through the stars, it is time we start accepting a world governed by biophysical limits to growth, development and manipulation. Through our thoughts, words and actions, we collectively decide whether we will develop a different relationship with the natural world. A relationship in which bringing forth our spiritual and moral beliefs into our everyday lives (such as our beekeeping), will be crucial. BC

Ross Conrad is author of Natural Beekeeping and co-author of *The Land of Milk and Honey: A History of Beekeeping in Vermont.* Ross will be teaching an organic beekeeping for beginner's class the weekend of May 16-17 in Lincoln, VT. For information contact Visit **http://www.dancingbeegardens.com/events.html**

This Year Will Be Different

I really mean it – just like I meant it last year.

In my bee world, I'm looking for something. I've yet to find it.

"But I still haven't found
What I'm looking for
But I still haven't found
What I'm looking for…"[1]

As another Spring and Summer season starts, I nearly feel as though it is the beginning of a new year. Some of you have bees that are already brooded up. No matter what our calendar predicts, our bees are already on the job – with or without us. My Spring season, as I write, is just starting. Every time a new season starts, I go through this procedure of making plans for the new bee season. This is the year. I feel it. This year, I will finally put together something that I have been looking for. I'm going to be sure that this year is different. Yeah, right.

I don't want to go all sappy on you, but after all these decades of working with bees, there is an ambience – maybe satisfaction or maybe a sense of safety – that finally comes to those established beekeepers who can look backwards as well as looking forward. I love that bee-related ability. The musty odor of old bee books. A well-used hive body with failing corners. The memory of old beekeepers wiring frames and themselves, making plans for some long past season that was to be "their season." None of this plastic stuff for them. It seemed that they practiced "Classic Beekeeping." An apicultural process to be coveted and revered.

Recently, every one of us were required to review our personal world as we experienced the novel threat posed by COVID-19. Unkept that it is, I found a familiarity and comfort in my scruffy bee yard; as if it were, my safe place. I reaffirmed how much my bees and beekeeping mean to me.

Old beekeeping postcards

For all my devotion to all things honey bee, I do not truly, aggressively collect bee stuff. I certainly have odds and ends, but I have never had both the funds or facility to truly collect and store bee-related artifacts. Even so, somewhere along the way, I have come to possess a few antique post cards that show bee related scenes.

On a picture postcard that I have, a young beekeeper in 1915, known to me only by the initials, "S.B.T." had his picture "struck" while sitting in his beeyard. He is holding a deep frame as he apparently sits on an upended deep hive body. The young man seems to have been confident in his bee management. He even mentions in his brief postcard comments, "This picture shows how afraid I am of getting stung." If I consider how feisty *Apis mellifera mellifera* (German Black Bees) are, he could have been taking a real chance on being "lit up" if he had not handled them with adroitness.

I enjoy forensically studying such old photos. Look at the complete absence of herbicidal chemicals. There are weeds and biotic growth everywhere. The nearness of nature just barely being kept at bay. The hive equipment appears to be homemade, but that would be difficult to determine. At that time, S.B.T. only had issues with American foulbrood – maybe some European foulbrood. I doubt he had a supply of improved queens. I would guess that he made splits and hived swarms.

Judging by the growth flush, in 1915, the season was well underway – even advanced. Yet, he had no tall colonies. He seems to have been in a colony increase phase. If his bees were making any honey, the colonies would need it for themselves to survive during the Wisconsin winter that was only a few months away.

What about robbing? That many colonies that close together would result in drifting and thieving. As the season passed into warm weather, I would doubt that he could whimsically hold that frame without protection.

I have noted in many old bee photos that the surrounding forest appeared to be abused. The woodland bit that shows seems to indicate that the surrounding forest had been recently cut or even cleared. Note the leaning tree behind the central building. It has the look of an abused tree that was recently near a logging operation. Not exactly woodlot management procedures for our time, but it was probably routine for S.B.T.[2]

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[1]Partial lyrics. "I still haven't found what I'm looking for."
Artist: U2; Album: The Joshua Tree; Released: 1987; Recorded: 1986; Producer(s): Daniel Lanois; Brian Eno

[2]If you care – S.B.T. addressed his card to his friend, Elmer Shaw in River Falls, WI. What are the chances? I did a web search and found an Elmer Shaw in River Falls attending the University of Wisconsin in 1915. He would have been a similar age to S.B.T. I actually have a photo of Mr. Shaw. These two young men would now probably be more than 120 years old. Could be coincidence or they could have been the friends described on the card.

S.B.T. (no name presented) with his bees in 1915.

An enlargement of S.B.T. from Wisconsin in 1915.

When looking at such old bee photos, is this the time and place where I should be searching for ambience, continuity, and consistency? Was this the good, ole timey place where there were no *Varroa* and no pesticides? Or is this the time and place in our beekeeping history where tin honey tanks were sealed with lead solder and 60# square metal cans were used for honey storage. Our protective clothing was marginal and our smokers unimproved and frustrating.

Nope. I still have not found for I am looking for

Maybe it's just the the search for beekeeping placidness and fulfillment that drives me. Keeping bees has never been static - not for S.B.T. or for J.Tew. Maybe Classic Beekeeping was always furtive and elusive. Stings have always hurt. Colonies have always died during Winter seasons. High swarms routinely got away. Poor queens have always been with us. Who knows? Maybe I am indeed a classic beekeeper – just decades and decades ahead of my time.

A visit to the Apivar manufacturing facility in Chaillac, France[3]

Last year, I had the unique opportunity to visit Veto-pharma facilities in Chaillac, France. This company manufactures Apivar, a *Varroa* control product that is sold worldwide. The company also designed and produces the *Varroa* easyCheck device that is popular in the U.S. The device simplifies the *Varroa* washing procedure. In all my years of beekeeping wanderings, this was my first (and only) opportunity visit to a company that produces a popular *Varroa* control product.

Though several people were involved, I was hosted by: Joanna Collin, Product Manager, Phil Craft (North American Technical Advisor) and Fredrick Proni, North American Area Manager, Veto-pharma, and Ludo DeFeraudy, Chief Operating Officer, Veto-pharma.

My observations were:

1. The staff was young, intelligent, confident, and committed to Apivar production.
2. Specifically, the staff I met were personable, likeable, and multilingual.
3. The facility was immaculate – even warehouse areas.
4. The commitment to quality control – at every step – was powerful and apparent.
5. Apivar label data was scrupulously accurate.
6. A consistent recurring theme was that beekeepers are getting exactly the product dose they think they are getting.

The video

The primary intent was to video the facility visit and post for public review. Part of the video production was live and occasionally presented some technical challenges. Nevertheless, the production is viewable, explains the production procedure, and shows pertinent parts of the facility at Chaillac. Questions and clarifications of the video or Apivar use can be directed to Phil Craft,

[3]I suppose a commitment to my openness and honesty is in order. Specifically, for the facility tour, my expenses were paid. Nothing more. International travel and travel to the Veto-pharma facility visitation amounted to two full days. The remainder of the trip was at my wife's and my expense. Presently, though I personally use Apivar and vaporized oxalic acid as my present varroa control plan, my comments here do not comprise a recommendation of Apivar or any other product.

Phil and Jim, a couple of beekeepers on a Parisian sidewalk cafe.

The Bee Pavillion at Luxembourg Gardens, Paris, France.

Veto-pharma Technical Representative for the U.S. at: **philcraftbeekeeping@windstream.net**

The video is located at:
https://youtu.be/S8NDlfo1J4Y

Luxembourg Gardens

Results from several previous reader surveys, indicate that reviews of tourist events are not high on your bee reading lists. I apologize, but I hope you will suffer through a couple of the major bee things my friend, Phil Craft, showed my wife and me.

My wife and I were 22 years old the last time we toured France, specifically Paris. That was 50 years ago. At that time, I had not experienced my passion for honey bees, so I missed all things bees. I did not make that mistake this time. Even though we visited many of the routine tourist attractions, Bees were on the top of my agenda. It was surprisingly easy to find bee-related locations.

I had not heard of the bee exhibit at Luxembourg Gardens. There have been bees and bee classes taught there since 1856. The bee gazebo and the antique-styled bee hives presented a sophisticated view of a long-term commitment to beekeeping. Iron fencing, a uniquely designed bee fountain, and posted French language warnings admonishing us to stay back. Since we could not read French, we got remarkably good views of the famous apiary and a couple of stings.

This bee exhibit is well known. There are numerous web pages. I randomly selected this one.

https://www.ipreferparis.net/2012/01/-bee-house-in-luxembourg-gardens.html

[4]**https://www.veto-pharma.com/varroa-control/61-126-varroa-easycheck.html#/41,contenance,unit**

Personally, I was struck by the long commitment to honey bees and to this specific apiary. I don't know of a one-hundred, sixty-four-year-old apiary in the U.S.

Roof top bees in Paris

My wife and I were only there for a few days. That's nothing in a city such as Paris. I admit, I was an inexperienced tourist in that great city. Having said that, it would appear that rooftop bees in Paris are frequent – maybe even common. Nearly everyone seemed to know of rooftop bees somewhere. Happily, rooftop bees are a thing in this country, too. I have visited rooftop bees in Denver and a few other places, so I could at least look sensible as I stood on the roof looking at bees flying from ten floors up.

Frequently, (with my limited experience, may I say "frequently"?) rooftop bees were sought out by some commercial businesses – not just hotels and restaurants that were pushing their rooftop honey. In some instances, new building blueprints included bee niches or bee rooms – not just rooftops.

As I searched the web, several hits came up where users asked, "Why are there so many bees in France?" That one I cannot answer, but I was reminded by our French hosts that Charles Dadant was a native Frenchman. He founded the Dadant Company in Hamilton, Illinois.

Beehives and the bee fountain at Luxembourg Gardens, Paris, France.

A breezy rooftop apiary that we visited that is about 10 floors high.

Personally, I was struck by the ease and acceptance of bees within the city of Paris – including rooftops but not excluding apiaries on the ground. As stated, I do not know the registration details, but I did not sense the restrictions that could possibly be encountered here. For instance, at the Luxembourg Gardens, people were strolling by and even sitting near the apiary. Surely, France must have the usual bee-terrified people, but I did not see any. One last time – I was only there briefly. Likely I was seeing and opining what I wanted to see and opine. I came back to Ohio, tired, bee-exuberated, and energized. It was a great 50th anniversary trip for my wife and me.

Do-it-yourself queens

I acknowledge a select group of beekeepers who go the extra distance in our craft. Those who produce queen cells and queens for their personal use are a unique subgroup of beekeepers. Yes, it does take coordination and commitment, but it also produces suspense and enjoyment. After transferring the larva, waiting for a couple of days and then checking the results, adds some zing to otherwise routine beekeeping management procedures. It's a surge of beekeeping adrenalin when some of those transferred larvae have been accepted by nurse workers.

An interesting aspect of this procedure is that the accepted cells are not required to be beautiful. You and your bees did this. In this situation, any cell can be a good cell. The primary expense has been your time and effort. I don't think any authority has ever clearly shown that a good queen cannot come from a scruffy mature queen cell.

So, for you beekeepers who have trained yourself to produce queens – great job! Great job. And thanks for letting me know that you gave it a shot.

Home grown queen cells from John H.'s queen yard. Nicely done.

As always

As always, thank you for reading. I'm humbled and appreciative that you have spent some of your valuable time in this way. I'm working on next month already.

Sincerely, Jim BC

Dr. James E. Tew, Emeritus Faculty, Entomology, The Ohio State University and One Tew Bee, LLC. ***tewbee2@gmail.com; http://www.onetew.com***

A video chat
https://youtu.be/ieO5les-lIg

NMR Honey Testing Policy Adopted at the 2020 National Farmers Union Convention

The National Farmers Union (NFU) 118th Anniversary Convention concluded in early March following the adoption of the organization's policy book and special orders of business. More than 500 family farmers and ranchers convened in Savannah, Georgia, to set policy positions and priorities that support American farm and ranch families and strengthen rural communities.

Delegates to the convention adopted the NFU Policy Book and six special orders of business that will guide the organization's government affairs priorities over the course of the next year, especially as they relate to the tough economic circumstances and sustainability issues facing family farmers. Before the policy review began, they elected Rob Larew to succeed Roger Johnson as the organization's president and reelected Patty Edelburg of Scandinavia, Wisconsin, to serve as NFU Vice President.

"The reason for Farmers Union's longstanding success – and the reason why I am so enthusiastic about leading this organization – is its grassroots structure," said newly elected Farmers Union President Larew. "Each year, our members set organizational directives and federal policy priorities in a democratic process, which ensures that the work we do in our national office is really in the best interest of the hard-working family farmers and ranchers feed, fuel, and clothe our nation."

A Utah farmer and beekeeper, proposed adoption of NMR (Nuclear Magnetic Resonance) honey testing under the "Health and Inspections Standards for Food and Fiber" section. The proposal which reads, "{We support} nuclear magnetic resonance testing on all imported products that are labeled as honey to ensure the purity of honey," was adopted unanimously.

While addressing his NFU co-delegates, the Utah beekeeper stated, "This is an quick and affordable test that protects the beekeeper and consumer through proving the adulteration of pure honey with sugar syrups and/or chemical additives, as well as country of origin."

NMR honey testing has been used for decades, however became newsworthy when the procedure was used to test honey entered into the Apimonida Montreal 2019 Honey Show. Forty five percent of the entries were pulled, citing NMR's detection of illicit sugars, antibiotic and pesticide residues, HMF, and country of origin discrepancies.

The Farmers Union Policy Book is a member-driven dynamic, working document that reflects the priorities of our country's agricultural producers. The policies adopted at the 2020 convention will determine the NFU's priorities for the coming year. Past policy positions approved by delegates have been adopted into farm bills and other pieces of important, impactful legislation.

Farmers Union members are welcome to suggest ideas for integrating NMR into the supply chain by contacting Sarah Red-Laird, or Bob Redmond, at **northwestfarmersunion@gmail.com**.

Full text of the adopted policy manual will be available soon at **www.nfu.org**.

About NFU

National Farmers Union has been working since 1902 to protect and enhance the economic well-being and quality of life for family farmers, ranchers and rural communities through advocating grassroots-driven policy positions adopted by its membership.

About NWFU

Northwest Farmers Union is a grassroots advocacy organization for family farmers, ranchers, and fishers in Idaho, Oregon and Washington.

submitted by
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Varroa Resistant Bees Get $1 Million In Norway

Erik **Osterlund**

Dr Melissa Oddie, a Canadian researcher, will continue her research for at least two years based on the *Varroa* resistant bees with Terje Reinertsen in central Norway. Her doctoral dissertation was based on research with these bees. The Norwegian authorities have allocated $ 1 million (NOK 8.5 million) for this research.

February 21-23 the commercial beekeepers in Sweden (Biodlingsforetagarna)had a conference in Sunne in western Sweden close to the Norwegian border at the newly built hotel Selma Spa. It was fully booked. Beekeepers from Sweden, Norway and some from Finland were listening to Terje and Melissa and many others, from the University of Agriculture in Sweden (SLU), from Belgium and Canada to mention a few. Sunne is the place where Selma Lagerlöf lived, a famous author, the first woman to get the Nobel Prize in literature.

Dr. Oddie discovered a salient trait in Terje Reinertsen's bees which expresses itself in that bees uncap pupae in which there are mites and recap them again without damaging the pupae. This apparently interferes with the mites' reproduction. The characteristic that is otherwise very much in focus today is called VSH (*Varroa* Sensitive Hygiene). Here, the bees remove pupae that are invaded by mites (mites that have offspring). VSH is not a prominent feature of the resistant Norwegian bees.

Visit in Norway

In the Fall of 2019, my wife Gunvi and I visited Anita and Terje Reinertsen. They don't have a lot of suitable agriculture land for growing crops in Norway so they use every little piece of land possible to grow food. Quite steep slopes had recently been harvested. Norway is no longer Sweden's little brother as it's been for many years. It's the big brother now, with oil and gas and *Varroa* resistant bees!

The *Varroa* resistant bees

Some years ago, researchers began to be interested in a population of *Varroa* resistant bees in Norway around Terje Reinertsen. The important thing is that you don't have to treat them at all against the *Varroa* mite, and they are therefore not treated. The mite population in a hive of Terje can vary during the season. His bees haven't been treated for about 25 years. It was about the time when the mite came to Norway. When I became aware of this, I wondered why we hadn't heard or read more about his bees during these many years.

Now there has been some exciting research reports from the works of Dr. Melissa Oddie and her coworkers.[1,2,3,4] Research on these bees was the basis for her doctoral dissertation. Since then, articles and reports of the bees of Terje Reinertsen have been published.

He has been focused on developing a stock of *Varroa* resistant bees since the mite began to create problems in Norway. And he has done that together with beekeepers in his vicinity. In April 2019, he was one of the speakers at a conference in southern Sweden on healthy bees that do not need to be treated against parasites and diseases, and how to get there. Melissa Oddie participated, together with several other speakers including Kirk Webster from Vermont. And now in February 2020 he and Melissa Oddie were speaking in Sunne.

***Varroa* in Norway**

In 1994, the *Varroa* mite had made its presence so well known among beekeepers in Norway that it was decided that bee colonies had to be treated against the mite. The central association took help from countries where they had had more experience of the mite. Among other things, it was recommended to use "Krämerplatten" that evaporates formic acid in the bee colony.[5]

Terje listened carefully to the advice and treated his bees in the recommended way in the Autumn of 1994. He lost 70% of his colonies in the Winter of 1994-95. Other

Dr. Melissa Oddie and Terje Reinertsen in Sweden.

Anita and Terje Reinertsen.

beekeepers also lost about the same amount of beehives. Several lost 100%. Spring treatment with formic acid was then mentioned as an additional alternative to save colonies that survived the Winter. Then fewer holes in the plastic around the formic acid soft board plate were used so that the evaporation speed would not be so high.[5] Terje applied this method to the survivors.

Decision not to treat

After analyzing the results of all the treatments, Terje and some other beekeepers concluded that if you were to loose so many bee colonies after treating, you could just as well not treat, because you didn't lose more colonies if you didn't treat.

At that time, little was known about the importance of the balance between all different types of microorganisms (bacteria, viruses, and other types of microbes) for the immune system. Such an ecological system of microorganisms in and on a living being is called a microbiome. For example, we humans have about 2 kg of microbes on and in us. Without them we die.

Microbiome and epigenetics

The microbiome[6] is now a hot topic in research, even among bees[7]. The microbiome will become unbalanced if chemicals in sufficient quantities affect the bees.[8] Defense against harmful microbes is weakened, for example against pathogenic viruses.

Another hot topic in research is epigenetics.[9] Changes in how genes in the DNA are used, in kind of a contrast (or rather complement) to how the composition of the genes in DNA are changed through breeding (natural or beekeepers).[10] Changes in the environment create changes in the DNA so that some genes are turned off and others turned on.

Purchase of never treated bee colonies

In 1995, Terje compensated for his colony losses by purchasing about 35 bee colonies. These came from an area where the *Varroa* hadn't yet arrived so these colonies had never been treated against *Varroa*. Some of these colonies were splits raising new queens of their own. The new colonies developed well and wintered successfully. These were more in number than those that survived *Varroa* and formic acid. In the Winter of 1995-1996 and onwards, the losses were again about normal, five to 10 %, despite the lack of *Varroa* treatment.

Because of the large losses of bees for many beekeepers in the winter of 1994-95, the reinvasion of mites was not a problem for Terje's bees. He also started at once with the simple breeding concept he has followed through the years since. He focused in various ways to identify the worst and the best bee colonies when it comes to keep down the mite population and being resistant to viruses.

Terje Reinertsen shows a split in September, grown in strength to be ready for Winter and well fed.

Breeding strategy

Today Terje Reinertsen doesn't estimate the varroa level in his colonies. He doesn't care about *Varroa* mites anymore. Others have made estimates. And it seems the *Varroa* levels mainly is 1-3%, with some exceptions at a higher level. The interesting thing is that no signs of virus damage could be seen.

His main traits for selection are

1 – Good temper

2 – High egglaying capacity

Every year he replaces the queens in the worst 30 % of his hives. They are today about 250. Once they were 350. He is retiring age, but he's working all days. If not with bees, he's hunting or fishing.

Among the best 10% of his hives he checks the very best. Good hives are of course also giving a good crop. He breeds queens from several of these. He does not regularly replace queens who have grown old. Only when the colonies are bad, whether the queens are young or old. Colonies in the mid range (and the best) are allowed to replace their queens themselves. Young queens are mostly mated in the center of an area where many good colonies of somewhat different heritage are kept. This type of mating system you can call population mating, actually the old type of line breeding where all bees in an area could be called a line. I remember Steve Taber explained what a line really was at the Bee-85 conference in Sweden many years ago. This could be likened with a kind of closed population breeding. In this way, high vitality, good harvest and genetic variation is maintained.

Terje wasn't sure it was sufficent with the buckfast variety of bees he had initially, so he tried other buckfast types and some other varieties of bees. Today, Terje's bees could simply be called Terje bees.

Comb foundation

Terje got smaller cell size wax foundation from Hans-Otto Johnsen,

a beekeeper colleague. Shortly after the year of 2000 he reduced the cell size to 5.1 mm, then to 4.9 mm. Now he is in the process of setting up his own, almost commercial equipment for manufacturing wax foundation.

Establishment of another *Varroa* resistant strain

Ten years ago he acquired 14 Norwegian carniolan queens mated in an area with only carniolan bees in Norway. These queens were introduced to splits from Terje bees. The splits were placed with a beekeeper about 60 km from Terje, isolated from other bees. Today, the 14 colonies have grown into a population of about 100 colonies. All new queens (and splits) come from the group and mated in its area. These colonies have never been treated against *Varroa*. There have always been low Winter losses in this group, which has become kind of a resistant stock. Maybe you can do it this way if you want to produce a *Varroa* resistant bee stock of a bee variety other than Terje bees.

Terje queens in a different environment

A number of years ago, Terje queens were purchased by some universities in Europe. From Switzerland I have heard results how they managed. They were introduced to colonies of local bees managed in their traditional way. After the introduction of Terje queens, these colonies were not treated against *Varroa*, and they managed well.

Active in the bee association

Terje has always helped beekeeper colleagues and beginners. He has held beginner courses for many years. And he has helped them with splits and new colonies. He has been the chairman of the local association for 20 years and vice president of the district association for many years. Once a month from April to September, the local association has a club meeting in his garden. There are gathered in average 30-35 people.

The Terje stock

There are now 1500-2000 Terje bee colonies in Norway. There are about 100 beekeepers who have these bees and they do not treat against *Varroa*. Most of these have their bees in the area where Terje lives, 20 minutes north of Oslo, the capital. One of these beekeepers, has eight colonies and lives on the outskirts of the Terje area. There are many bee colonies other than Terje bees around him. The closest is 200 meters (yards) away.

A small mini mating nuc with three mini frames. When the queen is egg laying, Terje harvests it and introduces it in a colony that needs a new queen.

Tim has done a small measurement study on the daily natural fall of mites during a season. It varies during the season and although from some colonies it can be quite big in May, it is low at the end of the season. BC

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				HIVE NO 1		HIVE NO 2	
Year	From Date	To Date	Days	Mites Per Day		Mites Per Day	
2018	Aug 30	Sep 10	11	24	2	170	15
	Sep 15	Sep 25	10				
	Oct 5	Oct 17	11	83	8	70	6
2019	May 1	May 8	7	23	3	193	28
	May 23	June 4	12	20	2	184	15
	June 10	June 20	10	29	3	271	27
	Aug 29	Sep 8	10	2	0	26	3

Valhalla Organics

CERTIFIED NATURALLY GROWN

Grassroots Goes A Long Way

Suzannah **Schneider**

Since 2002, Certified Naturally Grown has offered certification for farmers using natural methods to grow food for their local communities. In 2010, CNG launched an Apiary certification as a direct response to feedback from beekeepers concerned about colony collapse disorder.

Today, there are nearly 800 producers across the United States and Canada who hold CNG certification, with about 50 beekeepers who participate in CNG's Apiary certification.

Sensible Standards

Because honey bees can cover a geographic range of more than 8,000 acres, the concept of organic honey can seem like an oxymoron: it's impossible to control where honey bees fly, and what they encounter along their way.

Acknowledging this fact, Certified Naturally Grown's Apiary certification standards focus on the health of the honey bees and the sustainability of beekeeping, with a secondary focus on the agricultural products of the hive. Included in these holistic standards are natural methods of *Varroa* Mite control, minimal colony relocation, and beekeeper safety.

Christina Neumann of Apoidea Apiary in Pennsylvania has chosen CNG as the framework for her 75-90 hives to make her Good Food Award winning honeys. She elaborates on Certified Naturally Grown standards, in her own words: "The CNG logo symbolizes the factors I consider to be most important to my apiary management: no antibiotics, no high fructose corn syrup feed, no synthetic treatments, humane bee care, and healthy bee landscapes."

And, as the most discerning beekeepers know, "Not using any harsh chemicals in or around our hives is more work, but we know it's worth it," says Dave Davenport of Good Job Bees! Honey House in Hawaii. "People tell us they can taste the Aloha in our honey."

Rosalind Severt of Canebrake Apiary in South Carolina emphasizes, "Bees work way too hard for us to contaminate their product with additives that are not good for them, or us!"

The standards for holistic hive health were developed with the expertise of an Apiary Advisory Council that includes Jennifer Berry of the University of Georgia Bee

Valhalla Organics

Dayempur Farm.

Lab, Pam Fisher of the Beekeepers Guild of Southeast Virginia, Master Beekeeper Dr. Buddy Marterre, and Master Beekeeper Jon Zawislak of University of Arkansas Cooperative Extension Service.

CNG offers two publications on natural beekeeping: *Handbook for Natural Beekeeping*, now in its third edition, and *Help the Honey Speak: A Marketing Guide for Beekeepers with Naturally Managed Apiaries*. Both are available for free online at CNGfarming.org/handbook_info, and can be purchased as printed booklets for a small charge.

Good Job Bees

The Power of Peer-Review

CNG's annual peer-review inspection is a requirement for certification. Its primary goal is to verify high standards, but it also boosts knowledge sharing among beekeepers, promotes transparency, and builds trust.

In addition, CNG's model minimizes paperwork and keeps certification dues affordable.

Ruby Reid of Valhalla Organics is the first Certified Naturally Grown honey producer in Oregon. Like many CNG beekeepers, she finds value in the inspection experience. She says, "Our peer-to-peer inspections have resulted in new friendships and an opportunity to learn from farmers and beekeepers who truly understand the challenges of growing your crop in your area."

Bountiful Marketing Perks

Many beekeepers choose CNG as a way to spark curiosity among customers. David Davenport says, "The CNG logo catches customers' eyes, and they often want to know more about it. As we redesign our labels, we are paying extra attention to where the CNG logo is placed."

In fact, when we asked Talib-Mark Fletter of Dayempur Farm in Illinois about his favorite aspect of the CNG certification, he asked, "Would it be absurd to say . . . the cute labels?!"

Once applicants complete the certification process, they're eligible to use the CNG logo on product labels and elsewhere. Members can also purchase marketing materials such as logo stickers, laminated certificates, and signs.

Plus, Certified Naturally Grown offers affordable custom design services for banners, sticker labels, business cards, and more so farmers and beekeepers can benefit from the cachet of a full suite of customized marketing supplies.

Finally, all CNG producers earn a profile on the CNG website at CNGfarming.org. This profile can serve as a landing page for customers, and in many cases, it functions as beekeepers' main web presence.

Grassroots Goes A Long Way

Many beekeepers find that USDA organic certification just doesn't make sense for their operation, for one reason or another. As it turns out, a grassroots alternative can be just as powerful.

"People know it's a rigorous certification and you've done your due diligence," says Peter O'Donnell of O'Donnell Apiaries in Pennsylvania. "You're working hard to provide the best care of the bees, decreasing the risk of chemical exposure. People recognize that it's worth all of the extras that a person goes through."

"Certified Naturally Grown means high recognition, high standards, high expectations," says Peter.

Are you ready to pursue a holistic certification and grow your community? Please join us!

You can learn more, get certified, and register for updates at **CNGfarming.org/apiary** BC

For more information: ***CNGfarming.org;*** *Instagram:* ***@CNGfarming;*** ***Facebook.com/CNGfarming***

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The Land Of Flowers

Connie **Krochmal**

Florida is blessed with a good number of Winter blooming plants. However, due to space limitations only a certain number is discussed below.

Let's begin with some vines. **Coral vine** (*Antigonon leptopus)* was mentioned in an earlier article on late blooming bee plants in California. In Florida, this can bloom year-round and provide a dark colored honey. Very appealing to bees, the blossoms also supply pollen.

Carolina jasmine or yellow jessamine (*Gelsemium sempervirens)* is a twining/trailing evergreen vine that appears to be a mixed blessing for beekeepers. Inhabiting woods, thickets, sandy soils, and roadsides, it is native to the Southeast from Virginia southward to Florida and westward into Arkansas and Texas.

The scented, very showy yellow blossoms form clusters in the leaf axils. In Florida, these flowers emerge during February and March. A source of nectar, they can bring surplus honey. However, some beekeepers have reported that their bees have suffered harm and in some cases died from exposure to the blooms.

Although it hasn't been proven that the honey is indeed harmful, some sources report that the uncapped honey is toxic. What is definitely known is that the various plant parts, including the flowers, contain poisonous alkaloids with the effect of the poison accumulating in victims over time.

Red maple (*Acer rubrum)* is sometimes called swamp maple. The tree is native to the East and Central U.S. Hardy to zone three, it reaches 40 to 70 feet in height.

The very adaptable plant withstands ozone and poorly drained or wet sites. Generally free of pests, this is suited to most soil types but prefers an acid pH. Full sun to partial shade is best. Red maple limbs can break during storms.

This tree is one of the very first sources of nectar and pollen with the blossoms emerging in January and February in Florida. Elsewhere, this is generally in March and April. Despite the common name, this tree can sometimes bear yellow blossoms.

In its native range, red maple is an important nectar source. All maples are valuable for brood rearing as they bring generous quantities of pollen and nectar. These trees can provide a surplus honey crop of fifty pounds or so per colony.

This is usually white or light amber to amber, possibly with a pinkish or green tinge. Crystallizing very gradually, it can develop coarse or fine granules. The honey has a mild aroma and a distinctive taste that improves as it ages.

Carolina Jasmine

Carolina willow (*Salix caroliniana)* is also known as coastal plain willow, Ward's willow, and swamp willow. The plant is found in marshy areas, stream and river banks, shores, low woods, and other wet spots. Most common in the coastal plain, it is native in the Midwest and in the East from Pennsylvania to Florida westward to Texas, Oklahoma, Kansas, Missouri, Arkansas, and Iowa.

This resembles black willow. The small slender tree or much branched shrub can be over 30 feet tall. It features an open broad crown and thick spreading branches.

The gray bark is much checkered. Yellowish when young, the branchlets later become purplish or red. These are usually hairy.

The alternate, deciduous, papery, lance-like to lance-ovate, firm leaves are green above and whitish with hairs beneath. These are 2½ to 5½ inches long. Conspicuous, wing-like stipules are found at the base of the leaves.

In Florida, the catkins open during February and March with this occurring elsewhere in March and April. The male and female catkins open near the ends of the branchlets. The males have four to eight stamens. The female catkins are open and lax.

All willows are early sources of nectar and pollen. Both the male and female catkins yield nectar, but pollen only comes from the males. The bees also collect honeydew from these species.

When enough plants are available, a surplus crop of honey can result. Willows are valuable to bees because they bloom early and aid in brood rearing. The plants can result in up to ninety pounds or more of honey per colony.

Thin bodied with a light aroma, it granulates to develop a fine texture. The flavor is mostly delicate and distinctive, but can sometimes be stronger. The color varies widely from white and various shades of amber to yellow.

Willows prefer wet or moist soils and full sun for at least half of the day. They're easily propagated by cutting a stem and rooting it in water. Avoid planting willows near water or sewer lines.

Citrus is an important bee plant in Florida with flowering occurring from February to April, depending on the type being grown. These honey plants were covered in some detail in an earlier article on Southwestern Winter blooming plants.

Rosemary (*Rosmarinus officinalis)* tends to bloom in the Winter in warm climates. Thriving in Florida, this plant withstands heat, humidity, and salt. An excellent bee shrub, this yields pollen and over a hundred pounds of rich tasting water white to white honey per colony.

Ti-ti (*Cyrilla racemiflora)* is a native shrub or small

Citrus

tree that reaches 25 feet in height. The thick, leathery, alternate leaves are shiny. The small white blooms appear in February in Florida on six-inch-long pendulous spikes.

The plant occurs from Virginia throughout the South westward to Texas in sandy swamps and in moist, peat-rich soil.

Some bee experts believe that this plant causes 'purple brood,' which affects only the brood and not the adult bees. An article in the December 1935 edition of *Gleanings* described the effect of 'purple brood' on colonies. This indicated that the problem was restricted to those areas where ti-ti was in bloom with the hives recovering after flowering ceases.

Other Winter flowering bee plants in Florida include blueberries (pollen, honey), crimson clover (delicious honey), cherry (pollen, sometimes honey), hawthorn (pollen, honey, honeydew), plums (pollen, honey), yellow sweet clover (superior honey plant), viburnums (honey), beauty berry (nectar), coreopsis (pollen, honey), and mist flower (pollen, honey).

Avocado (*Persea americana)*

While the plants above have appeared in previous articles, the avocado is new. In Florida, this generally blooms from February to April, depending on the variety. Elsewhere, this can be from Winter into Summer.

While the main production in America occurs in California, this is also grown in Hawaii, Florida, Puerto Rico, and along the Gulf states to Texas.

Avocado

Rosemary

An avocado grown as a dooryard tree can live for a century. The average for commercial trees is thirty-five to fifty years. The tree is related to a native honey plant, red bay (*Persea borbonia)*

Description of Avocado

Native to Central America and Mexico, avocado is typically a beautiful evergreen tree with a large spreading canopy, but it can also be an upright shrub. Providing heavy shade, the plant can reach 20 to 60 feet in height with a 25 to 35 foot spread. Dwarf types are only eight to 10 feet tall.

The large, lush, leathery, deep green leaves are heavily veined. The new foliage is reddish-copper to bronze. This is four to ten inches long and up to three inches wide.

The leaves of the Mexican avocado varieties have a spicy aroma. Leaf drop can occur year-round on avocado plants, but this tends to be more pronounced during windy periods.

According to S.E. McGregor, author of "Insect Pollination of Cultivated Crop Plants," avocado blooms are "structurally bisexual and functionally unisexual." The very floriferous plant is covered with small blooms, ½ by ½ inch, borne in terminal clusters. Blossoms can be yellow-green, green or cream. These feature three green petals and three sepals.

Flowering can last for six months. The individual flowers are only open for two days. Avocado blossoms are classified as type A or type B. The former open in the morning of the first day, and during the afternoon the second day.

On the other hand, type B flowers emerge in the afternoon on Day 1 and the morning of Day 2. Each flower secretes nectar both days but from a different set of nectaries.

Avocado fruits can vary greatly by length, overall size, shape, color, and weight, according to the variety. Avocadoes ripen from Summer into Winter, depending on the variety. Harvest typically ranges from eight to fourteen months from the time of bloom.

Growing Avocado

Avocadoes thrive in zones 10 and 11. Hardiness differs according to the type being grown. West Indian avocadoes, the least hardy type (25°F.) is best suited to Hawaii, Florida, and the Caribbean.

For the Southeast and California, both the Guatemalan and Mexican races and hybrids are recommended.

Guatemalan avocadoes are hardy to 21-25°F. The Mexican type is the hardiest – to 18°F.

Avocado trees must have high humidity and good wind protection. A rich, deep, quick draining soil is best. Poorly drained, wet, or salty sites are unsuitable.

These are propagated by seeds, budding, and grafting. The latter methods promote earlier fruit crops – bearing in two to three years. Seedlings can take eight to 12 years. Avocado plants are available from Logee's and One Green World.

Spacing depends on the plant's ultimate size. Standard sized avocado trees are usually planted twenty to forty feet apart. A single plant can have more than one variety budded or grafted onto a single rootstock.

When planting an avocado, place the crown so that it will be slightly higher in the soil than it was in the pot. Avocado plants require little training or pruning. Normally, pruning is needed only if a branch dies.

Generally, the plants require less care than temperate fruit plants. Fertilize lightly in California. Elsewhere, use a small amount of complete fertilizer from early Spring into late Summer. Iron chlorosis sometimes develops, mostly in California. If this occurs, apply iron chelate.

These plants benefit from mulch. Water when needed until the avocado is established. Then, add enough water to keep the soil moist in the upper two feet of the soil on established plants.

Usually, avocadoes in California experience fewer pest and disease issues than elsewhere with the exception being root rot. Rot resistant varieties are recommended. Scab resistant varieties are good choices for Florida and the Southeast.

In the Southeast, fungal diseases can occur, mostly powdery mildew, scab, and anthracnose. In California, snails can be a problem, while in Florida scales can damage the plants. Recently, avocado lace bugs were found on avocado plants in Hawaii.

Bee Value and Pollination of Avocado

Avocado blossoms are a rich source of pollen and nectar. The sticky, heavy pollen is released during the second opening of the flowers.

Plants receiving adequate soil moisture are more floriferous. Climate, weather, and growing conditions can affect the nectar flow.

Avocado blossom.

Bees are strongly attracted to avocado blossoms. However, they reportedly don't work avocado blossoms nearly as vigorously as they do those of temperate tree fruits. Although a surplus honey crop is possible, most beekeepers use avocado plants to build up their colonies.

The thick, dark to profound dark amber honey is heavy bodied. Reluctant to granulate, it features a strong aroma and a robust flavor. When bees consistently work avocado blossoms, there can be a large crop of honey.

Bee gardeners will harvest larger fruit crops if cross pollination is provided despite the fact that some gardening books describe the plants as self fruitful. McGregor recommends two to three colonies per acre. Interplanting different varieties in the grove promotes better pollination.

Although other pollinators can play a minor role in avocado pollination. McGregor concludes that "only honey bees are sufficiently abundant on the blossoms at all times to set satisfactory crops of fruits." This is assuming that neither mustard nor citrus are growing nearby for bees will likely abandon the avocado blooms to work the other flowers.

In Florida, bee gardeners can expect one to two bushels of avocadoes per plant, while in California, a 10-year-old plant can bear two or three bushels. Avocados are essentially alternate bearing plants, which means they bear a heavy fruit crop one year followed by a lighter crop the following year. BC

Connie Krochmal knows all about plants and bees and lives in Kentucky.

Friend Or Foe

Wasps & Hornets

The recent discovery of one of the Asian hornets, *Vespa mandarinia*, in Washington State and neighboring British Columbia, has increased awareness of stinging insects that cause problems. This particular hornet does have an appetite for honey bees, thus making it an unwanted critter in the vicinity of honey bee hives. In Western Europe and now extending into the United Kingdom a problem is a second, different, Asian hornet, *Vespa velutina*, that also prefers honey bees as a large part of its diet and that of the hornets' developing larvae. There is no doubt that these two are a distinct problem for honey bees and their beekeepers, not only outside their native range, but also inside it. These two are true hornets.

Beekeepers realize that their own honey bees can sting but have learned how to avoid those stings. The honey bees bring praises for their pollination work and honey production. However honey bees are just one of an assortment of stinging insects that are actually extremely valuable. Unfortunately these stinging insects are misunderstood, unappreciated and frequently annihilated for one reason only – they sting. However, if you ever have to cope with either (or both) *mandarinia* or *velutina* I can recommend a control used in a number of countries where these are native – old, used cricket bats. They have flat surfaces and will deliver a deadly blow.

Ann **Harman**

This is the time of year when gardens, vegetable and flower, are being planted across the country. Some of the warmer areas have gardens well under way. The garden shops have been raided for seeds, young plants, fertilizers, garden hoses and in many cases for "bug sprays" to keep the garden pests under control. Beekeepers may prefer to use controls that would not be lethal to their pollinating honey bees. However, outside of the gardens, insect control methods might be used. Quite a number of stinging insects are happy to be of service in insect control. These insects need to be appreciated and conserved.

It may seem strange to someone who has encountered yellowjackets and their stings that these yellowjackets are a very desirable garden helper. Unfortunately the majority of yellowjackets, in the genus *Vespula*, nest in the ground, in old rodent cavities. Only a small hole in the ground is the only entry/exit to the underground nest. All is well until someone mows or walks over the hole. Then, rightfully so, the yellowjackets become defensive – defending their home with developing young and food supply. A normal reaction to disturbance. Our honey bees do exactly the same but beekeepers have learned how to cope.

The diet for the developing yellowjacket larvae is protein. Other wasps and hornets also need to feed protein to developing larvae. Our honey bees collect pollen, laden with proteins. The nurse honey bees use pollen to manufacture brood food and also mix with other substances for brood food. The yellowjacket's source of protein is other insects, adult or larval stage, that are actually made of an assortment of proteins. The adult yellowjackets will forage – search for sources – and your gardens may be excellent places to search.

Mine was. Many years ago I was raising pole beans in my vegetable garden. One morning when I was inspecting the bean plants I realized I had the larvae and a few adults of bean beetles, an unwanted pest. As I stood there, a yellowjacket flew in, grabbed a larva and flew away. In about two or so minutes the yellowjacket returned then flew off again with her prey. Her nest must have been close since the flight time was short. Or perhaps her nestmates were also collecting the bean beetle larvae. My beans were being cared for by yellowjackets. I needed to do nothing.

A yellowjacket out foraging for larval food is no more dangerous than a honey bee out foraging for pollen and nectar. Yes, you could get stung by either one if you get in their way and have a collision. So step aside and let the yellowjackets and honey bees get on with their work. If you do find the entrance hole to a yellowjacket nest, mark it with sticks or little flags to avoid your disturbing them and their defensive actions. They and their nest will be gone by late Summer and definitely by frost. In warm climates an imported yellowjacket, *Vespula germanica*, can continue to live through warm Winters especially in sheltered places. *V. germanica* is the yellowjacket most frequently found living in walls of houses and other structures.

Yellowjackets especially, as well as other kinds of wasps, can become quite a problem as the Summer is ending and the workers lives are ending. There may be no more larvae to feed so the unemployed adults are out searching for food, energy for themselves. That "energy food" can be rotting fruit in an orchard or a sweet drink in a can or glass. At this time of year the helpful yellowjackets, wasps and hornet can indeed become pests themselves. The workers will be dying but the mated queens are searching for protected locations where they will sleep through the winter. New nests will be established in Spring.

There are two yellowjackets that make large paper-encased nests in trees or bushes. One, with typical yellow and black stripes, is *Dolichovespula arenaria.* The other one, misnamed "bald-faced hornet" (or white-faced hornet), is not a hornet at all, but is a yellowjacket, *Dolichovespula maculata,* that preys on many kinds of flies. At the end of the season the gray paper nests can be seen in trees and are frequently collected for display. Unfortunately they are usually called "hornet nests." But what is more unfortunate they are sometimes shown as honey bee hives in cartoons or other drawings.

Back in the middle of the 1800s the one true hornet in the U.S., *Vespa crabro,* was brought into New York. Its native area is Europe. It constructs a paper nest in a cavity such as a hollow tree. It preys on a number of different insects. It does have one peculiar habit of hovering around porch lights at night. They will not sting if left undisturbed but can capture prey—other insects flying around the light. Just try not to have a collision. The hornets will return home when the light is turned off.

The paper wasps, *Polistes spp.* that build small paper combs under eaves of houses and barns keep various caterpillars under control. The small open combs usually disappear during the winter winds and rain, but the wasp's work has been done during the warm season. The *Polistes* wasps can be quite defensive and will readily sting if disturbed. Fortunately the small combs in the eaves are usually not near human traffic.

My barn is kept clean of too many spider webs by a few of very hard-working, but very docile wasps, the Pipe Organ Mud Dauber wasps, *Trypoxylon politom.* Some spiders and their webs are useful in keeping flies under control. But a barn can have too many spider webs. So somehow a balance had been achieved with flies, spiders and wasps. When the female Mud Dauber is hard-at-work bringing in mud to construct her "organ pipes" she flies quietly around people, horses, dogs and cats. It's hard work bringing in the mud and shaping the tubes, but the "organ pipes" are impressive. Fresh mud "organ pipes" are made each year by the new female. She was mated last autumn and found a sheltered place to overwinter.

Not all wasps construct nests to live in colonies. There are many solitary wasps that are working very hard to keep harmful insects under control. Some of these solitary wasps are so small that we never notice them or perhaps think they are some sort of tiny gnat just flying along.

Those people in the Eastern half of the U.S., and also along the coastal part of California, have had to cope with the Asia brown marmorated stink bug. This pest arrived in the eastern U.S. and proceeded to damage ripening fruit and vegetables, not only in small gardens but also in commercial farms. Furthermore it became a house pest, invading homes by the hundreds or thousands to winter over in a protected place. In its native eastern countries of China and Japan, a small solitary wasp kept this pest under control. Today, one of our native small solitary wasps has discovered this stink bug and is now working hard to keep it controlled.

Those gardeners who raise tomatoes are always happy to see a tomato hornworm decorated with numerous upright white cocoons. The tomato hornworm is actually the larval or caterpillar stage of a Sphinx Moth. It is related to the tobacco hornworm. Now you know what these caterpillars like for food! Both can be very destructive to their host plants. Those upright, white cocoons are the work of a small parasitic wasp, one of the Braconid family of wasps. These are all very small, much less than an inch, and are only interested in having the caterpillars provide food for the developing wasp larvae. When you actually see the white cocoons, the caterpillar is basically dead. The wasp larvae, many of them, have consumed the entire inside of the caterpillar. Wasps at their best! Insect control. Never destroy those white cocoons because the adult wasps will be emerging to continue their pest control.

Now we must consider another group of insects that are hard at work for us but unfortunately are killed because of their appearance. The mimics! You can have bumble bee mimics, wasp mimics, yellowjacket mimics and bee mimics. They cannot sting for a very good reason – they are all different types of **flies**! Flies do not have the sting apparatus that bees and wasps have. Flies have only one pair of wings; bees, wasps and hornets have two pair. Flies usually have large eyes and short antennae; bees and wasps have smaller eyes and longer antennae. However, you may not want to inspect such insects too closely or for too long a time. (They are fascinating to watch. But they do have work to do.) One trait can be more easily noticed – many of them hover. Just flying in one place, frequently over flowers. Bees and wasps do not hover.

The adults do eat nectar and pollen from flowers but the larvae consume aphids. So these mimics can be considered quite valuable for keeping pests under control. Many of the mimics do not have hairy bodies but the bumble bee and bee mimics are quite fuzzy. The mimics are considered pollinators but the extent of their pollination has not been studied in depth.

During your late Spring and definitely during the Summer months visit your vegetable garden and any flowers whether in your garden or just growing wild. See if you can find any of the yellowjackets, wasps and mimics. Of course you may also find some of the solitary bees. Yes, you can wear your bee veil if you wish. Remember when these insects are at work they are not interested in you but collisions can occur. You may see quite an assortment of solitary wasps and mimics on flowers, sipping some nectar – their energy drink. Always keep in mind that although some of these insects can sting they all are keeping the gardens and meadows thriving. BC

A Closer Look

Basic Honey Bee Biology

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274 pages, color

Clarence H. Collison

PROPOLIS

Rowan **Brown**

You may know propolis mostly as a nuisance. It cements boxes together and leaves dark tacky stains on bee suits. It runs down the side of your hive like molasses in the Summer and shatters like ice in the Winter. It may gum up tools and ruin the neat aesthetic of the combs, but it is absolutely essential for a healthy hive.

The word propolis, coined by Aristotle, is the same as the Greek word for "suburb" or "extended city." Supposedly this is because the Greeks recognized it as an essential material for hive growth and construction and even harvested it for themselves to use in medicine and religious ceremonies. They weren't the only ancient societies to recognize its value. The Assyrians used it to treat cancer and the Egyptians used it to embalm their pharaohs.

What is Propolis?

Propolis is essentially hive glue. Its main ingredient is plant resin. Though the most famous examples of resin are the sticky saps from conifers, the substance is actually produced by many different types of trees, shrubs, and even flowers. Bees collect these resins while they are warm and liquified, then grind them up and mix them with enzymes in their stomachs. Finally, they extrude the mixture out onto any imperfections in the hive. Propolis is most often located around the openings and cracks of the boxes where it acts as a sealant, regulating the size and location of exits and keeping the temperature stable. It can also be used to neutralize threats or just tidy up the bee's living quarters. Say an outsider, like a small lizard, makes its way into the hive and dies. Instead of letting the invader putrefy, the bees mummify the remains with propolis so that the hive remains sanitary and protected.

In the past, beekeepers tried to remove propolis from hives because they thought it led to a decrease in the amount of honey produced. Groups attempted to breed species that didn't produce propolis at all, but that led to hives that were far more susceptible to parasites and pathogens. Now, beekeepers understand that more propolis leads to a healthier hive and are finding new ways to make their hives produce more propolis, either to bolster the health of the hive or the health of their human caretakers.

Propolis and Human Health

Propolis's antiseptic and antioxidant characteristics make it perfect for use as a natural treatment for minor cuts and bruises. It has been shown to reduce swelling and prevent the spread of infections. Propolis can be applied as an ointment to heal everything from sunburns to canker sores, or it can be ingested to help with stomach and intestinal issues. The most common propolis product is a throat spray. Supposedly, this is an immunity booster that can be administered at times of sickness or stress. The argument is that if it can protect the health of the hive, it may be able to protect your health as well.

Some newer research indicates that propolis may have anti-carcinogenic properties that help to treat specific forms of cancer. In a laboratory setting, compounds in propolis were shown to slow the growth of cancerous cells by up to sixty percent. Propolis kills the cancer by interfering with its reproductive abilities. This allows propolis to be toxic to the harmful cells without hurting anything else in the body. So far, it has been tested against cancers of the nose, throat, and colon.

Unregulated products containing propolis should be used with caution as they can contain contamination from pesticides and may result in an allergic reaction if used consistently over long periods of time.

Harvesting Your Own Propolis

If you'd like your hive to produce more propolis either for the health of the bees or for your own use, the harvesting process is fairly simple. Bees naturally try to fix any imperfections with propolis, so all you need to do is add some artificial blemishes to your boxes and the bees will do the rest. Some easy ways to do this include adding grooves to the inside of the boxes with a chisel or scraping up the wood superficially with a wire brush. If you'd like to harvest the propolis for yourself or keep it more contained within the hive, there are propolis traps available for purchase. These traps are essentially flexible screens made of wire mesh or plastic. The bustling bees make quick work of sealing up all of the individual openings leaving you with a sheet of pure propolis. Removing the product is typically quite easy, all you have to do is take advantage of its temperature sensitivity. Simply place the screen in a freezer overnight and when you take it out, the propolis should flake off easily. BC

10 RULES Communicating On Pesticides

David **Zaruk**

One of the biggest challenges for any risk communications professional today is to deliver positive messages on pesticides. Like any communications process, trust is essential, but in a chemophobic world, trust in chemicals is a rare commodity. Pesticides found on the food the public consumes creates a vulnerability (fear) that cannot easily be overcome. People have to be convinced that their food is safe, any pesticide residues are of no risk and are there for a reason. In this case, we are asking a mother feeding her child to trust the chemical industry – a challenge indeed.

It wouldn't be half as hard were it not for the opportunists seeking to take advantage of a vulnerable population worried about their health and the environment. With social media networks making it feel like cancer is found in every spoonful, frightened consumers reach for their wallets and the dream of a chemical-free world. The narrative driven by the chemophobic activist community is that pesticides are dangerous to consumers, unnecessary and destroying the environment. They have left most of us thinking there must be some evil industry conspiracy wanting to pollute the countryside, poison children and profit from some intentional cancer plague.

Anti-GM campaigners have recently shifted their strategy to focus on how seeds are bred to resist certain pesticides. The activist attacks on glyphosate were part of an anti-GM campaign. Their logic is clear: attacking golden rice or GM brinjal was not going to increase memberships or donations, but pesticides attract public fear with minimal effort.

So for those taking up the challenge of getting the public to warm to pesticides (or pesticide-resistant seeds), allow me to catalogue what I feel are 10 best practices. There have been mistakes in the past as there will likely be in future, but perhaps an open discussion is the best place to start.

TEN RULES FOR COMMUNICATING ON PESTICIDES

1. DON'T DIMINISH HOW PEOPLE FEEL FRIGHTENED OR DISMISS THEIR CONCERNS

Scientifically literate individuals understand the insignificant levels of pesticide residues found on most foods, the comparatively high levels of hazardous natural chemicals and the decades of research that have gone into registration and compliance of all pesticides. But the public does not and they have been made to believe, most recently with the Monsanto Papers, that nobody knows with any certainty if any pesticides are safe at all. A scientist who dismisses their concerns, regardless how ridiculous they sound, is quickly dismissed.

When people feel vulnerable, they seek out someone they can trust and who understands them. Don't answer their questions with data, alienating chemical names or titles of important scientists or institutions. Try to put your answer into a personal story, compare the risk to an everyday exposure (like a cup of coffee) and try to demonstrate why farmers use these products. Anti-chemical gurus became popular because they understood and shared the vulnerabilities the public felt.

2. CELEBRATE ACHIEVEMENTS: HIGHER YIELDS, SECURE HARVESTS, LESS LABOR

Malthus thought the world could not feed one billion people. Agri-technology has allowed man to feed an ever-growing population with higher yields and less input and this should be celebrated. Man is a story-telling animal and the development of each pesticide is a story of how scientists were able to find a means to solve a problem and allow farmers to successfully bring a crop to harvest. Children in most countries no longer need to spend their Summers pulling weeds. The best story to tell is one of food security: We no longer live in fear of major global crop failures – the technology is proven and trusted.

3. MAKE IT CLEAR THAT THE NATURAL VS SYNTHETIC SOURCE IS NOT AN ISSUE

A dominant cultural narrative today is that natural is trusted. Organic food lobbyists like to claim their pesticides are safer because they come from a natural source. But the public needs to understand that all pesticides contain toxins that are used to solve specific problems (if they weren't effective, they would not be used). Consumers must be reassured that all toxins used in crop protection, whether natural or synthetic in origin, have been well tested and are safe. The organic industry needs to behave in a more ethical manner here.

4. USE PRECISE TERMS WHEN POSSIBLE: INSECTICIDE, HERBICIDE, FUNGICIDE

The word "pesticide" obviously has a bad connotation. More importantly, it does not say what the substance does. An insecticide kills insects – insects eat crops. If the public has a better idea what a substance does, they can better accept its necessity. While we don't want pesticides, we also don't want insects in our food, weeds in our garden or moulds or blight on our plants. A precise vocabulary is essential in risk communications.

5. SHOW WHY FARMERS USE PESTICIDES (BENEFITS) AND ONLY WHEN NECESSARY

Farmers and farming are seen differently. Farming is seen as a rather simple process: you plant

a seed and in a couple months you take a harvest to market (. . . and I grew beans in my garden once!). Conventional farmers, on the other hand, seem to work for some industrial complex, poison the land and don't care about public health. The organic food lobby bias that conventional farmers spray (douse, drench . . .) indiscriminately is inexcusable. The public needs to understand that farmers use pesticides only when there is a reason, at the lowest levels possible (it costs money) and with prevention in mind. There are clear benefits in using them. If a farmer could successfully grow crops without pesticides, surely he or she would.

6. PRESENT PESTICIDES AS PART OF A FARMER'S TOOLKIT USED IN DIFFICULT TASKS

Integrated Pest Management (IPM) is a good example of how a farmer has many tools to deliver a crop to market, including pesticides. But these tools need to be of the best quality (farmers generally use the best crop protection tools available). Each time a pesticide is removed from the market (and this is happening in Brussels at an alarming rate), farmers have to look for alternative tools (often older pesticides with less sustainable profiles). The public, especially the media and policy-makers, have to understand that banning important farming tools is not necessarily a step in the right direction.

7. HIGHLIGHT THE 50-YEAR TREND OF LOWERING DOSE LEVELS, BETTER TECHNOLOGIES

The first pesticides on the market in the 1960s were admittedly rather harsh (like any emerging technology). But over the last 50 years, scientists have worked to continuously improve agri-technologies (product stewardship), lowering dosages, reducing environmental and health impacts and providing better crop performance. Activists like to portray the industry with old images of crop dusters and military grade chemicals – they know the public might be attracted to advanced technologies. Precision agriculture is one such example of an attractive technology that could capture the public imagination if the story is told well.

8. DEMONSTRATE VISUALLY THE VOLUME OF COMPLIANCE RESEARCH STUDIES

The pesticide risk assessment process is not widely understood and trust in regulators is declining. Activists have made the process seem sinister: that a company puts a poison on the market with no data, and when cancers start to increase, the company then lobbies regulators to allow them to continue to make profits. If people understood the amount of testing and compliance measures required before a product goes on the market, and the levels of research required to keep it on the market, their trust in the process may improve. I often hear the terms "10 years and 10,000 pages" to describe how the risk assessment process works. That image needs to be visualized in a way to show the volume of work and research required to comply.

9. PUT TOXICITY INTO A BANALISING CONTEXT

Most people are numerically illiterate (they buy lottery tickets to pay off their credit card debt). Expressing toxicity in terms of LD50s to a person who equates "chemical" with "cancer" is a waste of time. You need to put the toxicity into a context people understand. For example, if you get people to remember there are more carcinogens in a cup of coffee than in the pesticide residues of a year's consumption of fruit and vegetables (Bruce Ames), they may begin to understand the risk a bit better (or stop drinking coffee). To say glyphosate has a very low toxicity is meaningless, but if you show how it is less toxic than ingredients found in chocolate or biscuits, maybe they will get it. I call this the banalisation of risk.

10. HELP PEOPLE FIND OUT MORE INFORMATION FOR THEMSELVES

An essential element of trust is agency. I fear flying more than driving my car to the airport because I know I am in control of the vehicle. If I can find correct information on pesticides myself I will gain my own understanding. Any communication effort should leave the audience with a means to find out more information by themselves. When I tell people there are more carcinogens in a cup of coffee, I ask them to Google "Bruce Ames + coffee + pesticides." There is a lot of information out there, but people need to be sent in a good direction. A passive receiver hears information, an active one learns it.

These 10 rules make communicating on pesticides seem easy. Of course anyone who has tried this challenging task will attest it is not. There are many clever and manipulative activists who are always one step ahead of you, using fear tools like children, bees and fear of cancer to undermine public trust. NGOs or social media gurus have no ethical codes of conduct restricting their behavior (so their lies and fear-mongering can be justified in a sort of Machiavellian zealot ethics). Neither industry nor regulators can play by the same rules.

An important element of trust is the messenger. An industry spokesperson is probably the least credible voice to deliver a positive story on pesticides. Farmers and scientists need to step up and be the story-tellers. They too will suffer from the continued aggressive assault on agri-technology.

I am sure there must be 10 more rules to add to this conversation and each pesticide or class of substances are different. Cultures have different perspectives (many languages consider pesticides as medicines for plants) and there are different levels of scientific literacy. One point is certain: we have a general idea today what doesn't work when communicating on pesticides. Things can only improve – right? BC

David Zaruk *is a professor based in Brussels writing on environmental-health risk policy within the EU Bubble. He writes a blog under the name: The Risk-Monger. The comments in the Risk Corner are his own and does not necessarily represent the views of European Seed.*

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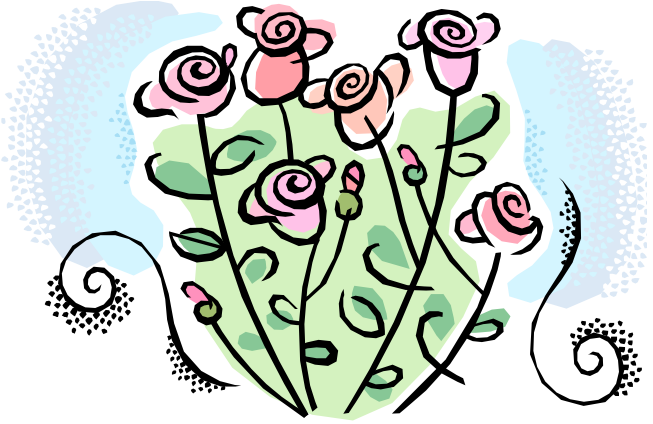
Who's Keeping Whom?

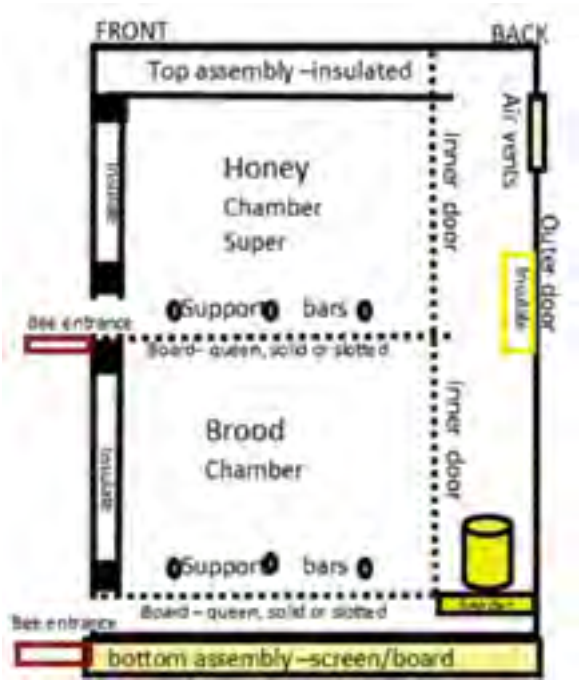
By our hands, they've reached strange lands:
All continents, save one.
From humble beginnings, they keep on winning,
Toiling under foreign suns.

They do our bidding? Who are you kidding?
Who's really in control?
You've been colonized, open your eyes,
The bees reversed the roles.

We get honey, sure. But it's just the lure
They use to keep you sweet.
We've all been played, but it's ok.
Just relax, and admit defeat.

Peter Keilty
Beesforall.com





The AZ Hive Journey

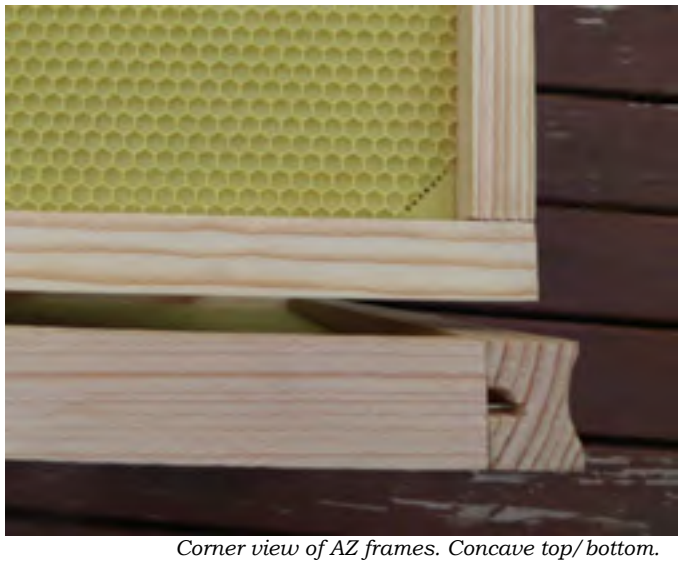
Debra **Langley-Boyer**

Who thought a daughter and one beekeeping class could cause chaos in my life? In 2016 my daughter talked me into taking a two-hour beekeeping class. She said she wanted to keep bees. Now my life includes four AZ hives and thousands of bees, yet she has no hive or bees.

Once I decided to keep bees, my initial research revealed that I had a serious problem, the Langstroth hives were too heavy for me. I found the solution in an article in 'Mother Earth News' magazine on AZ hives. Although I was told by more than one beekeeper that "you must start with Langstroth hives," I knew the Slovenian AŽ hive had been used in Europe for over 100 years.

The AZ hive has similar attributes to the Langstroth hive. It has frames, chambers (boxes) and the traditional bee space. The AZ hive enhances the design to make it easier for beekeepers to use with less disturbance for the bees. It is especially designed to fit those who have trouble lifting heavy boxes.

The AZ hive is designed like a cabinet with the bee entrance on the back and the beekeeper access through a door. It consists of individual chambers, that are accessed through a separate inner door and a set of frames. The frames slide in and out on horizonal rods placed below the frames. Lifting is limited to one frame at a time, which is perfect for me. Between each chamber is a separating divider board. This board can be solid (to separate completely), slotted (for easy bee flow), or a queen excluder.



Corner view of AZ frames. Concave top/ bottom.

View inside AZ hive. shows parts of three chambers. Bottom with some frames, middle no frames and top with inner door on.

Inside shelter, looking at two two-chamber hives and two four-chamber hives with one outer door open.

Front view of shelter with hive's bee entrances. Two four-chamber hives with yellow flowers. On right inset two two-chamber hives. Murals of Mt. Rainier and Olympics with garden and native flowers for bees.

View of AZ feeder. Jars of sugar water on either side. Empty hole in center for another jar.

Working AZ Hive inside shelter. Corner of shelter working chamber two of the four-chamber hives.

Club AZ bee entrance. Landing board and bee entrance on AZ hive.

AZ hives are kept in a bee house or similar building, I converted a shelter that was for my llamas to one for my bees. The bee house protects the bees as well as the beekeeper and equipment from the elements. The beekeeper accesses the bees from inside the bee house via the chamber they want to inspect. This allows elderly or handicapped beekeepers to easily work their bees (including wheelchair users). The hives can be opened in the rain if needed. They can also be made mobile when put on a trailer.

AZ hives seemed ideal for me except I encountered a lack of information and access to supplies, including hives. After more research, I only found a couple of people in the USA that sold AZ hives and even less information, especially in English. I chose the American AZ hive which is a variation of the Slovenian AZ beehive with frames the same size as the Langstroth frame. Thus, they fit the same foundation and honey extractors commonly used in the U.S. An AZ hive cost about $500 but lasts longer and are often passed on to the next generation. Based on cost, I designed and built my own. This was a challenging project as there were no plans available. After many hours of design and construction, I have two wonderful four-chamber AZ hives that are installed in my bee shelter.

The bees came next. I purchased two five-frame nucs in Langstroth frames. I then removed the foundation with comb, brood, and honey by cutting off the Langstroth frame and put the foundation in my new AZ frames. This was a bit messy but worked well.

Bees are bees. Naturally, bees propolize and add bur comb wherever they can. To help limit this the frames only have a few contact points. Metal spacers at the front and on the inner door to keep 3/8-inch bee space. The frames have concave tops and bottoms that sit on the rods, with no tabs. This makes removing the frames easy, unless the bees have added extra burr comb. Sliding the frames

View on inside an AZ Hive with two frames out. Slotted divider boards on top and bottom. Rods frames sit on on bottom.

to the side after removing the frame next to it usually disconnects it easily. If you do not regularly tend your hive, and the bees build too much in the wrong place, it is difficult just like a Langstroth hive.

The AZ hives are worked by moving frames, not adding new chambers to the top. The hive still has the brood chamber on the bottom and honey above. Since the number of chambers never changes, you must tend them via moving the frames. Feeders can be added to the back between the inner and outer door. Ventilation is done with openings at bee entrance and in the top outer back door.

My bees have done very well in the AZ hives. I've had 100% Winter survival so far after three Winters. I like being able to work them in any weather. I even treat them in the late Fall with rain. I can heat the shelter to keep the hive from getting a chill when I open it up, not breaking the Winter cluster. With the screen I can peek in and see my bees year-round, adding to my enjoyment, as well as checking on my bees.

The American AZ hive has not been in the U.S. too long but is taking hold as more find the benefits of this style of hive. AZ

AZ frame spacers on inner door holding frames.

hives are a good choice for those needing less lifting, weather protection and hobby beekeepers like me. I have since added two more hives with two-chambers each for queen rearing. My daughter continues to manipulate me and loves the honey. I love my bees and the AZ hives. BC

Further information can be found online below are some recommended sites.

- The Bee Shop – Drebbieville hives – Information and sales (American AZ hive)
- Slovenian Beekeeping – information and sales (traditional AŽ hives)
- Facebook has a few groups – AZ Hivers and AZ Hive Creators. AZ Hives -Pacific Northwest

CALENDAR

♦MAINE♦

EAS 2020 will be held August 3-7 in Orono at the University of Maine.

For more information visit **www.easternapiculture.org/confereces/eas-2020.html**. Watch these pages for details.

♦MICHIGAN♦

Michiana Beekeepers Association have cancelled their annual meeting May 16 at 7234 W. Moore Road, Nappenee. If permitted will be held at the Nappenee Public Library - 9 a.m. to 12 noon.

The following Michiana Beekeepers monthly meetings for 2020 will be held at the Nappenee Public Library, on date shown from 9 a.m. to 12 noon.

June 13th - Speakers Mel Disselkoen and Tim Ives
July 18th - Speaker TBA
August 15th - Speaker Sam Comfort
September 19th - Speaker Dr. Jeff Pettis
October 17th - Speaker Dr. Jim Tew

For more information and to register contact Debbie, 574.277.0152.

♦VIRGINIA♦

The 2020 Virginia State Beekeepers Association (VSBA) Spring/Summer Meeting will be June 26-27 in Smithfield.

Speakers include Jennifer Berry and petra Arnhert. The Nansemond Beekeepers will host a Painted Hive Body Auction. For details visit **www.virginiabeekeepers.org**.

A workshop on Preparing, Exhibiting and Judging for the honey show will be offered June 26 8:30 a.m. to noon prior to the start of the meeting, sponsored by ApiSolutions Consortium. For more information on this workshop contact **ApiSolutionsBee@gmail.com.**

August 22

Principles & Practices of Biodynamic Beekeeping - Part IV: Fall & Winter Learn about successful overwintering, including how to consolidate hive space, wrapping, feeding and more. Classes take place at Spikenard Honeybee Sanctuary in Floyd, VA.
website: **www.spikenardfarm.org** contact: **info@spikenardfarm.org** or 540-745-2153

October 10-11

Sun Hive Workshop: Learn how to build the Sun Hive! This exciting hands-on hive building experience will be accompanied by lectures related to the importance of hive scent and warmth, wax, form and hive body materials. Classes take place at Spikenard Honeybee Sanctuary in Floyd, VA.
website: **www.spikenardfarm.org** contact: **info@spikenardfarm.org** or 540-745-2153

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I have an obligation to Andi, who trades my gal Marilyn and me chiropractic adjustment and life-restoring massage for honey and eggs, lamb and beef when we have it. Andi has the healing touch. The other morning I bought her breakfast in Aspen at a little bistro that just happens to serve Colby Farms honey. I love this place! When I worked on Aspen Mountain and slept in the ski patrol room the owner would swap me breakfast burritos for honey bears.

I brought Andi three kinds of honey, including mild, pale, glass-clear, dwarf waterleaf that never crystallizes. She wondered if I brought any of that Collbran alfalfa honey that I bought from Marty last Summer. Girl knows her local honey!

We caught up over scrambled eggs and toast-and-honey. The good doctor has a new beau and rock-climbing partner. Now she wants a German Shepherd. When we parted, she gave me an affectionate kiss. We never talked about the unfolding coronavirus epidemic.

Afterwards I took a few ski runs on Aspen Mountain and dropped in on the patrol. They still have some graybeards up there. Curtis gave me her famous sourdough bread recipe. They were conducting an avalanche drill, which brought back memories, some not so good.

Late in the morning on the chairlift I suddenly felt dizzy and overheated. I dropped a ski pole off the chair while trying to cram my parka into my backpack. By the time I skied to the bottom of the mountain, one ski had mysteriously delaminated, and I felt positively ill. Luckily I didn't embarrass myself in public. I managed to pack my gear to the car, where I slept for nearly two hours.

I spent the rest of the afternoon at home on the couch. By morning I felt just fine. When I picked up the paper, it reported that Aspen just reported its first case of coronavirus. A visitor from Australia flew home, where she got the bad news. Nine members of her Aussie tour group, still in Aspen, subsequently tested positive and are under mandatory quarantine. The genie's out of the bottle.

When you read this in May, this will all be old news. We'll know more about coronavirus that we could ever have wished. Today, on March 11, six states have no reported cases. But here in Colorado, coronavirus is popping up along the east-west I-70 corridor, where we live. Marilyn's still substitute teaching and driving her school bus. But today President Trump restricted travel from Europe, the NBA shut down until further notice, and the stock market plunged into bear territory. The World Health Organization declared a pandemic. Tina and I are scheduled to teach a beginner bee class at the end of the month. Will anyone show up, or will the state be in lockdown, like Italy?

No one I've talked to seems confident that they know what to do – Stay home? Wash your hands a lot? Don't touch your face? (Easier said than done!) Carry on like this were just another strain of the flu? Maybe I'll just wrap my arms around my school bus driver every night and wait for the seemingly inevitable.

Honey bees have their pandemics as well. Parasitic *Varroa* mites continue to take their relentless toll. Beekeepers who eschew *Varroa* treatments doom not only their parasitized colonies, but neighboring colonies, when robbers from healthy hives bring home honey and hitchhiking mites from collapsed, *Varroa*-infested colonies.

My 90 Colorado-overwintered colonies look good, so far. This is dangerous talk, I know. March can be the cruelest month. I lost a couple to starvation. That was my fault, not theirs. I kicked myself, but it didn't do any good.

Do you know the secret to successful beekeeping? I'll tell you. You fall down. You get up. You fall down again. You strive for perfection but settle for progress and a lesson learned. You never give up. That's it!

Late last Fall, I got caught with my pants down when I discovered some pretty high mite counts in 300-bee sugar-shake samples. How high? I don't know for sure, because when I started seeing numbers in the 20s and 30s, I stopped sampling and concentrated on treating with an oxalic acid dribble. But all of these hives are alive today. (More dangerous talk!)

My portable battery-powered truck lift gate is en route from South Dakota, just in time for moving bees to Palisade for the apricots. If it works like Derrick assures me it will, I'll never have to push or pull a hive-laden hand truck up a ramp onto my pickup or my sweet '83 flatbed Ford, ever again. No more throwing 40-pound honey supers from the ground onto six-high stacks on the flatbed when I bring in the honey. I'll just push a button instead.

The lift gate will take the place of a 17-foot trailer that I bought two years ago to make it easier to move bees, the trailer being lower than the beds of either of my trucks and hence an easier push with a heavy hand truck. But for a bunch of reasons, none of them important, the trailer made my life harder, not easier. I paid a pretty penny for it, and I'll sell it used, so I'll take a beating. The new lift gate should solve my heavy-lifting challenges. Or not. It's beekeeping. It's life. We all make mistakes. We fall down. We get back up. We settle for progress and a lesson learned. We never give up.

Ed **Colby**

We Fall Down. We Get Back Up.

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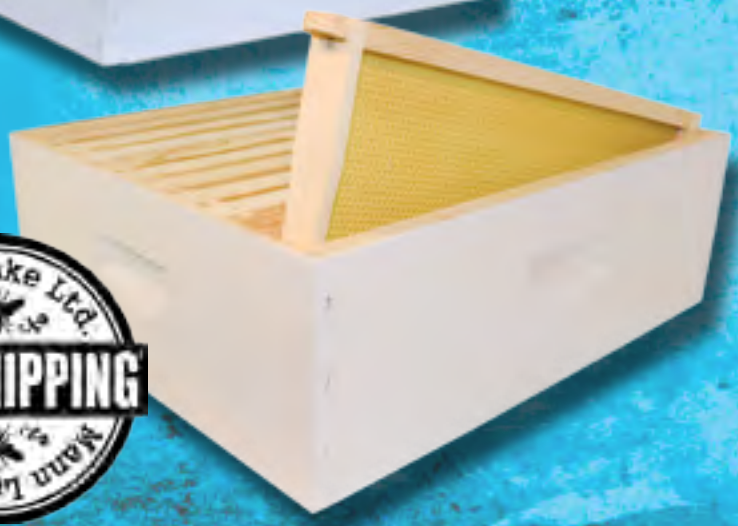

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