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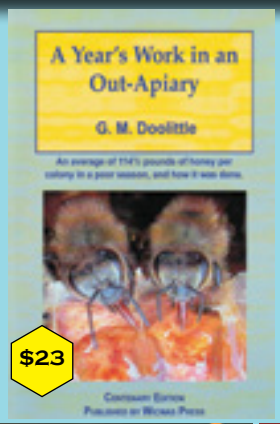

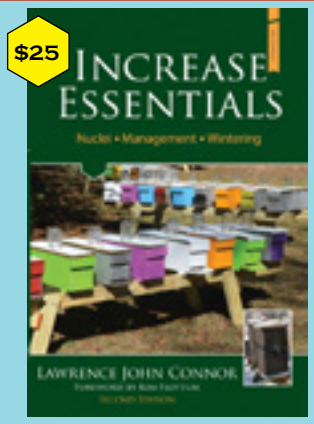

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January Features . . .

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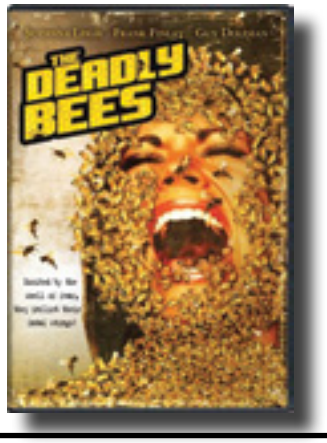
THE OREGON BEE PROJECT



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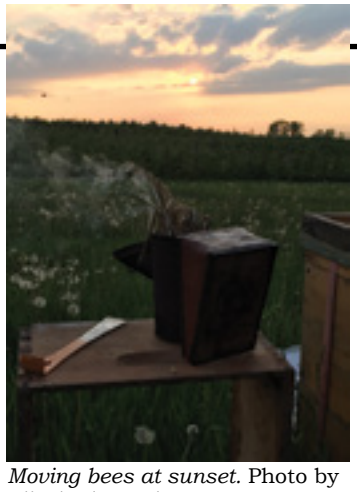

Moving bees at sunset. Photo by Elizabeth Donley.

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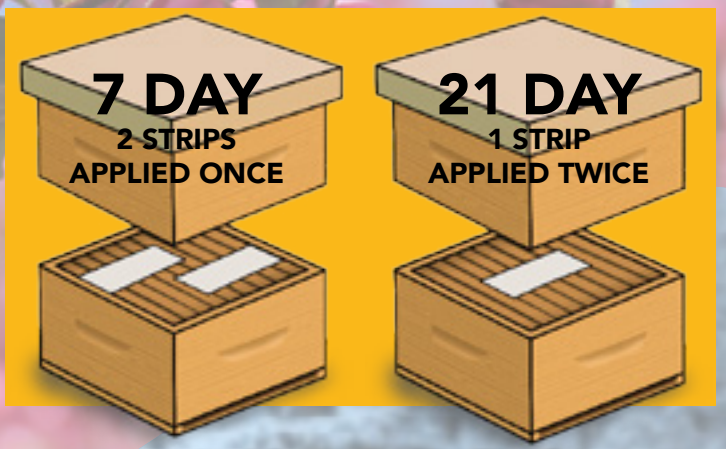

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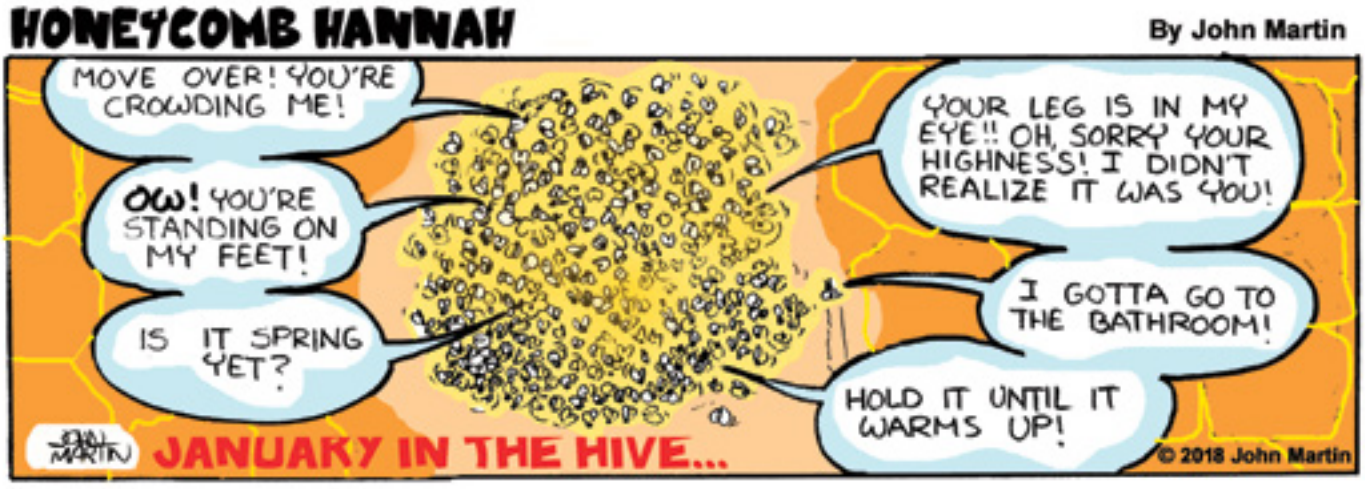

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Turkeys – Good, Bad & Ugly

In 1954 at the age of 12 my beeyard had expanded to six boxes. My family lived on a small share cropper chicken farm where everything was done by hand, draw water from the well, feed and water 16,000 chickens, milk cows, slop hogs and so on.

About every 12 weeks we would sell the chickens and my parents would receive a small amount of money. It was on one of these occasions that they returned from a rare shopping trip with two baby turkey poults for me. They came from Rosie's 5 & 10 because it was Easter and they had the turkeys in the show window. One turkey soon died, but the other was healthy and grew fast. He loved my mother's corn bread and butter milk hot cakes.

Until I read Jessica's article I had forgotten how moody the turkey was. When I petted him he would purr. But at 12 years old that was not enough. I would pull his snout that was on top of his beak and stretch it from its normal 3" - 4" to about 6" - 8", open his mouth and stick the snout in it.

Rufus, that was his name, would start changing the color of his neck and head from white to red as he got mad, and finally to purple when he was really mad. He would finally spit the snout out of his mouth and chase me all over the barn yard.

Rufus grew to be about 40 pounds, and with me making him mean, problems developed, but we were buddies and were an even match. But my older sister, who worked a public job, would come home each day and have to sit in her car until I captured Rufus who was circling her car, strutting and not allowing her to get out. You see, Rufus could tell who was afraid of him and took full advantage of that. But he never bothered my mother. She was a short, stout, hard working woman who put up with little foolishness.

One of my mother's favorite past times was writing and receiving letters, which was a popular way of communication back then. Rufus would often follow along with my mother as she went down the long muddy driveway to get the mail. He would strut and spin circles, but never touched my mother. But on one particularly hot, muddy July day mother was off to the mail box with Rufus tagging along. As she started back up the driveway, she opened a letter from her sister and began to read it. What happened next I could hardly believe.

Rufus ran at my mother striking her with both feet and all 40 pounds. My mother flew into the deep ditch, her shoes came off and her feet stuck up in the air. Her glasses were cock-eyed on her forehead, the mail scattered all over the muddy driveway and Rufus was strutting all over the mail with his muddy feet in a victory dance.

My mother, who was wedged in the ditch, began to regroup as she righted herself and adjusted her glasses. I could see from a distance that her face was redder than Rufus' head, but he was so busy celebrating he failed to see mother's strong hands approaching his neck. In a minute, with both hands firmly around his neck, it was easy to see where mother was heading – straight to the chopping block.

I dared not say a word, and it was time for me to check my bees and make myself scarce.

Rufus had to be cooked immediately as we had no place to put a 40 pound turkey in July. We were the only family in NE Georgia that ate turkey for a solid week that July in Georgia.

I've enjoyed keeping bees for 63 years, except in the 80s with tracheal mites, and I've also had turkeys over the years, but I don't make them mean any more. Bees have always been a source of challenge and amazement to me – there's always something new. Thanks Jessica and Keep up the good work.

James Vaughn
Cornelia, GA

Oh Christmas Hive!

My name is Sarah Doroff and I wanted to send you a photo of our decorated beehive Christmas tree. My family let the beekeepers decorate the tree this year and we decided that it would be fun to decorate some of our honey

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supers. Of course we didn't use the ones that had actual bees in them since we live in Minnesota but we brought in some of the clean ones that we haven't use for bees yet. We thought about doing this to an actual hive but we didn't want the lights and the heat that would come from the lights to mess up our bees. We of course put a little tree on top and honey miels around the tree for decoration. We put mistletoe at the front entrance because we thought about the drones and the queen mating at the mating grounds and a little wreath at the front like we put on our houses. We do have some beekeeping ornaments hung on the tree. We love our beehive Christmas tree! My father, Roger, didn't think it would be a great idea until he saw the final product and thought it was the funniest thing ever. We are a family of beekeepers where my dad got myself and my youngest brother Peter started. Now we are

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joking with the idea to leave it up all year and decorate it for all the season.

Sarah Doroff
MN

North America & Honey Attitudes

Enjoyed your November column. Just returned from a few weeks in Ireland speaking at bee clubs, and had an interesting chat with a beekeeper in the western County Mayo, a relatively poor place for agriculture and bees. He was building up to run a 200 hive operation, and said he could make a nice living on that, even though average colony production per year was only about 40 lbs. of honey a hive. He estimated his profit would be about $40-50,000 U.S. per year, after expenses, a decent income for that part of the world, and possible because of the high price of honey. You're so right; we North Americans view honey as a mass produced sugar rather than the artisan product that most of the world sees.

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Neonics

It's interesting to watch all this furor over dicamba from the perspective of a beekeeper. Not that this reaction from the farmers is unwarranted or unjustified.

Beekeepers have been subjected to just this kind of damage from drift of agricultural chemicals since WWII chemical inventories were converted to weaponized agriculture, about 70 years.

The EPA came into being in 1970 and for a time had a purity of purpose, it would take a few years before the pirates and profiteers sank their mycelia in.

The importance of pollinators was recognized back then because of the damages in the 50s and 60s, coupled with the publication of Silent Spring in 1962.

DDT was banned in 1972.

It was thought at the time that if honey bees were protected then other pollinators and other insects would be as well, and since honey bees were a managed species we could monitor them fairly easily.

One of the first steps was the inclusion of what is called The Bee Caution on the labels of pesticides dangerous to bee. With some variations, it said "Do Not Apply This Product Or Allow It To Drift To Blooming Crops or Weeds If Bees Are Visiting the Area To Be Treated."

This was reinforced by the mantra "The Label Is The Law". I'm sure many of you heard it in the past, not so much in the past 20 years unless from the mouth of some bureaucratic Rip Van Winkle who just emerged from their office after 20 years.

As the chemical companies took over the EPA however, the label wasn't the law, at least extending to bees, the label was an inconvenience. Various actions were taken to get the beekeepers out of the way and shift the burden of protection to them, until today they have virtually no protection at all.

If the farmers being damaged by dicamba were beekeepers they would be told to cover their crops or move them.

Beekeepers have been on the receiving end of drift for three generations with little effort other than to silence them and get them out of the way.

I sympathize with the farmers and hope they are successful in their challenge, but it doesn't end with dicamba, a few thousand farmers and a few million acres, this is a systemic problem of profiteering with weaponized agriculture.

And if we are all going to wring our hands over the horrors of aerial drift, let's broaden the discussion to drift by groundwater, as in neonicotinoids, in the final analysis infinitely more damaging and costly than dicamba.

Tom Theobald
CO

INNER COVER

When I first moved to Medina I lived in a rented house for several months, letting John Root, my new boss figure out if I was a good choice for this job. Apparently he was OK with that and I decided it was time to buy a house since I was going to be here for a bit, and having a garden, yard and a place to put bees was important.

The house that worked for everything needed came on the market right about then. Built in 1928, it has that grand old house feeling and look and smell. A ranch style house was about as far from what was needed, or wanted as you can imagine. The one we found had had only a single owner and it was in magnificent shape, and I got it at the auction, in October.

Originally it had been purchased and built by the son of the farmer who owned the land it now sits on, and built so they were neighbors, working the farm together. There's still a sidewalk leading from my house to the neighbors that they had used. The son died years ago and his wife lived there until she passed too, and their only child had to figure out what to do with the house he didn't want.

It was a kit house, made by a company called Aladdin, from up in Michigan and had been delivered to a railroad siding about two blocks from where the house now sits. The basement and foundation were dug and prepared before it arrived and when it came in they took their horse and wagon to the rail siding, loaded up the house and brought it home.

There are only a few homes nearby. One is converted from what was a hotel right next to the depot, an empty general store is close by, the depot is still there, and a couple of other houses that came along after the hotel, but before my house are across the road from where I now sit.

The oldest home in the neighborhood, the first at this spot, is kitty corner across the road from me that had belonged to a farm family that had been there before the hotel, the depot or general store. They were long gone, but their son took over the house and was farming the land his father had, but when I moved in had been building ships up on the lake. He'd raised his family there, was renting out most of the farm land but had just retired from his ship building job.

There was another home on his property, about a mile from his house that had belonged to the family, and was sitting on that original 40 acre piece of land so many pioneers had made a living on. He used part of that land to build a landing strip for the plane he built himself, and the FAA still has it on record as Quentin Wagner Field.

It turns out there wasn't much of anything this guy couldn't fix, build or jury rig to make work. He was a welder, motor mechanic, farmer, gardener, poultry, cow, duck and quail expert, a hunter, carpenter, wood worker craftsman, banjo musician, brick layer, tree cutter, antique repairer, and did anything else you can think of that needed fixing, building, converting, mowing, growing, protecting or watching. He wasn't a big guy, maybe a bit over five feet, and weighed about 120 pounds when soaking wet.

Well, he had retired about a month before I moved in, and wasn't getting his daily fix of fixing and building and making things he'd had at work all those years, and his farm land was all rented out so there wasn't that to do, and even with two half-acre gardens, an asparagus patch, enough sweet corn for an army and more grass to mow than you can imagine, he was bored.

That garden thing of his. He was death on anything that tried to share what he grew. He used live traps, a .22, something bigger and louder than a .22, even a shotgun once in a while and definitely leg traps. He used fences and such for the deer, but he had a real thing for groundhogs and rabbits. You'd see him out there at dusk, setting his traps and tightening the fence. Then, in the morning, BANG! And another varmint bit the dust. Then he'd take the carcass up to the other farm on the back of the four by four right after breakfast and toss it behind the barn there. By late Spring the Buzzards would be waiting and watching from the top of that barn for that four by four to be coming up the road with breakfast. I watched one time and warned him that he probably wouldn't want to go up there empty handed. He wasn't so big that three or four of them couldn't carry him off.

His wife was still working at the local high school, so she wasn't around all day, so often he'd go there to help her with her work as the janitorial supervisor. He'd be washing rugs, cleaning windows, running the floor buffer in the gym, fixing the broken door jam in the bathroom, getting the loading dock straightened out so the next load had room, or whatever needed doing, whenever it needed doing. But he was still bored.

I'd been in the house only a week or so when he showed up in my driveway one Saturday morning and introduced himself. He got around to all the places he needed to get to on that four by four that could go anywhere he needed to be, or an old bicycle he had fixed up and used. Walking a lot was troublesome because of a bad and getting worse knee problem, so riding was a lot easier.

Quentin Starr Wagner

We got to know each other a bit, but I was gone long hours during the day, and often weekends to meetings so we only crossed paths on occasion. He came over a couple of times before dawn to plow my driveway with his four by four during the winter after an evening of snow, and he wouldn't take any pay for the work. It wasn't a particularly snowy Winter so he only plowed a couple of times.

The next Spring he helped get the garden plowed using a tractor he borrowed from another neighbor. The sod he turned over had been sod forever, and before that the whole of the backyard had been fenced and held pigs when the son was still farming. After he passed his wife let it go to pasture for heifers for a bit, then just grass to be mowed. There was a north/south row of maple trees on one side of the backyard lot between the two places, and a similar row of Osage orange trees on the other side that ran along the road the length of the lot. Together, one blocked the light in the morning and the other the light in the afternoon and the garden just wouldn't do well there with only a couple of hours of direct sun. So we decided to take some of them out. We, that is, Quentin decided they should go if I wanted a garden at all. And, since he burned wood for heat, and he said he'd be happy to take them down because he could use the wood and needed something to do, the wood was his for the cutting. And away they went, and in went the garden.

That first Spring I was on the road a lot and working late a lot and getting things done around the house was not at the top of the list. I only had a push mower for the two acre lawn, so you can kind of imagine it got out of control. One Sunday evening I got back from a weekend away and the whole lawn was mowed. Perfect. Quentin's handiwork I supposed, but it was late and I didn't get back to him for several days.

Sure, he said. Nothing to it. I have this great big rider and it's easy to do, and it gets me out of the house and away from that old woman and something to do, so no problem. Well, I didn't mow my lawn for 22 years. Didn't even own a lawn mower for that long. I'd buy him all the gas he needed, gave him gift cards for the best restaurants in town because they liked to dine fine, as he said, and didn't spend one minute mowing grass.

One thing about that big mower. It turned, on a quarter it seemed, not quite a dime. So if I planted something out there, and he couldn't quite make the turn, it had been planted in the wrong place. It wasn't his driving or the mowers fault – just poor site selection for the sapling apple tree.

Early on he had bees, and I helped him with those. He used to have a lot of colonies he said, and he had a big old Cowen-Root extractor in the garage to handle all the honey he made. That sits in my basement now because he thought I might need it one day. We chased swarms, hived packages, moved bees out of an abandoned truck body, and cleaned out deadouts in the spring. But a few years back it was more than he wanted to do anymore, so he gave up on the bees.

Over those years we got to know each other pretty well. He fixed anything I broke, and I let him mow my lawn, plow my driveway, cut down trees, and pretty much anything he thought needed doing. We'd invite him and that old woman he lived with, Stella, over for picnics on the deck, and birthday parties and the like. We were comfortable together.

Quentin started slowing down about six or seven years ago, and his wife wouldn't let him cross what now is a busy road with his lawnmower to mow our lawn anymore. That's when mowing lawn came back into my life, but fortunately Kath likes that chore way more than I do, so we bought her a tractor with a deck and I still don't mow grass. And a couple of years later they let the garden at the other house, then the one at home come up grass, except for a few tomato plants in pots.

Quentin turned 95 just a bit ago, and right after that stomach cancer showed up. But he's one tough old nut and it didn't get him then. But even though he beat it, eating was hard, and what he was supposed to eat wasn't much to his liking, except for fresh eggs. And we had chickens and all the eggs he wanted. So for more than a year mostly what he ate were eggs from our chickens. For a while, two a day, then one, and in the home stretch this fall, only a half.

That home stretch didn't last long. He was at my birthday party in August, then went from cranky old guy eating my eggs and reading my Ford 9-N magazine to bed, and was gone by mid-November.

We visit Stella every few days, and if there's something we can help with we'll lend a hand. Her children are close so they mostly handle what she needs. And she still drives, believe it or not, so she gets to doctor's appointments, shopping and the like when she wants.

But for the 30+ years I've known them they sat across the kitchen table for breakfast, lunch and supper, the weather on the TV, eating what she cooked and reading the paper. Now, it's just Stella and the paper. And Quentin's bike sits just outside the door, right where he left it last time. As good as new.

Quentin and Stella, just having fun.

The National Honey Show and England

Kathy **Summers**

I wanted to share a bit more of our trip to England with you. Leaving my own country was not something I ever contemplated as a younger woman, and now we have been lucky enough to travel to England several times. Most of the trips have been to The National Honey Show or other bee events going on, but one trip was just for fun a couple of years ago. It's a trip worth making if you ever get the opportunity.

The National Honey Show happens each year in October and as soon as the dates are published for 2018 I'll be letting you know so you can make your plans.

Kim and I over the years have both been invited to speak at the National and that is always a humbling experience. There is at least one, and most years two, U.S. speakers at the Show. They welcome our experiences and knowledge that sometimes are different than theirs.

The venue for the last two or three years has been at Sandown Race Track and Lodge. I had never been to a race track before. The Show has moved at least four times since we have been attending. But this location is beautiful and seems to have everything they need.

The National Honey Show is the largest honey show that I've ever seen. I know that a lot of years ago we had huge shows here in the states, but that doesn't seem to happen on this scale today.

The judges take their jobs very seriously and some of the ways of judging are very different than ours. The rules are posted on their web site if you want to take a look, and take up pages and pages in their program book. On a couple of our trips Kim and I were invited to be stewards for the judges. That was quite an experience. The displays are gorgeous and so professionally presented and just go on and on as you can see in some of the photos. There were hundreds of entries, I'm told this was the biggest show they've ever had.

When the National Honey Show first started it was just the honey show. After some years they added exhibitors, and then speakers so it's a three-day event now with probably 50 exhibitors. The trade show room was big and roomy and easy to get around. Everything was in one building which always just makes it easier for folks. There was a small lodge right there on the property, but also several hotels close by. And restaurants galore within walking distance of the racetrack and lodge.

When we make these trips we try to take a few days either before or after to see some of the sites. There is so much history to this country. I'm amazed every time we go. And, it's a lot of our own history. And aside from the long plane ride it's a fairly easy trip. England has an amazing

train and underground system. You can go just about anywhere on the train – which I love because I would never master the whole driving on the left thing. That scares me, a lot. When we're with friends I just sit in the back and look out the side windows.

Kim and I have been fortunate to make several lasting friendships there. Ruth and Jeremy Burbidge of Northern Bee Books, have become dear friends. So we always try and spend a few days with them. And Jeremy is kind enough to take time out of his busy day to take us around to see something that we haven't seen before. He knows that I have a love for the amazing cathedrals and the last few trips he has taken us to different ones each time.

This time we visited the Lincoln Cathedral and the Halifax Minster, a protestant church. These are churches that have been around for hundreds of years and still have church services every Sunday. I believe it was the Halifax Minster that is open for some time everyday, so people can just come and be there – to pray, to just have quiet time or to get out of the weather if you don't have any other place to go to.

On this trip we also visited the Halifax Piece Hall. Check out the photo. This was a wholesale market built sometime in the 1700s – there is a bit of confusion on the exact date and exactly who designed it. It was aboslutely amazing though. It is a

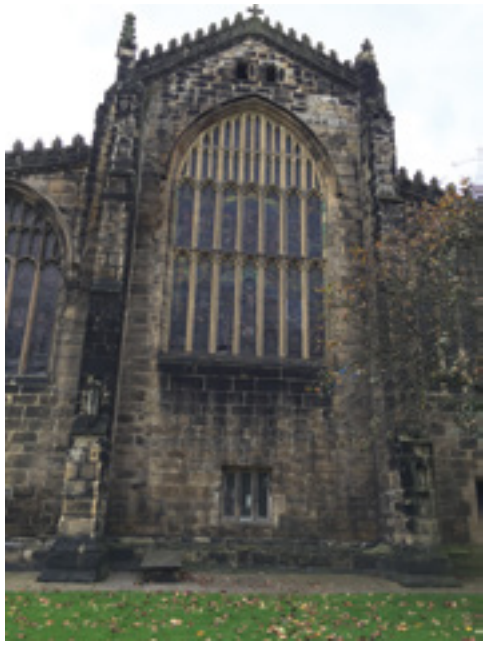
The Halifax Piece Hall.

huge building surrounding an open courtyard and people would bring their items to sell. You can see in the picture all of the different 'compartments' where each seller would set up their wares. Today they are in the process of a huge rennovation turning it into a modern day shopping venue. There are some shops already set up – coffee shop, candy store, art shops, a pub, boutiques – it will be amazing once it's complete.

•

This is our first 2018 issue starting year 146. Wow! As we prepare this issue it's still 2017, so one last time we want to wish you a Peaceful and Joyful Christmas and New Year. We appreciate your loyalty and hang on because we've got some exciting things coming up here at *Bee Culture* in 2018. We hope to see many of you at the ABF meeting in January in Reno.

As we head into Winter – snow is in our forecast and some bitter cold – it's a good time to read those new books that are out there, look at all of the new catalogs that will be arriving soon – as well as those seed catalogs and start now to get ready for Spring. We hope you enjoy this issue and your 2018 calendar. BC

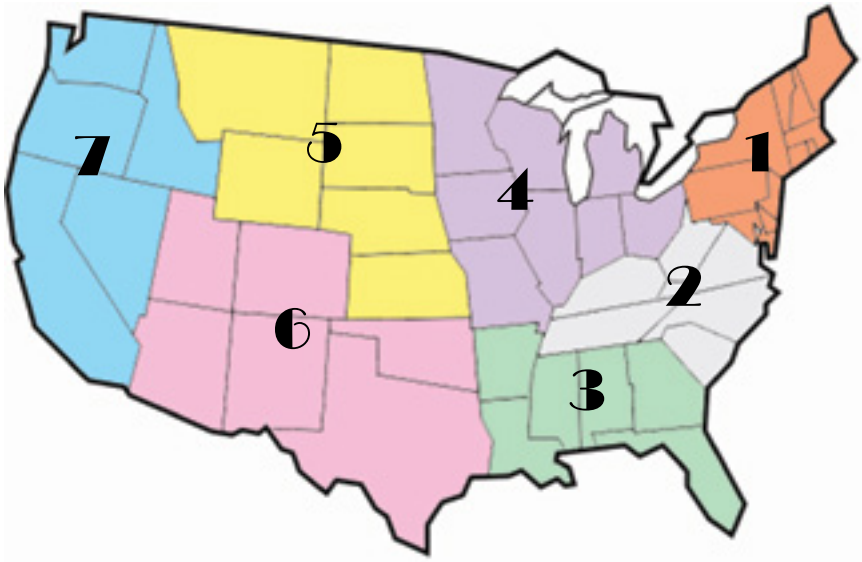


Outside and inside Halifax Minster.

Each entry consists of 25 identical jars.

Lincoln Cathedral. That window is as large as a tennis court.

JANUARY – REGIONAL HONEY PRICE REPORT



% Responding Yes In Red

1. Do you ever feed any of these?
   Sugar Syrup - 100
   High Fructose Corn Syrup - 34
   Fondant - 20
   Feeding Stimulant - 30
   Pollen Substitute - 55
   Pollen - 11

2. What IPM do you use for *Varroa*?
   Organic Acids - 54
   Essential Oils - 30
   Resistant Bees - 32
   Drone Comb Removal - 23

3. I belong to what Association?
   Local - 68
   Regional - 45
   National - 25

4. Equipment I use
   10-Frame - 73
   8-Frame - 14
   5-Frame - 30
   Top Bar - 4
   Warre - 0
   Other - 7

5. Queen Replacement
   Buy all - 38
   Buy some, raise some - 34
   Raise all - 18

6. Kinds of queens
   Russian - 11
   Italian - 64
   Carniolan - 61
   Local/Survivor - 38
   Whatever I can get - 18
   Raise my own 'Best Queens' - 25

7. I change old comb –
   Every year - 9
   Every two years - 14
   Every three years - 29
   When damaged - 7

8. Do you test for *Varroa* after treating? - 41

Some Management Practices

We asked our reporters about some of their management practices this month, expanding it some from the survey we did last year. One note are the changes in nutrition management. Last year, only 84% were feeding sugar syrup, this year 100%. HFCS up from 26 – 38%. But pollen substitute was down 10% from last year and pollen was half of last year. Significant changes in *Varroa* management, too. Organic acid use down 6%, and half as many are using drone comb trapping this year as last. But we expanded this report this year. Equipment – 73% use 10 frame, but 14% use 8. 11% are using Russian queens this year, a positive number certainly, and 25% are raising all their own queens. Even better. But, still, 18% have to take whatever they can get. Over 50% are getting rid of old comb every 3 years or less, and 41% are testing their bees for Varroa AFTER they have treated. That will improve next year, we hope. Association membership – Local – 68%, regional – 45% and national – 25%. All of those numbers are up from when we last asked this several years ago. Definitely an improvement.

REPORTING REGIONS								SUMMARY			History	
	1	2	3	4	5	6	7				Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS								**Range**	**Avg.**	**$/lb**		
55 Gal. Drum, Light	1.85	2.12	2.29	2.55	2.25	2.11	3.25	1.50-3.25	2.26	2.26	2.23	2.14
55 Gal. Drum, Ambr	1.78	2.07	2.08	2.37	2.23	1.99	2.88	1.35-3.25	2.16	2.16	2.17	2.09
60# Light (retail)	222.14	184.67	197.50	215.25	159.60	194.10	200.00	159.60-270.00	203.60	3.39	119.89	189.23
60# Amber (retail)	219.69	199.50	191.25	206.50	201.62	183.63	200.00	150.00-250.00	203.24	3.39	204.85	189.73
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	89.74	77.60	88.15	60.00	57.84	84.00	89.51	57.60-134.40	83.01	6.92	85.48	80.43
1# 24/case	130.36	108.50	127.14	114.08	127.16	127.44	148.20	86.40-211.20	126.46	5.27	126.50	117.20
2# 12/case	118.33	94.00	113.01	103.30	97.44	98.40	114.00	79.20-192.00	110.71	4.61	110.74	105.03
12.oz. Plas. 24/cs	107.17	86.73	96.63	84.00	74.40	102.60	97.20	66.00-172.80	97.13	5.40	96.28	92.92
5# 6/case	138.54	105.73	128.17	126.40	102.30	115.50	134.37	70.33-210.00	128.57	4.29	126.38	121.70
Quarts 12/case	170.91	137.13	123.84	154.05	155.32	141.36	192.00	90.00-255.00	149.02	4.14	141.27	138.59
Pints 12/case	116.03	85.81	89.00	168.00	111.00	81.96	84.00	65.00-168.00	100.74	5.60	87.38	89.15
RETAIL SHELF PRICES												
1/2#	5.77	4.32	4.39	4.60	3.26	4.75	5.43	2.92-9.00	4.90	9.80	4.77	4.30
12 oz. Plastic	7.17	4.81	5.16	4.84	4.56	7.00	5.25	3.07-12.00	5.93	7.91	5.81	5.35
1# Glass/Plastic	8.27	6.59	7.41	7.93	6.84	7.30	8.33	4.00-14.00	7.71	7.71	7.34	7.01
2# Glass/Plastic	14.46	10.47	12.81	13.33	12.04	12.50	15.00	8.00-23.00	13.44	6.72	12.37	11.59
Pint	13.09	8.68	9.99	14.83	11.00	10.19	8.00	6.00-19.50	10.65	7.10	10.19	9.67
Quart	21.99	15.42	16.30	20.13	18.47	17.35	17.25	9.50-32.00	18.06	6.02	17.15	16.14
5# Glass/Plastic	30.05	25.98	35.75	18.12	24.79	31.33	32.00	9.50-50.00	28.49	5.70	27.28	25.81
1# Cream	10.88	8.16	9.12	5.50	6.92	5.50	8.00	5.00-16.00	8.90	8.90	9.23	7.80
1# Cut Comb	13.81	9.50	9.33	8.83	10.00	6.50	14.00	6.00-24.00	11.15	11.15	10.67	9.40
Ross Round	9.93	6.76	8.54	6.50	8.54	10.50	12.49	4.00-12.49	8.83	11.77	9.37	8.36
Wholesale Wax (Lt)	8.35	4.75	5.50	6.30	6.00	4.67	9.00	3.00-15.00	6.68	-	6.01	5.75
Wholesale Wax (Dk)	7.81	4.52	4.64	5.75	6.39	2.75	6.00	2.00-12.00	5.78	-	5.39	5.09
Pollination Fee/Col.	101.43	83.33	51.00	78.33	84.29	90.00	55.00	30.00-150.00	78.57	-	81.30	76.29

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FOUND IN TRANSLATION

#Beeoptomism: What if the super really is *half full?*

Jay **Evans**, USDA Beltsville Bee Lab

My ears perked up recently on hearing several leaders in environmental science talking, for once, about some silver linings in our environment. This 'Earthoptimism' ethic (e.g., https://earthoptimism.si.edu/) does not deny the huge impacts, many negative, our species is having on the planet. It doesn't even claim that things can't get worse. Instead, Earthoptimism strives to point out that much remains. More importantly, the movement seeks foot soldiers to preserve what remains by putting all their energy into solutions. Many of us only respond to recruitment fliers when the outcome has some hope of being positive. Nancy Knowlton, an ocean researcher who is driving the Earth Optimism movement, has every reason to be pessimistic. She is well aware of coral bleaching, changing climates, and those swirling masses of ocean plastic that show up on Youtube (https://www.youtube.com/watch?v=fDHuPjx0aPQ). Despite these challenges, she is promoting the more powerful view that there is much to be done and we are the ones to do it. As she says, ""Big problems without solutions leads to apathy. Big problems with solutions leads to action."

The bee world deserves and, more importantly, needs a bit of optimism to start the New Year. This doesn't let bad beekeeping, bad stewardship, or even (gasp) bad research off the hook, but points to what is working and especially to all that is worth saving. It is absolutely true that we need healthy populations of pollinators for our food supply and environment. Achieving this requires improving the tools used by beekeepers (for honey bees) and habitat stewards (for honey bees as well as the remaining bees) to maintain these populations. These tools range from science to management and regulation. #Beeoptomism is one way to get more mechanics on board to make something happen.

I have always been most comfortable in the optimists' club, despite occasional bad luck and outright failures by myself and those around me. We all have formative experiences, and I spent a year of my early teens in and out of hospitals with pretty severe kidney disease. It was apparently some sort of puzzle for the day's medicine, or I wasn't responding, or both, but I spent months and months as just another sad kid with a catheter. We Evans' are pretty stoic and I don't remember my caring parents ever explaining why I was still sick, and I assume they were just as scared as I was. Enter Dr. Liliedahl, a pediatrician who not only had a plan of attack but an overwhelmingly infectious optimism. I distinctly remember my parents looking puzzled and perhaps thinking "what is this victory of which he speaks?" But his spirit dragged us along for additional months and procedures and eventually things worked out fine.

So – what can we be optimistic about in the world of honey bees and other pollinators?

Here are five things, in no particular order:

1) We have a great corps of passionate new beekeepers on the scene, and they're good at communicating in real time. They are using twitter, instagram, and other avenues to communicate and improve their beekeeping.
2) Ditto that for new researchers. I am in awe at how quickly and effectively my younger colleagues transmit their latest thoughts and results, leading to some real and rapid advances, and decreasing redundant studies. This #oldguy is impressed.
3) We have new methods, treatments,

Lab pollinator garden.

and diagnostics that are being used to peel back the darkness, from super-sensitive assays of chemical levels in bees and hive products (e.g., **http://science.sciencemag.org/content/358/6359/109**) to genetic screens for stress and disease (**https://doi.org/10.1016/j.jviromet.2017.07.013**), to hive monitors like the one in my backyard that reports to the web day and night (thanks **www.hivetool.net**).

4)We have systematic surveys that are amassing great insights into what happens just before colonies thrive or die, where those colonies are positioned, and how their beekeepers treated them. In the U.S., the Bee Informed Partnership and affiliated efforts (**www.beeinformed.org**) and the USDA-NASS national bee health survey (**www.nass.usda.gov**) provide fascinating and robust insights into losses from prior years, and they are only getting better. Worldwide, the COLOSS network (**www.coloss.org**) helps coordinate and advertise similar efforts and fights to make survey datasets available to researchers and the public.

5) Most importantly, we work with a truly resilient organism that needs help right now but can also do a lot on her own.

I am afraid this review will raise hackles among those who see the many challenges to honey bees and other pollinators. I do not pretend we live in perfect times. The threats to pollinators are numerous. But to those who say tone down the smiles until things get better, I say fiddlesticks, give me Pharrell any time over Morrissey. Can't wait until Spring, and counting on better times for beekeepers. BC

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The Quarto Group

2018 Almond Pollination Market Outlook: Demand, Supply, and Contracts

Brittney **Goodrich**

The end of 2017 is here, and the upcoming almond pollination season in California looms on the horizon. Many of you are probably wondering what the almond pollination market and pollination fees will look like this year. The following article summarizes some supply and demand considerations that may provide insights into the 2018 almond pollination market. In addition, I outline contractual components that you may consider for 2018 and future almond pollination seasons.

Demand

USDA estimates that there were one million bearing almond acres in 2017. The 2017 almond crop was approximately 117 million pounds more than the 2016 record crop of 1.56 billion pounds. Current almond prices for Nonpareil in shell remain around $3 per pound, similar to 2016 prices. Almond receipts are not at record highs of recent years, but they are relatively steady.

For those wondering about self-fertile almonds, according to the 2016 California almond acreage report, the "Independence" variety represented 2.5% of all (bearing and non-bearing) almond acreage, but represented 25% of new plantings. While some nurseries suggest that no honey bees are required for nut set, University of California Cooperative Extension recommends growers to use at least one colony per acre to achieve significant yield benefits (Doll, 2012). In my opinion, self-fertile almond varieties will not have a significant impact on the demand for colonies in the foreseeable future.

According to the USDA's Cost of Pollination Survey, 1.7 million colonies were used in almond pollination in 2016, with an average of 1.9 colonies/acre. This suggests that colonies demanded for almond pollination in 2018 will likely be around 1.9 million, approximately 73% of the total U.S. honey bee colony population on January 1, 2017.

Supply

The supply of colonies for almond pollination relies heavily on out-of-state apiary shipments, which have been steadily increasing with almond acreage. For the 2017 almond pollination season, a total of 1.7 million colonies were shipped into California according to apiary shipment numbers provided by the California Department of Food and Agriculture. For the most part, colony health in the U.S. is the primary influence on the supply of available colonies for pollinating almonds. As of November 15, 2017, approximately 522,000 colonies have been shipped into California for the 2018 almond pollination season. This is a decrease of about 14% from colony shipments that had arrived in California by November 15, 2016.

A few natural disasters occurred during the Summer and early fall which may impact the supply of available colonies for almond pollination. The Summer drought throughout major honey-producing states of North Dakota, South Dakota, and Montana could affect colony health given many colonies required supplemental feeding rather than foraging on natural food sources. Not to mention, beekeeping operations could be affected by low cash flows due to lower than average honey production. This area shipped over 510,000 colonies to California for the 2017 pollination season, amounting to 30% of the total apiary shipments. As of November 15, 2017, approximately 366,000 colonies have arrived in California from these states for 2018 almond bloom. Compared to shipments prior to November 15, 2016 for the 2017 almond pollination season, there has been a 15% decrease in colony shipments from this region to date. High Winter mortality rates and low colony strength due to this drought could have considerable impacts on the supply of colonies for almond pollination.

Hurricanes Harvey and Irma brought high winds, rainfall, and substantial flooding in Florida and Texas. These states provided 18% of the colonies for California almond pollination in 2017. It remains unclear how many colonies in these areas were affected, but if it is a large amount, it could decrease the supply of colonies. So far, comparing this year's shipments to those prior to November 15 for the 2017 almond pollination season, there has been a 58% decrease in colony shipments from these states. This appears to be a significant decrease, however most colonies from Florida and Texas arrive within one or two weeks of almond bloom. This significant decrease may in part reflect beekeepers' decisions to delay shipment until closer to bloom.

A final supply issue to note is a change in the regulations of bee shipments into California. Due to numerous bee sting incidents at California's Border Protection Stations (BPS), bee shipments that are rejected

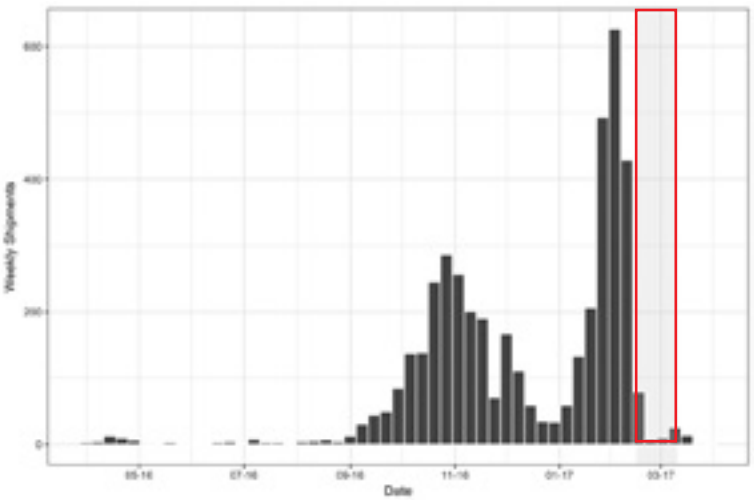

Figure 1. *Histogram of Weekly Apiary Shipments into California for 2017 Almond Pollination Season (Almond Bloom Period Highlighted)*

due to inadequate cleaning will no longer be allowed to be cleaned for re-entry at the BPS. Any rejected shipments must be cleaned off-site and then return to the BPS and be re-inspected to enter California. This may cause substantial delays, so it is important to ensure loads are cleaned before departure. Figure 1 shows weekly bee shipments into California, with the 2017 almond bloom period highlighted. Most bee shipments are coming in within a week or two of almond bloom, so delays could be costly, especially if your pollination contract includes penalties for late colony placement.

Sources: Apiary Shipments through California Border Protection Stations, CDFA Plant Health and Pest Prevention Services; Blue Diamond Grower's Crop Progress Reports

Per-Colony Fees

Figure 2 shows actual and projected almond pollination fees reported by members of the California State Beekeeper's Association. The 2017 average fee was $184.43. The highest fee reported was $200 and the lowest $165. The average projected fee for 2018 is $190 per colony. Overall, per-colony almond pollination fees have been increasing on average since 2006, so

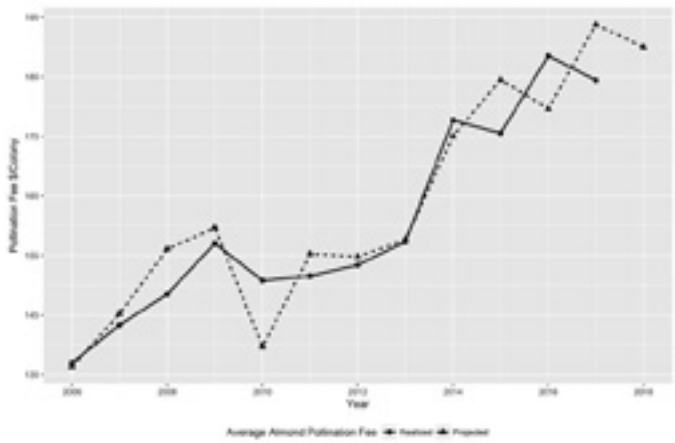

Figure 2. *California State Beekeeper's Association Survey Average Projected and Realized Almond Pollination Fees, 2006-2018.*

New plantings.

beekeepers can expect fees around $185-200 per colony for the standard eight-frame average for the 2018 season. Variation in fees will exist based on contracted and delivered colony strength. As almond bloom approaches and the supply disruptions from the previously mentioned natural disasters are realized, strong colonies may become hard to find. This may drive almond pollination fees upward from the projected range.

Almond Pollination Contracts

Almond growers and beekeepers have many different choices when it comes to the structure of their almond pollination agreements. Some may prefer a formal written contract with many explicit contract provisions, and others prefer an informal oral agreement based on experience with and an underlying trust of the other party involved. The following paragraphs include a discussion of different contract formats and components based on findings from a survey I conducted with almond growers at the 2015 Almond Conference. The survey asked 114 almond growers about the contract provisions typically used in their almond pollination agreements.

Contract Form: Written vs. Handshake

One of the most important contract decisions is whether to require a formal written contract, or rely on a handshake agreement. Based on almond growers responses of the basic type of agreement used in 2015, formal written and handshake (oral) agreements were used to about the same extent. Figure 3 shows that in 2015, 43% of respondents used pollination agreements in a formal written form, 42% of respondents used pollination agreements that were informal oral agreements and 12% of respondents used a combination of written and oral agreements during 2015.

Both types of agreements have their advantages and disadvantages for almond pollination. Written agreements are more easily enforceable in a court of law, while informal agreements allow more flexibility and demonstrate a trustworthy relationship between grower and beekeeper. However, as almond pollination fees continue to increase, it may be time to consider switching to a more formal agreement that lays out specific terms and conditions for almond pollination in case disputes do arise.

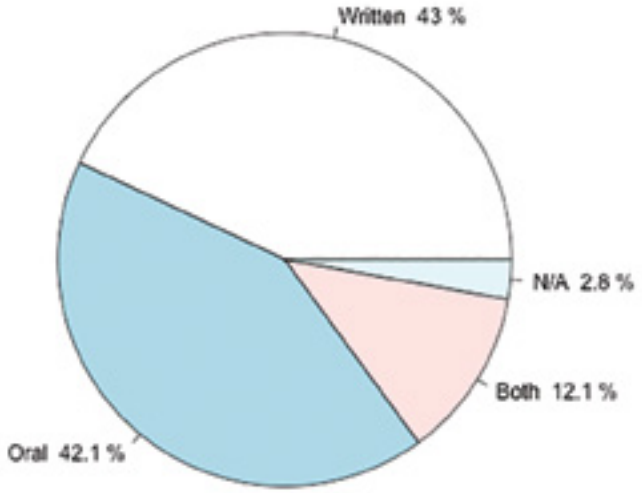

Figure 3. *Form of Pollination Agreement, 2015 (N=107)*

A contract may spell out where, and how many colonies at a drop site,

Colony Strength Requirements

Early literature on pollination markets suggests the industry standard colony strength requirement was a four-frame average in the 1970s (Cheung, 1970). Today the standard is an eight-frame average, so colony strength has become more important to almond growers over the years. Nearly 45% of survey respondents stated that their largest pollination agreement contained a minimum average frame count specification of eight frames. However, there were some deviations from this standard. 16% of growers reported minimum average frame count requirements above eight and 17% of growers reported minimum average frame count requirements below eight. Over 14% of respondents required no minimum average frame count.

Higher frame requirements mean more inputs for the beekeeper, so these higher costs must be reflected in the pollination fee. Figure 4 shows box plots of the growers' reported almond pollination fees by the minimum average frame count required in the contract. The white square denotes the average for each category, while each black dot represents a price/colony strength observation. It is easily seen in this figure that there are many observations for minimum averages of eight-frames, and far fewer for the other frame count categories. Average fees seem to be higher for those frame requirements of eight and above, however I did not find statistically significant differences, likely because of the small sample size of other frame count categories. This figure suggests that higher frame count contracts are receiving premiums, but beekeepers should consider whether the premium is enough to cover the additional cost of providing stronger colonies.

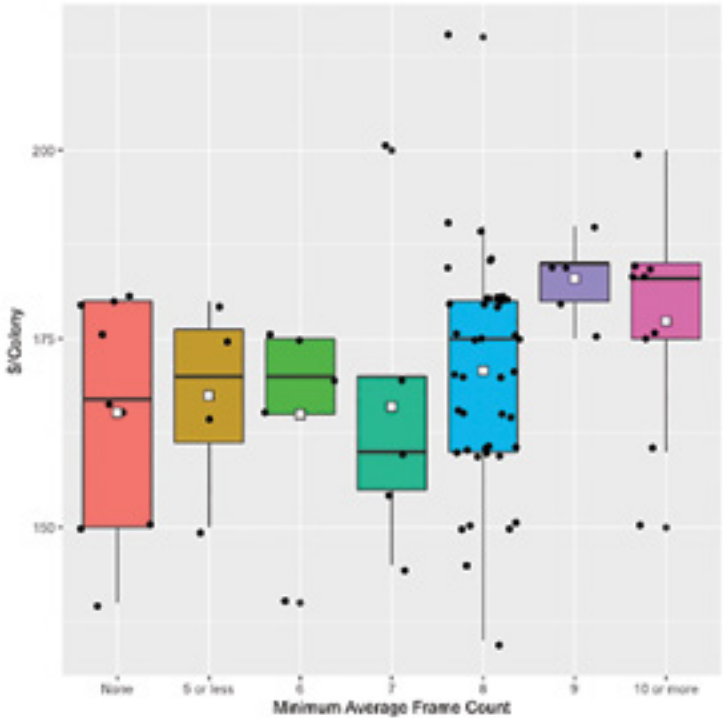

Figure 4. *Per Colony Almond Pollination Fees by Minimum Average Frame Count Requirement, 2015. (N=82)*

Additionally, I asked growers about whether or not they offered a per-frame bonus to incentivize beekeepers to provide high strength colonies. For example, a per-frame bonus contract would give a base pollination fee per colony for an eight-frame average and if the beekeeper provides colonies of more than an eight-frame average the beekeeper would receive a bonus per colony for the number of frames she is above the eight-frame average. Just over 20% of respondents offered such incentive contracts.

Colony Strength Inspection and Enforcement

Colony inspections by a third party can be required in almond pollination agreements to verify that minimum colony strength requirements have been met. As seen in Figure 5, most respondents (61%) stated that they never pay a third party to perform inspections to verify colony strength, while nearly a third stated that they pay for a colony strength inspection to be performed every year. A smaller portion of respondents (11%) pay for a third-party inspection to verify minimum requirements have been met only in years when they believe colony strength is low.

Colony strength inspection can be an explicit clause in the pollination contract, or it can be implicit. For example, of the respondents who pay a third party to perform colony strength inspections every year, 38% stated they had a clause related to inspection specifics in their pollination contract while the other 62% have no explicit clause regarding colony strength inspections. It is

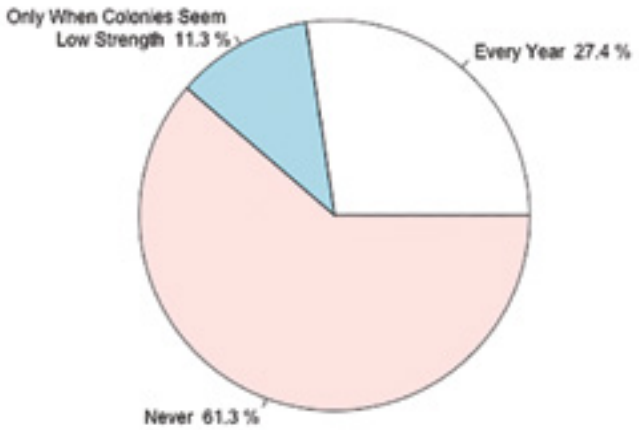

Figure 5. *Frequency of Third Party Colony Strength Inspection (N=106).*

important to communicate with your grower about when and if a colony strength inspection will be performed.

Respondents were asked what actions they could take according to their pollination agreements if a beekeeper provided colonies below the minimum average frame count requirement. Table 1 shows the percentage of respondents who selected each action. Less than 1% of respondents would have taken no action if colony strength was too low, so unsurprisingly colony strength is an important element of almond pollination transactions. Most of the respondents reported that if colony strength was too low, they would communicate with their beekeeper to bring more colonies to compensate for the low strength (74%), and over 40% of respondents said that low colony strength in one year would impact future pollination contracts with that beekeeper. Approximately 22 and 28% of respondents said that they would impose a per-frame or fixed monetary penalty for low colony strength, respectively. When faced with low colony strength, relatively few respondents would remove the colonies and find another pollination provider (8%) or impose some other penalty (<3%).

Table 1 shows that communication with your almond grower is key to maintaining a successful, ongoing pollination relationship. If it is beginning to look like your colonies will not make grade, let your almond grower know. Many almond growers stick to the rule of thumb of two hives per acre, but you may be able to reach an alternative solution of a slightly higher per-acre hive density to compensate for low colony strength, or they may appreciate your efforts in obtaining higher strength colonies from another beekeeper.

Table 1: Percentage of Respondents by Stated Actions Allowed by Pollination Agreements in Response to Low Delivered Colony Strength (N=105)

Action	Percentage
No Action	0.9
Communicate with Beekeeper to Bring More Colonies to Compensate	73.8
Impose Per-Frame Penalty (For Number of Frames Below Average)	22.4
Impose Percentage of Total Pollination Expense or Fixed Penalty	28
Remove Colonies and Replace with Others	8.4
No Longer Contract With in Future	41.1
Impose Another Penalty	2.8
Not Applicable	5.6

Note: Respondents were allowed to select multiple actions, so these percentages sum to more than 100 percent.

This year it seems fewer beekeepers are bringing their bees early and avoiding holding yards like this one.

Pesticide exposure during almond pollination needs to be explored in a contract.

Other Contract Components

Additional clauses in pollination agreements other than colony strength requirements can outline conditions that may be beneficial for you during almond pollination. Growers selected various other clauses that were included in their 2015 almond pollination agreements. Table 2 reports the percentage of respondents, with both written and oral agreements, who indicated that their agreement contained a specific clause. The three most common clauses used in respondents' pollination agreements related to (1) beekeepers having access to colonies after initial colony placement, (2) pesticide application while colonies are in the almond orchard, and (3) late colony placement. Over one third of respondents did not have any of the listed contract clauses in their pollination agreements.

Nearly 38% of respondents with an oral pollination agreement had at least one of these clauses, so it is possible to discuss some of these issues with your almond grower even if you don't have a formal written agreement. If there are items that you really value, such as locked orchard gates to deter bee theft, or well-maintained roads, it may be a good idea to offer a discount to almond growers who could provide those items. Additionally, offering a discount for at least a portion of payment up front may be a way to increase cash flow prior to almond bloom and cover some of your preparation costs up front.

Is an independent inspection of your colonies part of the contract? Should it be?

Communication with your almond grower is key to a profitable and sustainable pollination relationship. As almond pollination fees continue to increase, it may be time to start considering additional contract provisions to promote behavior that deters colony thefts, or determine compensation if a theft occurs while in an almond orchard. Additionally, know what your grower intends to do if you are not able to meet colony strength requirements. Discussing these difficult topics in advance can alleviate the stress and potential court costs of future disputes. BC

Table 2: Percentage of Respondents Whose Contracts Included Various Clauses (N=95)

Clause	Percentage
Pesticide Application	29.6
Colony Theft	18.4
Colony Collapse Disorder (CCD)	7.1
Late Colony Placement	28.6
Bloom Percentages for Approximate Move-in/Move-out Dates	23.5
Beekeeper Access After Colony Placement	33.7
Inspection Specifics	25.5
Unpaid Balances	14.3
Minimum Number of Colonies per Drop	23.5
None of the Above	36.7

Note: Respondents selected all provisions in their pollination agreements so the percentages sum to more than 100.

Summary

Almond pollination can be a profitable endeavor for many beekeepers. However, it is important to enter into pollination agreements that are mutually beneficial for you and the almond grower. Give careful consideration to the colony strength requirement and number of colonies you contract so that it won't be excessively costly to you to meet your obligations. A fee of $210 for a 10-frame average may sound great, but may not be profitable for you once the costs of inputs are considered.

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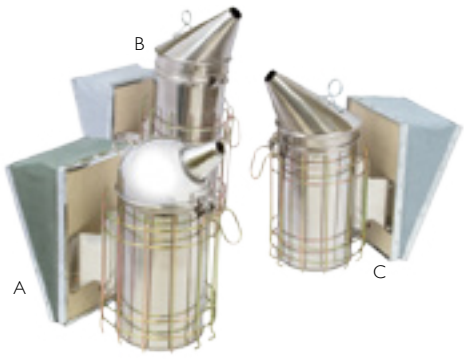

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Over the past half century we have successfully met the needs of beekeepers in the states of Florida and Georgia.

Most of our bee licenses to this point have come from word of mouth. In fact, many have been passed down by beekeepers in the same family for generations. As we grow our Southeast operations and look toward expansion into Texas, Mississippi, Oregon and Washington, we're ready and able to meet the needs of more beekeepers nationwide.

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In short, you should. Rayonier services a wide range of bee customers, from small "mom-and-pop" honey producers to large industrial breeders who transport bees multiple times per year.

Why become a Rayonier Customer?

We have land. Rayonier recently purchased an additional 90,000 acres in Georgia, and continues to expand operations in Florida, Texas, Oregon and Washington. Even with high demand snapping up bee licenses, we currently have land available for bees.

Our reputation precedes us. You don't maintain multiple generations on the same property by being a difficult landowner. Our customers stick with us because they appreciate our secure, accessible land and our hands off approach. We put our customers first and will not micro-manage your timing or placement of hives.

Our land is secure. Gated properties provide increased security for commercial operations. Rayonier also maintains a staff of forest rangers and equipment for fire suppression to protect our land and your bees.

We are accessible. The majority of our properties are large, enabling a crew to station numerous truckloads of colonies. Our mainline road system is actively maintained for tractor trailer log trucks and fire suppression access. For beekeepers, this means easy in and out for hive maintenance and hauling.

We keep it simple. The contract process is streamlined and easy by design. In fact it can be completed entirely via e-mail. For most of the beekeepers I work with, we do everything online. Within a course of two weeks, we go from an inquiry to a contract.

But don't take my word for it. Check out the experiences of these Rayonier bee customers:

Testimonial: Timmy's Bees, Hampton, FL

Candace Douylliez has been keeping bees for a decade. Five years ago, she ran into a problem.

"There was nothing for the bees to eat," she says.

Douylliez – who has tended up to 200 hives – had been keeping her bees on her own property in central Florida, but she needed better forage for her bees, specifically the gallberry, palmetto, and pine that make for delicious honey. She also needed more space.

"We live in a planned urban development, and we couldn't have the bees there. They were getting in people's swimming pools," she says. "We had to move off our personal property. That's what made us look into licensing from Rayonier."

Douylliez and her husband, Timmy, found a 1400-acre tract of Rayonier land near Hampton, Florida, and set up their permanently placed hives on about ¼ acre. They share the land with hunters, who also license from Rayonier.

"It's a great area to raise bees because it's all natural," she says.

The tract is close to her home – just about 25 miles – and offers the variety of forage that makes for a great-tasting product. And that's important for Douylliez, who is known locally as "the honey lady."

"Rayonier has been very bee-friendly," she says. "It's been a good working relationship for now and the future."

Testimonial: Swan's Honey, Hortense, GA, and Albion, Maine

Lincoln Sennett's bees live a migratory life. They Summer in Maine and spend the cooler months foraging for gallberry and tupelo on their Rayonier acreage in Hortense, Georgia. Sennett acquired the license a decade ago from another beekeeper who retired after working on the property for more than 30 years. And while licensing property for his 2,000-plus hives is an expense, thus far it's been worth it.

"It works out well for the beekeepers because you have a set location you're going to go to and you're familiar with the area," he says.

Working with a large company also has advantages over licensing from private landowners. Often, Sennett says, farmers won't think out six months when opening up land for beehives, "he might need to move [his] cattle, and the next thing you know you're moving your bees again . . . It's not a lot but it adds up when you have a lot of locations."

Sennett also appreciates the gated security and in-and-out convenience of Rayonier properties, especially for migratory bees.

"It's relatively easy to move things in and out, which is a problem with private landowners, just the access to get into some properties is a hassle you can end up driving across a field that is not accessible depending on the weather, things like that."

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A Closer LOOK

BIOGENIC AMINES

Clarence **Collison**

They play a role in the regulation of honey bee behavioral development and are particularly important in the control of the age-related division of labor.

Biogenic amines are important neuroactive molecules associated with the honey bee nervous system. Physiologically, biogenic amines can act as neurotransmitters, neuromodulators or neurohormones (Blenau and Baumann 2001). They play a role in the regulation of honey bee behavioral development and are particularly important in the control of the age-related division of labor (Schulz and Robinson 1999). The biogenic amines dopamine, serotonin, and octopamine are found in the brain of the honey bee and are known to influence the expression of many types of behavior, presumably by modulating the responsiveness of individuals to various behaviorally relevant stimuli. Treatment studies have revealed the effects of olfactory sensitivity and performance in laboratory learning assays (Mercer and Menzel 1982; Macmillan and Mercer 1987; Hammer 1993).

Biogenic amines regulate the proximate mechanisms underlying most behaviors, including those that contribute to the overall success of the colony. One crucial set of behaviors contributing to the welfare of the colony is involved with nest thermoregulation. Worker honey bees cool the colony by performing a fanning behavior, the expression of which is largely influenced by response thresholds modulated by the social environment. Cook et al. (2017) examined how changes in biogenic amines affect this group-performed thermoregulatory fanning behavior. Concentrations of two biogenic amines, octopamine and tyramine, are significantly lower in active fanners than in non-fanners, but there is no difference in dopamine and serotonin concentrations. Direct feeding of octopamine and tyramine induced a decrease in fanning responses, but only when both amines were included in the treatment. This is the first evidence that fanning behavior is influenced by these two biogenic amines, and this result is consistent with the typical role of these neurotransmitters in regulating locomotor activity in other insects. Individual variation in amine expression also provides a mechanistic link that helps to explain how this group behavior might be coordinated within a colony.

Taylor et al. (1992) examined changes in biogenic amine levels associated with the morphological and behavioral development of worker honey bees. A significant increase in amine levels in the head of the honey bee is associated with transition from the larval to pupal stage. Adult emergence is also accompanied by a significant increase in serotonin (5-hydroxytryptamine, 5-HT) levels in the brain, but no significant change in brain dopamine (DA) levels. NADA (N-acetyldopamine) levels increase during larval and pupal development, but in contrast to both DA and 5-HT, drop significantly during the transition from pupa to adult.

Levels of dopamine in the brain of nectar and pollen forager bees, presumed to be among the oldest adults sampled, were found to be significantly higher than in nurses, undertakers or food storers. These results suggest that an age-dependent change in amine levels occurs in the brain of the worker bee. In the optic lobes, levels of dopamine and serotonin were found to be significantly higher in pollen forager bees than in all other behavioral groups. Significant differences in amine levels in the optic lobes of nectar foragers and pollen foragers indicate that some differences in amine levels occur independent of worker age (Taylor et al. 1992).

Brain levels of dopamine, serotonin, and octopamine were measured in relation to both age-related division of labor and inter-individual differences in task specialization independent of age in honey bee colonies. The only differences among similarly aged bees performing different tasks were significantly lower levels of dopamine in food storers than comb builders and significantly lower levels of octopamine in guards than foragers, but guards also were slightly younger than foragers. Differences associated with age-related division of labor were stronger. Older bees, notably foragers, had significantly higher levels of all three amines than did younger workers in the hive. Using social manipulations to unlink chronological age and behavioral status, octopamine was found to

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exhibit the most robust association between behavior and amine level, independent of age. Octopamine levels were significantly lower in normal-age nurses versus precocious foragers and overage nurses versus normal-age foragers, but not different in reverted nurses versus reversion colony foragers. Dopamine levels were significantly lower in normal-age nurses versus precocious foragers, but higher in reverted nurses versus reversion colony foragers. Serotonin levels did not differ in any of these comparisons. These correlative results suggest that octopamine is involved in the regulation of age-related division of labor in honey bees (Wagener-Hulme et al. 1999).

Levels of the biogenic amines dopamine, serotonin, and octopamine were measured in different brain regions of adult worker honey bees as a function of age-related division of labor, using social manipulations to unlink age and behavioural state. In the antennal lobes, foragers had higher levels of all three amines than nurses, regardless of age. Differences were larger for octopamine than serotonin or dopamine. In the mushroom bodies, older bees had higher levels of all three amines than younger bees, regardless of behavioural state. These correlative results suggest that increases in octopamine in the antennal lobes may be particularly important in the control of age-related division of labor in honey bees (Schulz and Robinson 1999).

The effects of environmental and genetic factors on levels of octopamine, dopamine and serotonin in brains from worker honey bees were measured using high-performance liquid chromatography with electrochemical detection. Exiting foragers were stressed by clamping their legs, which resulted in peak elevation of octopamine and serotonin after 10 minutes. Significant seasonal differences in levels of all three biogenic amines were found for bees sampled from an observation colony during the Spring, Summer and Autumn of 1990. Levels of the amines were highest during June-September, corresponding to high levels of colony foraging activity. These differences may reflect seasonal changes in colony nutrition, population size, or brood-rearing activity. The levels of all three amines were significantly lower in the brains of newly emerged bees than in brains from randomly aged worker bees from the same colony. Since the total protein content in bee brains was not different for bees from these two groups, age-related differences were not related to brain growth. Significantly different levels of octopamine, dopamine and serotonin were detected among workers in colonies that contained unrelated queens (Harris and Woodring 1992).

Forager honey bees have higher brain levels of octopamine than do bees tending larvae in the hive. To test the hypothesis that octopamine influences honey bee division of labor, Schulz and Robinson (2001) treated bees orally with octopamine or its immediate precursor tyramine and determined whether these treatments increased the probability of initiating foraging.

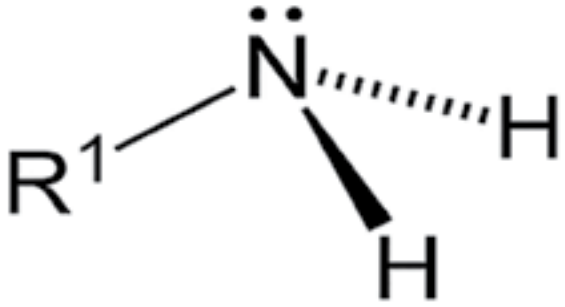
Octopamine treatment significantly elevated levels of octopamine in the brain and caused a significant dose-dependent increase in the number of new foragers. This effect was seen for precocious foragers in single-cohort colonies and foragers in larger colonies with more typical age demographies. Tyramine treatment did not increase the number of new foragers, suggesting that octopamine was exerting a specific effect. Octopamine treatment was effective only when given to bees old enough to forage, i.e., older than four days of age. Treatment when bees were one to three days of age did not cause a significant increase in the number of new foragers when the bees reached the minimal foraging age. These results demonstrate that octopamine influences division of labor in honey bee colonies. They speculated that octopamine is acting in this context as a neuromodulator (Schulz and Robinson 2001).

Previous findings have shown that high levels of octopamine and serotonin in the antennal lobes of adult worker bees are associated with foraging behavior, and octopamine treatment induces precocious foraging. To better characterize this relationship between amines and foraging behavior, Schulz et al. (2003), performed a detailed correlative analysis of amine levels in the antennal lobes as a function of various aspects of foraging behavior. Flight activity was measured under controlled conditions in a large outdoor flight cage. Levels of octopamine in the antennal lobes were found to be elevated immediately subsequent to the onset of foraging, but they did not change as a consequence of preforaging orientation flight activity, diurnal pauses in foraging, or different amounts of foraging experience, suggesting that octopamine helps to trigger and maintain the foraging behavioral state. In contrast, levels of serotonin and dopamine did not show changes that would implicate them as either causal agents of foraging, or as neurochemical systems affected by the act of foraging. Serotonin treatment had no effect on the likelihood of foraging. These results provide further support for the hypothesis that an increase in octopamine levels in the antennal lobes plays a causal role in the initiation and maintenance of the behavioral state of foraging, and thus is involved in the regulation of division of labor in honey bees.

In the honey bee, responsiveness to sucrose correlates with many behavioral parameters such as age of first foraging, foraging role and learning. Sucrose responsiveness can be measured using the proboscis extension response (PER) by applying sucrose solutions of increasing concentrations to the antenna of a bee. Scheiner et al. (2002) tested whether the biogenic amines octopamine, tyramine and dopamine, and the dopamine receptor agonist 2-amino-6,7-dihydroxy-1,2,3,4-tetrahydronaphthalene (6.7-ADTN) can modulate sucrose responsiveness. The compounds were either injected into the thorax or fed in sucrose solution to compare different methods of application. Injection and feeding of tyramine or octpamine significantly increased sucrose responsiveness. Dopamine decreased sucrose responsiveness when injected into the thorax. Feeding of dopamine had no effect. Injection of 6,7-ADTN into the

Concentrations of two biogenic amines, octopamine and tyramine, are significantly lower in active fanners than in non-fanners, but there is no difference in dopamine and serotonin concentrations.

thorax and feeding of 6,7-ADTN reduced sucrose responsiveness significantly. These data demonstrate that sucrose responsiveness in honey bees can be modulated by biogenic amines, which has far reaching consequences for other types of behavior.



Colony condition and differences in individual preferences influence the type of forage collected by bees. The physiological bases for the changing preferences of individual foragers are not fully understood at this time. Octopamine has been shown to influence age at the onset of foraging and probability of dance for rewards. However, octopamine has not been causally linked with foraging preference in the field. Giray et al. (2007) tested the hypothesis that changes in octopamine may alter forage type (preference hypothesis). They treated identified foragers orally with octopamine or its immediate precursor, tyramine, or sucrose syrup (control). Octopamine-treated foragers switched type of material collected; control bees did not. Tyramine group results were not different from the control group. In addition, sugar concentrations of nectar collected by foragers after octopamine treatment were lower than before treatment, indicating change in preference. In contrast, before and after nectar concentrations for bees in the control group were similar. These results, taken together, support the preference hypothesis.

Neuronal plasticity allows an individual to respond to environmental changes by modulating its response to stimuli. In the honey bee, the biogenic amine octopamine plays a crucial role in appetitive odor learning, but little is known about how octopamine affects the brain. Rein et al. (2013) investigated its effect in the antennal lobe, the first olfactory center in the brain, using calcium imaging to record background activity and odor responses before and after octopamine application. They showed that octopamine increases background activity in olfactory output neurons, while reducing average calcium levels. Odor responses were modulated both upwards and downwards, with more odor response increases in glomeruli with negative or weak odor responses. Importantly, the octopamine effect was variable across glomeruli, odorants, odorant concentrations and individuals, suggesting that the octopaminergic network is shaped by plasticity depending on an individual's history and possibly other factors. Using RNA interference, they showed that the octopamine receptor AmOA1is involved in the octopamine effect.

To explore neuro-endocrinal changes in the brain of honey bee queens before and after mating, Harano et al. (2005) measured the amount of several biogenic amines, including dopamine and its metabolite in the brain of six- and 12-day-old virgins and 12-day-old

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mated queens. Twelve-day-old mated queens showed significantly lower amounts of dopamine and its metabolite (N-acetyldopamine) than both six- and 12-day old virgin queens, whereas significant differences in the amounts of these amines were not detected between six- and 12-day-old virgin queens. These results are explained by down-regulation of both synthesis and secretion of brain dopamine after mating. It is speculated that higher amounts of brain dopamine in virgin queens might be involved in activation of ovarian follicles arrested in previtellogenic stages, as well as regulation of their characteristic behaviors. BC

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Neonicotinoid Pesticides:
A Major Problem For Bees, Part IV

Ross **Conrad**

The often heard refrain that Varroa is the primary cause of colony losses associated with CCD is simply not supported by the evidence.

So far in this series, we've established that hyper-toxic neonicotinoids are severely damaging wild pollinator populations and that the numerous studies showing these pesticides harm honey bees are stacking up like cord wood. Unfortunately the evidence is also quite clear that neonicotinoids are harming honey bees in the field as well as in the lab, and thus devastating colonies in much the same way as the wild pollinators.

Colony numbers increasing

Evidence that neonicotinoids are harming honey bees in the field is a bit confusing, a factor that proponents of pesticides are quick to latch onto. While yearly colony losses by beekeepers remain at an all-time high, the total number of managed honey bee colonies have been increasing in recent years both within the U.S. and world-wide. How could this be? Honey bees are exposed to neonics in the same ways that most other pollinators are exposed. Being insects, we know that honey bees are highly vulnerable to the toxic effects of neonicotinoid insecticide exposure. There is also strong evidence that it is not just pollen that is a source of neonicotinoid contamination in colonies, but nectar is also a source of chronic pesticide poisoning of bees.

In October 2017 the journal Science published the results of a worldwide survey of neonicotinoids in honey. After sampling honey from all six continents that honey bees inhabit, researchers reported, "We assessed the global exposure of pollinators to neonicotinoids by analyzing 198 honey samples from across the world. We found at least one of five tested compounds (acetamiprid, clothianidin, imidacloprid, thiacloprid, and thiamethoxam) in 75 percent of all samples, 45 percent of samples contained two or more of these compounds, and 10 percent contained four or five. Our results confirm the exposure of bees to neonicotinoids in their food throughout the world." (Mitchell, 2017) Researchers found that contamination rates were highest in North America with 86 percent of samples contaminated.

Given all the evidence of impending harm and confirmation of exposure, why are honey bee populations growing and not dramatically declining in a similar manner as native pollinators?

Buffering effects

By all accounts honey bees are in fact being decimated in a similar manner as native pollinators, but colony numbers are being buffered by the effects of these chemicals in two important ways. The first is due to their large colony population size (tens of thousands of individuals in a colony compared to solitary pollinators or hundreds of insects in a bumble bee colony for example). When a hive of honey bees losses 10,000 bees due to pesticide exposure, there may be tens of thousands of bees left to carry on – all the beekeeper observes is that the hive is not as strong and vigorous as it should be. Additionally, the large numbers of bees in a colony can mask (in the short term) the fact that following exposure, individual bees are not as long-lived as usual.

Another way the honey bee appears to be buffered from the effects of pesticides is by the fact that beekeepers are covering up for the pesticide's effects. This occurs when the conscientious beekeeper: treats their bees for diseases after pesticides have weakened the bee's immune system making them vulnerable; treats for *Varroa* mites after pesticides weaken brood immune systems allowing mite populations to increase faster than normal, or when pesticides kill some but not all the bees thereby increasing the ratio of mites to bees in the hive; replaces the queen when pesticides cause the queen to fail or be superceded; or feeds the bees when pesticides inhibit the ability of the bees to forage effectively for food. As mentioned last month, the primary issue with many pesticides and neonics in particular, is not just acute toxic exposure but the chronic, sub-lethal doses that bees are exposed to over time.

Beekeeper experience: The Story of Lyle Keller

Ever since 2007 when David Hackenberg of Lewisburg, PA sounded the alarm over the devastation he was experiencing in his hives, scores of beekeepers have suffered a similar fate. One recent example is the story of Lyle Keller of Arcadia, Ohio who has been keeping bees since 1973. Keller worked for 30 years as a commercial beekeeper. He is the owner and operator of *Keller Bison and Bees* pollinating cherries and apples in Michigan and producing honey while running about 2,000 colonies at his peak. In 2016 Keller had 1,000 colonies, today he is lucky if he has 20 left. An exceptionally wet spring in 2016 prevented the farmers in his area from planting until May 23rd when the fields finally dried out and all the farmers planted at the same time releasing large amounts of neonicotinoid impregnated dust from their treated seeds. Three days later Keller reports that he had three inches of dead bees littering his apiaries. By mid-

Despite not being exposed to Varroa *mites, Australian bees, such as those found in this beeyard in the Australian outback, are starting to experience some of the same symptoms that colonies have been suffering from in the rest of the world where neonicotinoid insecticides have been in common use.*

June he had about 600 living colonies left and the bees were weak and demoralized. He tried drenching his hives with essential oils and by July his bees seemed to have rebounded. Unfortunately, the colonies were not strong enough to survive Ohio's Winter and almost all his hives were dead by Spring.

When the initial die-off of his bees occurred, Keller says his beekeeping income "came to an abrupt halt." Keller knew that the best thing he could do under the circumstance was to have samples tested in order to identify the cause of death and help prevent other beekeepers from suffering the same fate. He had his Ohio County Extension Agent pull samples to test in house and at the same time he sent samples to North Carolina's USDA Agricultural Research Services (ARS) lab in Raleigh as well as Georgia's EPA lab in Atlanta. The results of EPA and USDA analysis found alarmingly high levels of several neonicotinoids that are commonly used for agricultural seed treatment. The state of Ohio meanwhile would not release the results of its testing until after Keller got his state Senator to intervene to release the results. Interestingly, the state of Ohio reported finding absolutely no pesticide contamination in any of the samples it tested. Personally I am not sure what is more disturbing, the high levels of neonics found in samples of Mr. Keller's bees or the apparent attempt by the state of Ohio to sweep the entire incident under the rug.

Mr. Keller had been planning on selling his beekeeping operation in retirement. Today, he can't even find anyone who wants to purchase his empty equipment due to concerns about contamination. It is heartbreaking that he can't continue to keep bees commercially and he finds it frustrating and "irritating that this can happen to somebody." Keller told me that "if we don't do something relatively soon there's not going to be a commercial bee industry anymore."

Costs to beekeepers

Even when the impacts of acute exposure don't put beekeeping operations out of business, the constant drag on the health of honey bee colonies from sub-lethal exposure costs beekeepers money as they spend extra time and resources treating for pathogens and pests, having to feed and re-queening hives all in an effort to keep their bees alive. The only reason the beekeeping industry has not collapsed already is because beekeepers have developed numerous approaches to prop up colonies and reduce stress in various areas (nutrition, pathogen exposure, mite predation, etc.) in the attempt to make up for the acute and chronic stress colonies are suffering from pesticide exposure.

While I have previously reported on the wide-spread use of essential oil drenching in response to stress induced CCD symptoms (see *Bee Culture* March 2010), some beekeepers will sacrifice much of the honey harvest to insure that their bees are fed natural honey and pollen during periods of prolonged dearth. This is more expensive but preferable to feeding sugar syrup and protein patties, since the colony's immune system tends to be stronger when subsisting on a natural diet rather than an artificial one. (DeGrandi-Hoffman 2010, Mau 2013) Other beekeepers will take their weak hives and split them, giving each split a new queen. Such efforts cost beekeepers money and labor, directly reducing profitability of the beekeeping operation than if colonies were not exposed and were all strong and healthy to begin with. The current recommendation that beekeepers rotate out their old combs due to pesticide residue and pathogen build up also creates additional costs. Combs are a large investment in time, money, and honey on both the part of the beekeeper and the honey bee. Beekeeper actions such as these have caused reports of CCD symptoms to

decline while allowing chemical companies to maintain their billion dollar market by forcing beekeepers to absorb the financial side effects of pesticide use as I have pointed out on these pages in the past. (*Bee Culture* May 2016)

Arguments in defense of Neonics don't hold water

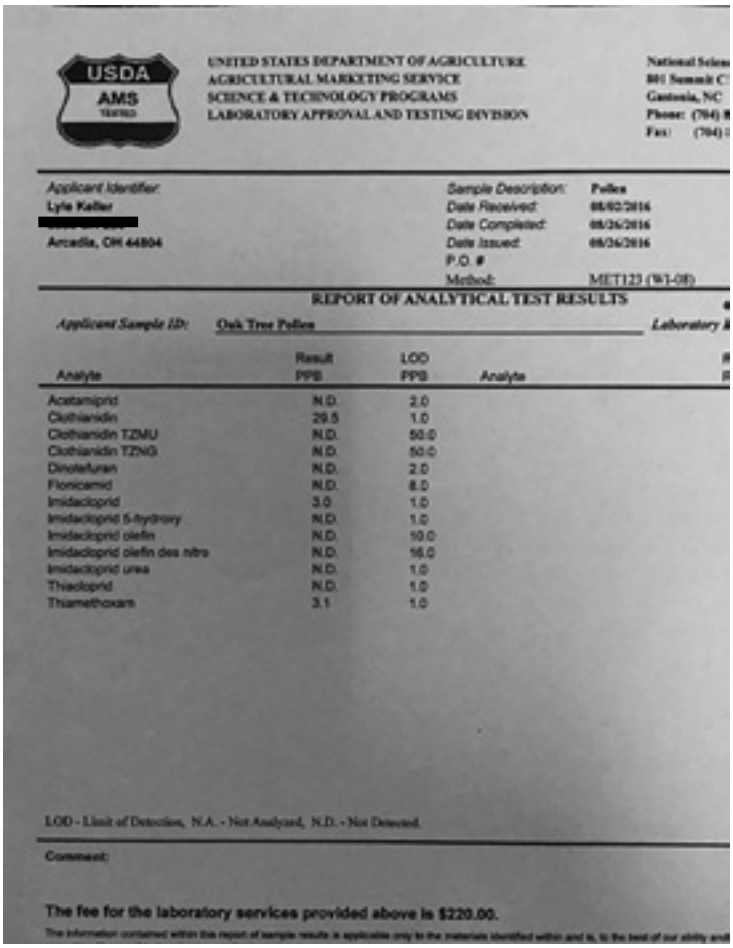
The proponents of pesticides have long pointed to the continent of Australia as proof that the primary problem facing the honey bee is the *Varroa* mite, not pesticides. Australia is the only continent upon which honey bees are found, but the *Varroa* mite has yet to become widely established. Australia meanwhile has seen neonicotinoid pesticides used on the continent for many years and no CCD-like problems have been reported by beekeepers in all that time – until recently. According to Des Cannon, the editor of the Australasian Beekeeper magazine headquartered near Queanbeyan, in south-eastern NSW, Australia, "In regard to bee losses in Australia, there have been no *documented* large scale losses of bees such as in Europe or the U.S. Any localized bee losses (of the order of 25%) have generally been attributed to Nosema (primarily *Nosema apis*), but losses here are generally less than 15% (15% is regarded as high but natural). Victoria did have a large problem with Nosema in August a couple of years ago.

"That said there have been many anecdotal stories of bees failing to thrive on Canola, and commercial beekeepers are telling me that they now regard losses of 30% as becoming normal. I am also being told by two of our most respected beekeeping families that they now requeen any hive that has been to Canola. My own experience, and this is backed up by the anecdotal evidence, is that this trend toward 'lack of thriving' has been associated with the increase in use of neonics. The farmers I talk to outside beekeeping have told me they find it almost impossible to obtain Canola seed that has not been seed coated," says Cannon.

Cannon recognizes that, "In the past, bees would always be at swarming pitch after Canola, but over the past few years that has definitely not been the case. Many beekeepers have blamed the Gaucho seed treatment of Canola seed for this, but there has been no scientific evaluation of these claims. There could just as easily have been a shift in the bee's ability to utilize the Canola as a result of changes in Canola varieties, for example.

He continues, "I think it would also be fair to say that beekeepers in Australia are fortunate that we produce 70% of our honey from native flora, particularly Eucalyptus, and that these plants also provide a good supply of high-quality pollen. We also have a diverse range of weeds in our agricultural environment. There is little need for supplementary feeding in Australia (except on some species of Eucalyptus), although beekeepers would benefit from targeted supplementary feeding – myself and some other commercial beekeepers have certainly done so, and reaped economic benefit; but Australian beekeepers generally have not accepted that there is economic gain to be made. This aside, the bees survive generally in a good state of nutrition, which reduces the possibilities for large scale bee losses. I would add, however, that the landscape is changing with climate change, mainly because of changing rainfall patterns."

Thus it appears from Des Cannon's comments that although the majority of bees in Australia forage on native



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Applicant Identifier:
Lyle Keller
[redacted]
Arcadia, OH 44804

Sample Description: Pollen
Date Received: 08/02/2016
Date Completed: 08/26/2016
Date Issued: 08/26/2016
P.O. #
Method: MET123 (WI-08)

REPORT OF ANALYTICAL TEST RESULTS

Applicant Sample ID: Oak Tree Pollen — Laboratory

Analyte	Result PPB	LOD PPB	Analyte
Acetamiprid	N.D.	2.0	
Clothianidin	29.5	1.0	
Clothianidin TZMU	N.D.	50.0	
Clothianidin TZNG	N.D.	50.0	
Dinotefuran	N.D.	2.0	
Flonicamid	N.D.	8.0	
Imidacloprid	3.0	1.0	
Imidacloprid 5-hydroxy	N.D.	1.0	
Imidacloprid olefin	N.D.	10.0	
Imidacloprid olefin des nitro	N.D.	16.0	
Imidacloprid urea	N.D.	1.0	
Thiacloprid	N.D.	1.0	
Thiamethoxam	3.1	1.0	

LOD - Limit of Detection, N.A. - Not Analyzed, N.D. - Not Detected

Comment:

The fee for the laboratory services provided above is $220.00.

Lyle Keller learned that it is always advisable to send samples to more than one lab when having pesticide residue testing done. Unacceptably high concentrations of neonicotinoids were found in the samples tested by USDA and EPA labs, while the results from state testing of similar samples found no contamination at all."

flora (eucalyptus), the increasing use of neonicotinoid treated Canola seed seems to be having an impact on the overall health of the honey bees down-under, undermining the argument that the situation in Australia is proof that *Varroa* is the primary cause of the world-wide decline in honey bee health and not pesticides.

A similar scenario appears poised to play out on the island nation of Cuba, where honey bees have been thriving for decades in an environment where *Varroa* are common-place, but pesticide use has, until recently, been non-existent. (*Bee Culture* April 2017)

Correlation Does Not Prove Causation

Clear evidence that the dramatic increase in honey bee colony losses coincides with the rapid increase in the use of neonicotinoid pesticides comes in the form of a study published in the journal Science and Technology. This research documents a dramatic increase in neonicotinoid use right around the time the U.S. beekeeping industry started experiencing a dramatic increase in honey bee colony losses. (Douglas and Tooker, 2015) Similar findings have been uncovered in Europe where "...a positive relationship with honey bee colony losses such that increased regional usage (of imidacloprid) was linked to higher honey bee colony losses (Budge, 2015)

In every country where neonicotinoid insecticides

have been introduced, mass bee deaths and hives that "fail to thrive" have eventually followed. In rare places where they are not used, which besides Cuba include The Hebrides islands off the West coast of Scotland and the Orkney Islands to the North of Scotland, no mass bee deaths have occurred. Apologists for the pesticide industry are quick to point out that such correlations of neonicotinoid use and honey bee losses do not prove causation. However, it is also true that you can't have causation without correlation. We know that these insecticides are highly toxic to honey bees; we know that the bees are getting exposed to these chemicals through numerous channels; and we know that despite the best efforts of beekeepers, honey bee colonies are dying and dwindling in record numbers.

Despite all this evidence, you will still hear people claiming that *Varroa* is the primary cause of honey bee losses. The reality is that *Varroa* does not kill hives within a few weeks, nor does it leave empty hives and vanished bees. Hives that collapse from *Varroa* do not show symptoms of delayed scavenger activity, where other bees, hornets, wax moths, or small hive beetles stay away from the collapsing colony for weeks. Nor can *Varroa* be blamed for the fact that many of the 4,000 or so species of native wild bees in the United States are disappearing much faster than honey bees. Honey bee colonies appear to die from a plethora of diseases, but the evidence strongly suggests that the primary cause behind their deaths is neonicotinoid pesticides. Without an immune system, bees succumb to whatever knocks on the door. Even though scientists have unmasked neonics as a primary killer EPA, USDA, CropLife, the White House, and even state bee inspectors and extension services attempt to sweep it all under the rug. We'll take a closer look at pesticide regulation and the economic environment that has led us to this moment in beekeeping history next month. BC

Ross Conrad is the author of Natural Beekeeping: Organic approaches to modern apiculture, Revised and Expanded 2nd Edition

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Marina Marchese

Toni **Burnham**

Learning The Language Of Flavor

When she was born, Marina Marchese must have entered the world taste buds first, because that is the way in which she entered the world of bees and honey, and how she hopes to help you understand it, too.

Marina is an author (*Honeybee: Lessons from An Accidental Beekeeper,* and co-author with Kim Flottum of *The Honey Connoisseur: Selecting, Tasting, and Pairing Honey*), designer, trained expert in the sensory analysis of honey, and founder of the American Honey Tasting Society. Every year she trains beekeepers in tasting and evaluating their products, and to see the world of honey through a new lens. She is a honey *sommelier*, an expert in tastes and pairings and beautiful experiences only available through the shared work of human and bee.

"You have got celebrity chefs on TV in the news, going to farms. Picking out their own vegetables, visiting slaughterhouses, picking out organic grass-fed this and that, and they've got their favorite beekeeper! We're in a food renaissance where the chef and the restaurants are king. Why wouldn't beekeepers want to make that connection with the consumer and the foodie and the chef and be able to talk that language with the chef and say, 'the honey is very light, it's got a very fruity butterscotch nifty note?' Why wouldn't beekeepers want to make that connection? It is only to their benefit!"

"I have been a beekeeper for 17 years and I kind of straddle the line between beekeeping and food, and from what I see it is kind of a unique position"

"You've got all these really great beekeepers that are producing really excellent honeys, but I find that many really don't know enough about honey as a food, as a flavor. That's where I straddle the line in knowing about bees and about floral sources, but I'm a foodie at heart."

"I went through all the steps of learning beekeeping: managing pests and diseases, splits and swarms, and so on. Coming from the arts, as well, I was of course really excited and interested in beeswax and in crafting skin care products and candles. But honey is truly what most intrigued me early on."

"And then I couldn't find any information about it! That search is what led to writing *The Honey Connoisseur*. In fact, however, that book was written before the first book I published, *Honeybee: Lessons from and Accidental Beekeeper*."

"Back in 2003, I went to the National Honey Show in London seeking information, and was disappointed that beekeepers were passionate about honey as a food, and interested in being discoverers of flavors and matching flowers to flavors. It became my passion, and my mission to figure this out."

"I wanted to come to some sort of understanding, to find a resource, a database, to answer the question of 'Where's that information?' Well, it didn't exist. After the honey show, I did extensive research on Eva Crane: she wrote a lot about honey and was probably the most prolific writer on the subject. But she never talked about flavor!"

"I turned to the research of Jonathan White of the FDA, who wrote hundreds of papers on honey in the 1950s and 1960s, but who again did not address this concept of flavors and flowers, and where to find them and what they taste like."

"That's what led me to Italy, where I stumbled upon a class that they were doing on honey. Early on, I saw that it paralleled the appreciation of wine. I'm a wine person, I'm Italian, I'm a foodie: I grow food, I cook food, this is where my head is. I was very excited. I thought, 'Maybe this is a new road where I can see what's happening.'"

"In these tiny local shops in these small medieval towns, they would sell honey alongside the olive oil and

wine. That's something that would never happen in the U.S. You would never go out to buy a bottle of wine in the United States, and 'Oh! By the way, get some olive oil and honey.' That just doesn't happen here."

Why not in the U.S.?

"Remember, we are talking about local, small batch beekeeper honey. We are not talking about commercial honey, which is completely different. I think you can, though education, change beekeepers' approach because what they are producing is gold! Though many complain that they can't compete with $3 Chinese honey in the plastic teddy bear, all you have to do is put yours side by side." "You don't have to be an expert to taste the difference between beekeeper honey and commercial honey. And you know, beekeepers need to be able to talk about honey and to explain the floral sources and the seasonality of it to the consumer, and just let them taste it side by side. If that person doesn't want to spend $10 or $12 dollars on your honey, they aren't your customer. You have to go to where the people are foodies, people that are interested in quality."

In cities, yes, or online?

"That may be part of it, I think. Beekeepers that are not in affluent areas may not think that they can get that premium. Beekeepers may have to think outside of the box, be innovative and put up a web site. To learn how to market and sell their honey, to package and ship it. To reach out to chefs and to gourmet shops in their area. If you want to get in the trade of selling honey, you will have to learn some of the business side. I understand that many beekeepers see themselves primarily as farmers or hobbyists, not business managers, so it can be a decision about whether you are in it for fun or also for money."

"All of this is based upon the training that I had in Italy. It is mind boggling what they have done: they have picked apart honey in the manner that we have used to talk about coffee, tea, or chocolate. They are 30 years ahead of us in evaluating honey, taking it to the point where you can look at a honey and taste it blindly and be able to identify it."

"I don't think here in the US that people yet understand the depth and the breadth of the evaluation process for honey. You need to sit in a class, or sit yourself down and learn this stuff. I offered this just recently at EAS in Delaware (2017). We had 20 people signed up, and then they asked for a second talk. There was a waiting list for the first one, and then a waiting list again, but we were out of time and could not do anymore!"

"[During the classes,] People sit in and find it incredible to see just how much there is to know about honey that has either been lost or not developed here. We have a lot of work to do. Beekeepers can learn a lot to create a better product and market it, and to connect consumers in a more intelligent way."

Honey judging* is not *honey tasting

I know that there is a honey judging culture in the US, and I did go to the University of Georgia to take the beginning of the Honey Judging Class. I was a little bit disappointed because I came from a place of food, and there is not a lot of emphasis on flavor. The judging tends to be much more about preparation for the bench. You know, you can't have fingerprints on your jar…"

"I was to judge the Black Jar Contest at EAS. You don't have to be trained judge (though I am a trained judge in Italy–they do it very differently). I tasted about 30 honeys, and some were really good and some were not. We took notes. I felt like the honeys in which I was able to taste a defect–like those that were overheated or had rust or grit in them – perhaps my tasting notes were really going nowhere unless I could actually help the beekeeper? Like there were a couple of samples where I said, 'I would like to sit down with the beekeeper and talk to them, to help them to make a better product for next year.'"

"Next to me some other judges were evaluating a frame of honey comb, and it was a poor-quality sample. They took their notes, they critiqued it, but the only way that that beekeeper is going to learn is if the educated, trained judge can sit down with them and say, 'this is what we look for, this is what you need to do, this is what went wrong, this is what the bees did not do, and next time it should look like this.'"

"The judging protocol in the US is established, extending back to Roger Morse in the 1940s, but in the future, we, as a country and a culture, could go more deeply into this food renaissance: honey has got to catch up! . . . Now, honey is judged light, medium, and dark. But in the "Light" category, for example, you are going to have things like a Black Locust or a clover honey, which are different. In my mind, and as I was trained in Italy, you are judging apples against oranges. How can you do that? They are both going to be light honeys, but they have different flavor. They don't belong in the same category."

"Talking about the dark categories: if you are submitting honey in the category of the dark ambers, you are going to have things like buckwheat and avocado, maybe Tulip Poplar, maybe bamboo. If you have got those four very different dark honeys, you can bet your bottom dollar that buckwheat is going to lose, because that honey is going to split the room! Some love it, some hate it. Then you have avocado, which is very dark, and a very bitter honey. On the other hand, everybody is going to love Tulip Poplar and red bamboo honey, which are also dark. It doesn't make sense–in my brain – how we can judge honey by color. You should be judging by floral source or flavor."

"I want to repeat: I am not criticizing, just a little confused. It doesn't make sense in my head to judge by color or even by region. Here in New England, we have like five different honeys, and they go from very very light to very, very dark. Many variations of medium! If you are going to judge honey by this region, you are going to have Black Locust, which is extremely light, compared to buckwheat, which is really really dark. There will be medium, middle, super floral with earthy malty tones, all in the same category. We have such a diversity of flavors AND colors, so it is really going to be a personal opinion if you are going to judge honey by region."

"We have also not done the work here on how honey conforms to particular floral sources – meaning, nobody has done the complete pollen and chemical analysis of enough samples of any particular honey to be able to definitively say 'This is goldenrod honey' or 'this is orange blossom honey.' In Italy, we were trained on almost 50 different honeys. Once you have that training you know what this floral source honey should taste like. You have a database in your mind and in your nose that you can take to other honeys."

I am doing classes about twice a year…but we also do like a newsletter and we reach out to the mead people and the food industry. We've had people come from all over the country, and we've had people come to our classes from Canada and Mexico."

What happens in class?

When we talk about tasting honey, we start even before actually tasting it. We talk about how we taste: how to use your nose, and your tongue. We teach them the psychology and the physiology of tasting: 'What is the difference between taste and flavor?' And there is a difference!"

"Without going into a million details, we also teach the psychology of tasting: how your body reacts to smells and flavors. There are tasting exercises, some smelling exercises. Then we present the group with 12 honeys from known floral sources. We teach them the methods of evaluation: visually, then we do aroma, then flavor, then texture. We walk through a method for sort of a schedule, a process of how to evaluate honey."

Like the Tasting Wheel that breaks out a wider vocabulary and set of concepts for tasting and comparing honeys!

I search online for samples to use for my classes, and I come across some very interesting floral sources. Then when I try to get a description, the beekeepers just say things like "it is delicious" or "it is surprising." They have no vocabulary, and that is where the honey wheel comes in, to teach them how to talk other than saying 'It's good.' Or 'sweet.' Or 'delicious.'"

"I've had the opportunity to taste some honeys that literally taste like licking an ash tray, or the most sweet-fruitiest-lightest. For me, every honey has a story, every honey has a value, every floral source has a story about that region, the flower itself, even the beekeeper comes into play as part of the story of the honey"

"But you know, honey still needs to get a little bit more respect in the culinary world. Honey is more complex to produce than wine and olive oil."

If we don't respect it, they don't respect it.

"Exactly. As more people get interested in a protocol for sensory evaluation of honey, we are going to get more respect. You meet people who say, 'I don't like honey' and the first question I have is 'what kind of honey did you have?' 'Oh, I had the teddy bear in the grocery store.' You must immediately be able to whip out a bottle of honey, no matter where it is from, and let them taste it. Most of the time they say, 'Hah! I do like honey!'"

"People just need to know about good honey. They just need to know." BC

Toni Burnham lives and keeps her bees on roof tops in Washington, DC. She is one of Bee Culture's *regular contributors.*

It Took 50,000+ Dead Bumble Bees . . .

Dewey **Caron**

In Wilsonville, Oregon there was a massive kill of bumble bees in the parking lot of a Target store on a Sunday morning in mid-June, 2013. Over 50,000+ bumble bees, mainly of one species (*Bombus vosnesenskii*), foraging that morning on 55 flowering European linden trees (*Tilia cordata*) shading the parking lot contacted the neonicotinoid dinotefuran (product name=Safari), applied to kill the aphids feeding on those same trees.

The sap-feeding insects excrete the majority of the plant sap they suck up to get rid of the excess sugar they take in. Beekeepers know their exudate as honey dew. Customers of the store know it as the "sticky stuff" that smears their windshields.

Oregon Department of Agriculture and Oregon State University experts were called, along with Rich Hatfield, a bumble bee insect conservation expert of Portland-based Xerces Society, to assess the damage (see website **https://xerces.org/the-wilsonville-bee-kill/** for links to initial and a number of subsequent reports on the kill; I discuss the incident in previous *Bee Culture*, June 25, 2013).

The bumble bees, from an estimated 300 bumble bee nests, were likely flying to the parking lot from an immediately adjacent farm that was in the third year of red clover seed production. Such fields have elevated numbers of voles, whose tunnels provide excellent nesting habitat for bumble bees. Any other parking lot, at any other site, and the killing of such large numbers of bumble bees would not likely have occurred.

With their own investigation, the Oregon Department of Agriculture found the pesticide in dead bees and subsequently restricted the use of four neonicotinoids, dinotefuran, imidachlorprid, clothianidin and thiomethoxan for use on linden trees. The spray applicators were fined – less than $1000 each.

So what else happened?

This "accident" set in motion a number of diverse activities. There was point of sale picketing in protest of neonicotinoids and general public "protest" activities meant to "speak" on behalf of the bumble bees and raise awareness of pesticide dangers. More recently introduction of the OR Pollinator Protection Act, an effort similar to one passed in MD, to limit the sale of neonicotinoids to individuals not trained in safe use of pesticides was proposed as legislation. Unfortunately, this bill did not get out of committee during the most recent session.

More substantively, the Oregon Legislature established an eight member Pollinator Task Force. By the end of 2014, this Task Force sent a couple of consensus opinions to the Legislature that called for expansion of pollinator outreach and education, and support for new research on pollinator health. Note: several other recommendations did not result in a consensus but were included in the report: read task force report at: **https://olis.leg.state.or.us/liz/2013I1/Downloads/CommitteeMeetingDocument/41335**.

Also in 2014, in Washington, DC, President Obama signed a Presidential Memorandum creating an Interagency Task Force to create a strategy to promote the health of honey bees and other pollinators. **https://obamawhitehouse.archives.gov/the-press-office/2014/06/20/presidential-memorandum-creating-federal-strategy-promote-health-honey-b**

With this background, the 2015 Oregon Legislative agenda included three(3) bills for Legislative action. The three Oregon House Bills, numbers 3361, 3362, and 2653 were passed based on the Task Force recommendations (summarized below). The full text of HBS 3361, 3362 and 2653 may be accessed at: **https://www.oregonlegislature.gov/bills_laws**.

- *HB 3361: Make available to the public best management practices (BMP) to improve pollinator health for native and managed pollinators in urban, roadside and agricultural areas throughout Oregon.*
- *HB 3362: Develop educational materials and an outreach and education plan outlining the best practices for industry and the general public in the use of pesticides. Additionally develop a safety plan for pesticide applicators that protects honey, bumble,*

native bees & other pollinators toward avoiding adverse effects of pesticides on pollinator populations.

- *HB 2653: Develop guidelines, educational materials and best practices for beekeeping within urban, residential and rural residential areas, including recommendations for ordinances to mitigate nuisance conflicts.*

To provide leadership and focus for the bills passed, the legislature looked to Oregon State University and Oregon Cooperative Extension for implementation. Dr. Andony Melathopoulos, an expert on bee pollination, was hired, after an International search, as Cooperative Extension Pollinator Health Specialist at OSU, at the end of 2016. He specifically was brought on board to focus on improving the health of honey bees and other pollinating bees.

Andony Melathopoulos brings 15 years of experience to this new position. He came to OSU from a post-doctoral position in pollination ecology at the University of Calgary in Alberta, Canada. He completed an interdisciplinary PhD at Dalhousie University, Halifax, Nova Scotia (2015) and a Master of Pest Management from Simon Fraser University (1999). He was an Honors scholar at Simon Fraser as an undergraduate, doing a pheromone project under Mark Winston. In between, he was a technician in Agri-Food Canada's Apiculture Research program (2000-2012), Beaverlodge, Alberta. His PhD included studies of bumble and honey bees in lowbush blueberry fields in Atlantic Canada and Maine and his post-doc was of honey and leafcutter bees in canola in the province of Alberta.

New beekeepers are often not aware of how the Cooperative Extension Service helps beekeepers. About 25 U.S. Universities have Extension Bee specialists, located at their State supported (Land Grant) University or one of the regional research/extension station sites. Most of the 3142 US counties (includes parishes in LA, boroughs in Al + a few cities) have County Extension agents; a number are beekeepers or are sufficiently knowledgeable that they service local beekeeping associations. Few University Bee specialists (exceptions are UC Davis and Penn State) concentrate only on honey bees as their major responsibility.

Dr. Melathopoulos' extension position at OSU is a bit specific and unusual. The position is part of a $14 million commitment to pollinators authorized by the 2015 Oregon Legislature. Funding also implemented a diagnostic lab under honey bee specialist Ramesh Sagili and operational funding from registration fees for pesticides.

Andony's specific task is to design, develop and implement a multi-disciplinary Extension program in pollinator health, with a focus on collaboratively developing and disseminating educational materials, such as Best Management Practices (BMP). The overarching aim is to enable stakeholders to adopt practices that will have a positive impact on pollinator health that support Oregon agriculture and environmental sustainability.

Unlike traditional honey bee extension that focuses on beekeepers and growers of pollinator dependent crops, the mandate for OSU Pollinator Health Extension is *broad* engagement around issues of pollinator health. In part, this broadened scope is the product of the specific issues that arose in Oregon, namely landscape practices impacting native bee populations combined with broad public concern around the plight of pollinators *generally*. But the mandate of the OSU Pollinator Health program also reflects a widened public focus to include not just honey bee, but native bees, and not just agriculture, but additionally urban land management.

Another uniqueness of the OSU Pollinator Health program is a close integration with state agencies, such as the Oregon Department of Agriculture and Oregon Department of Forestry. In many states pollinator health plans have become the domain of either the Department of Agriculture or land grant Universities. In Oregon, state-wide pollinator health activities are closely coordinated between OSU and state agencies in the Oregon Bee Project (**www.oregonbeeproject.org**).

The goal of the Oregon Bee Project is to produce an active and engaging set of initiatives that connect beekeepers, land managers, pesticide applicators, native bee enthusiasts, conservationists and gardeners into a coordinated set of activities. "We want to give individuals the tools to keep Oregon pollinator-friendly," Melathopoulos said. "If we do our job right, protecting pollinators will merge seamlessly with people's daily life and work."

As Dr. Melathopoulos explains: "a true measure of [our] activity will be evaluation of change, not merely how many materials are dispensed, how many presentations given or how many reports are generated." He acknowledged that for the Oregon Bee Project to succeed it has to "produce results; people need to see changes and they need to own the process that drives those changes".

The strategy for Oregon Bee Project is to highlight and promote land managers and industries that then develop bee-friendly practices such as Flagship Farms or Flagship Industries. In this way, land managers can take ownership and get credit for developing best management practices. Joining in and enthusiastically participating are the Oregon State Beekeepers Association and native bee conservationists. OSU Pollinator Health is also working with the recently developed Oregon Master Beekeepers programs to train new beekeepers from around the state on these practices.

The activity of Andony is to integrate what has occurred in recent years in rapid growth of residential beekeeping. OSU Pollinator Health has worked with the Oregon State Beekeepers Association to develop best management guidelines for reducing nuisances associated with residential beekeeping. The goal is to reduce nuisance residential beekeeping, not through restrictive regulations, but through a robust educational program.

So maybe 50,000 + bumble bees may not have died in vain. They have become a 'poster child' of what can happen, and is happening in our surroundings. The Oregon Bee Health initiative, from a mandate from our state legislature, is working with a diverse and engaged clientele to help bumble bees honey bees and conservationists and beekeepers to sustainably insure healthy populations of pollinators. BC

Some Carrot Family Bee Plants

Connie **Krochmal**

The Umbelliferae family is a treasure trove of pollinator plants. This group is named for the flower heads, which are typically umbrella-shaped. It contains carrot, parsley, and some commonly cultivated vegetables and herbs.

A number of these perennial or biennial species grown as annuals are good nectar and pollen sources. Parsnip, a biennial, can provide a small honey crop of 10 to 50 pounds per colony. Celery is another good honey plant.

The cultivated carrot (*Daucus carota)* and its naturalized counterpart, the wild carrot or Queen Anne's lace, were introduced to America by the Europeans. Queen Anne's lace grows wild in all mainland states. This species is an excellent source of nectar and pollen.

The nectar flow is best during hot weather and also when the plants are growing in heavy soils. This species can sometimes bring a surplus honey crop of around 65 pounds per colony.

Carrot and Queen Anne's lace honey ranges from white to various shades of amber to dark yellow. Varying from mild to strong flavored, it has a distinctive taste and an aroma much like that of the plants. This honey readily granulates within a few months.

This article provides an in-depth look at three herbs in this family – chervil, fennel, and parsley, all of which are superlative choices for bee gardens. Additional carrot family herbs will be covered in a future article.

Chervil (*Anthriscus cerefolium)*

This herb was originally native to Asia Minor and Western Asia. It was first cultivated in Syria. Chervil was introduced to southern Europe where it naturalized. The common name comes from a Greek word that means "herb of rejoicing."

Chervil was used by the ancients, especially in Europe. The Romans have been credited with its introduction to various parts of the continent.

European colonists brought this pollinator plant to America. It has naturalized in a number of states, including Oregon, Washington, Montana, Illinois, South Carolina, Virginia, Connecticut, New Jersey, Pennsylvania, and New York.

Widely used in ancient Rome, this herb is most popular in France where its main use is in herb blends. For best results, add this mild flavored herb at the last minute to hot dishes for heat diminishes its subtle flavor. Normally, chervil is used in combination with other flavorings rather than alone.

Chervil.

A related native species in Europe and Britain called cow parsley (*Anthriscus sylvestris)* can be used the same way as chervil. It features a slightly stronger flavor than chervil.

Chervil is a superb herb for bee gardens since this tends to bloom rather quickly – usually within six weeks or so from planting, especially during warm weather. Several successive sowings of this can be planted several weeks apart, depending on the climate.

This species can provide a small to moderate honey plant. In addition, chervil is especially rich in pollen.

Description of Chervil

Although chervil has some resemblance to the curly leaved parsley, this annual is more upright. It bears finer cut foliage that is rather sparse when compared with that of parsley.

Reaching 1½ to two feet in height, the dainty looking herb bears hollow ribbed stalks. Deep green to pale green, the very finely divided, aromatic foliage features oval leaflets. The small, white blossoms appear during mid-Summer in flat umbels. The black seeds are pointed and furrowed.

Growing Chervil

Sometimes self sowing, this species is extremely tolerant of frost. Easy to grow, chervil can be planted during the Fall or Winter in warm areas. The plant doesn't respond well to hot weather.

Chervil seeds can also be sown during very early Spring as soon as the ground can be worked. It prefers night temperatures of 55°F or below.

Fresh chervil seeds germinate best. These can be stored for about three years, although the germination rate tends to fall. Avoid covering the seeds.

These will sprout in about 10 days. Chervil doesn't transplant as easily as some herbs. For that reason, use peat pots if you plan on starting it early indoors. This ensures the roots won't be disturbed when transplanting to the garden.

Chervil plants should be spaced eight inches or so apart. Keep the soil evenly moist. The plants experience few insect or disease problems.

This herb prefers light shade, especially in warm climates. It can tolerate slightly more shade than most other herbs. A sandy, rich soil high in organic matter with a pH of 6.5 to 8 is ideal.

Several varieties of chervil are available to gardeners. Curled chervil is a variety that is slightly less hardy than the species. In addition, this vigorous plant is easier to grow than the species. It also begins yielding earlier and provides a larger overall yield. The attractive, curled foliage is milder flavored than that of plain chervil.

Vertissimo chervil is an European variety that is tolerant of cold and heat. The dense, vigorous plants are the same height as plain chervil. The lacy, shiny, flat, deep green leaves offer a very mild, anise-like flavor. This variety tends to bloom late in the season.

Fennel (*Foeniculum vulgare)*

This is also known as sweet fennel. Native to Europe, fennel was used by the ancients. The plant grew in the fields where the marathon or Battle of Marathon took place in ancient Greece.

Charlemagne is credited with introducing the plant to central Europe where it was grown on his estates. The Anglo-Saxons used the plant before the Norman Conquest. In medieval times, people believed the plant could protect them against witches.

The plant was introduced to America by European colonists. It has naturalized in all states except Montana, Idaho, Wyoming, Colorado, the Dakotas, Minnesota, Oklahoma, Arkansas, Mississippi, Indiana, Vermont, and New Hampshire.

Fennel was used as a food and flavoring in ancient times. The young shoots were eaten as a vegetable. The anise-flavored leaves are added to salads. The seeds also serve as a flavoring. The oil appears in perfumes, soaps, and candy.

This nectar and pollen plant can yield a good honey crop, especially in California. The nectar is readily available to bees over a long period. Each of the individual blossoms can provide 0.012 to 0.035 mg of nectar daily.

On average, fennel can bring 25 to 110 pounds of honey per acre. This is light amber.

Description of Fennel

Sometimes grown as an annual, this erect, branched perennial typically reaches four to five feet in height and 2½ feet across. It features a ridged, blue-green stem. The feathery soft leaves resemble those of dill. They consist of thin, thread-like segments.

Fennel.

In California, fennel typically blooms from May to August. Elsewhere, flowering extends from July to October, depending on the location. The very small blossoms are pale yellow. They form large flat umbels, which can contain fifteen to twenty-five single flowers.

The oval, ridged seeds are flat. For culinary purposes, fennel seeds are harvested when they turn brown.

Growing Fennel

Hardy in zones six and higher, fennel prefers full sun. A rich to average, well drained soil is preferred with an alkaline pH of 6.0 to 8. Thriving in light soils, fennel is intolerant of heavy clay and wet conditions.

This herb can withstand frost and heat. Avoid planting it near wormweed or coriander for they can harm fennel. Likewise, fennel can have a detrimental effect on kohlrabi, tomato, bush beans, and caraway.

Fennel is grown from seeds, which should be planted 1/8 inch deep after the danger of frost has past. This herb is typically direct sown since the plant doesn't transplant well.

Sometimes, fennel is started early indoors in peat pots. Avoid damaging the roots when planting these pots into the garden. This plant can experience root rot and nematodes.

Fennel plants should be spaced 12 inches or so apart, depending on the type. A number of varieties are available. Florence fennel is less suitable for bee gardens since the bulbous base would be harvested before the plant has a chance to bloom.

Bronze fennel is a very good choice for pollinator gardens. It is sometimes grown as a hardy annual mainly for the very attractive, lace-like foliage. Initially purplish-brown, the leaves mature to a lovely reddish-bronze or rust. The vigorous, two-foot-tall plant tends to bloom later in the season, mostly from July onward when compared to the species. The flat flower heads contain ocher colored blooms.

Parsley (*Petroselinum crispum)*

Parsley originated in southern Europe, Greece, Lebanon, and the eastern Mediterranean. Once it was brought to America by the European colonists, the plant naturalized in many areas. It now grows wild over much of the mainland with the exceptions being Oregon, Wyoming, Colorado, New Mexico, Arizona, the Dakotas, Nebraska, Oklahoma, Minnesota, Missouri, Wisconsin, Illinois, Indiana, Kentucky, Tennessee, Alabama, West Virginia, Virginia, Vermont, New Hampshire, and Maine.

This is now commonly used as a garnish and herb. Yet, ancient people associated this plant with the underworld and considered it to be "a harbinger of death." According to Greek myths, it supposedly "sprang forth from the blood of Archemorus, the forerunner of death."

Ancient Greeks used the plant in funeral rites. Parsley was also associated with Hades and with the myth of Persephone, who spent part of the year in the underworld.

The seeds are extremely slow to germinate, sometimes taking four to six weeks. This reluctance to sprout gave rise to the saying that "it goes nine times to the Devil and back before breaking into leaf."

The ancient Romans used the leaves, stems, and seeds as flavorings. One of King Henry VIII's favorite foods

Parsley.

was parsley sauce. The root of the flat leaved variety is also used to flavor foods.

Parsley is a source of nectar and pollen. It can bring a modest honey crop of 55 pounds or so per colony.

Description of Parsley

This much branched, hardy biennial is typically ½ to 1¼ feet for much of its life. Once parsley begins flowering, the plant's height can easily double. The leaves can be either flat or curl, depending on the variety. Around 300 B.C.E., Theophrastus, the Greek writer, provided descriptions for both types.

Parsley normally blooms the second year. However, if the first Summer is very warm and dry, the plant can bear blossoms. The usual blooming period is from late Spring to early Summer. The greenish-yellow flowers form flat clusters.

Growing Parsley

Hardy in zones three and higher, parsley is cold tolerant, but abhors hot weather. Grown from seed, the plant can self sow. It prefers full sun or light shade.

A slightly moist, deep, reasonably rich, well drained soil is ideal. The preferred pH range is 6.0 to 8.

The plant can be direct sown or started indoors in peat pots. To hasten germination, there are several options. Methods that seem to work well are freezing the seeds or soaking them in boiling water before planting. Fresh seeds sprout the best of all, so avoid using old ones.

Wait until the soil has warmed to 50°F before direct sowing, which is typically done three to four weeks before the last frost. Plant the seeds ¼ inch deep.

Space parsley a foot or so apart. Seedlings that are started indoors can be transplanted outdoors about two to four weeks before the last frost.

Keep the soil evenly moist for parsley. Potential diseases of this herb include crown and root rot. The most common insect problems are caterpillars-especially the parsley worm, and carrot weevils.

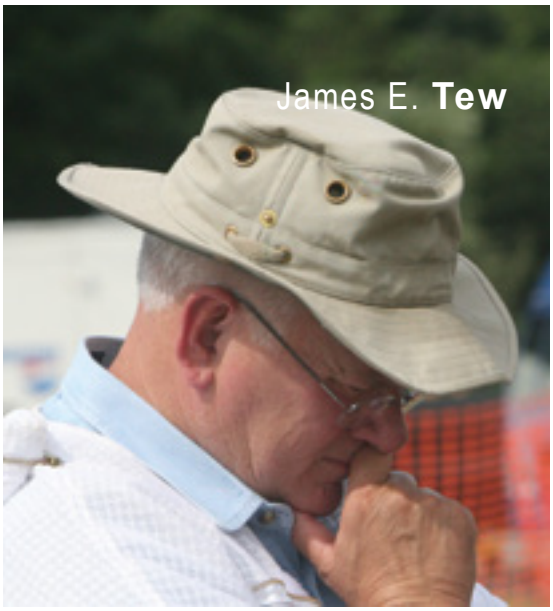
A large number of parsley varieties are available. The two that are best suited to bee gardens are the following.

Moss curled leaf parsley is a popular, traditional variety. Improved strains of this are available. The vigorous, compact plants are typically less than 1½ foot tall. This variety can tolerate light frost. Easy to grow, it adapts to most regions. The deep green, uniform leaves are so tightly curled that they look almost mossy.

Plain leaf parsley is another widely grown, standard variety. The erect plants are vigorous. This heirloom dates to the early 1800s. It bears shiny, vivid green, flat, long-stemmed leaves, which are flat and finely cut.

Connie Krochmal is a long time plant writer and beekeeper. She has recently relocated to Kentucky.

Beeyard Thoughts, Observations, and Updates



Conflicted beekeepers and invasive plant species.
The inspiration of talking to super-senior beekeepers.
Odds and Ends.

I'm conflicted about my bees and invasive plant species

I've tried to start this piece three or four times. I'm having trouble hooking it. I know my thoughts, but I can't assemble the words to describe them. In fact, on earlier occasions, I have tried to write about these devilish invasive plants. I didn't do very well writing the other pieces either, and I am already worried about the success of this one.

As a disclaimer, I'm not writing as any kind of plant or forage specialist, and I have an admitted bias in favor of bees. So, I'm writing as a typical beleaguered beekeeper with ever dwindling food resources for my bees and their uncontrollable foraging visits to undesirable plants. From that stance, it's a bit dicey for me to stay objective, but I do try.

I confess that there are several forms of *"me"* all packed into my one body. These different *"me forms"* regularly argue amongst themselves about issues like goodness or badness of nectar producing invasive plants or logging beautiful old Oaks so I can have clear and blemish-free woodworking lumber. I want it both ways. I want beautiful forests with grand Oaks, but I also want high quality, clear boards for my furniture projects.

In a similar manner, I want the environment of my youth returned to me. There was simply more *"growth"* everywhere. There were more insects – both good and bad – everywhere. Weeds, grass, and sapling trees were everywhere on our farm. There was a significant quail population in Alabama, but strangely a much smaller deer herd. Now the quail population, on our family farm, is at zero so far as I can tell. At the same time, deer are nearly pests. The primary reason seems to be changes in farming practices.

I am conflicted. In the last few decades, we have become amazingly adept at destroying more "weeds" than ever before. *"Oh, that's good!"* Well, it is if you hate weeds; however, weed flowers are frequently beneficial to insect pollinators, so this success at weed destruction seems bad to others including me. On one hand, applicators – both professional and homeowner – have ready access to convenient chemicals and application equipment that will kill *"weeds."* That technology is not going away. We beekeepers will have to find ways to work around it.

Are we crying crocodile tears?

Now, across the country, lawns, roadsides, fence rows, and fallow fields are cleaner and neater – possibly even sterile – for insect visitors. We have the technology and an evolved human culture that has changed through the passing decades. We have commercial companies that are superb at keeping our lawns lush and weed-free. Or should that be written, lush and sterile?

Are lawn care providers a bit villainous? Nope. Our homeowner culture wants this service. It's where we are at this point in cultural development. I suspect if masses of lawn-loving people wanted a clover-based, lush lawn, there would be clover lawn care sources that could deliver it.

Why all this rant about lawn care? Because as beekeepers, we do a similar thing. We cry crocodile tears about invasive plants that help our bees.

Invasive, nectar/pollen producing plants are seemingly in every area of the country. In some instances, beekeepers had a hand in the distribution of various invasive/exotic plants. I would argue that our involvement has been tiny compared to larger schemes that spread

Chinese Tallow Tree. It does not look like a killer tree.

these unloved plants far and wide. For instance, I thought that Chinese Tallow trees were primarily distributed by beekeepers just a few decades ago. In recent times, maybe they were, but apparently, it's on record that Ben Franklin had a hand in introducing these plants into our country in 1776. They have been here for a long time.

Though Chinese Tallow is a major invasive in many southeastern states, confusingly, it has positive uses and ornamental value. Regardless, this plant is not wanted by agencies that try to control such invasive plants. It aggressively eliminates local flora, and it's a tough survivor. One of *me* does not want these trees, but another *me* can't help but notice honey crops beekeepers get from these plants. Isn't it interesting that you can easily purchase this plant on the web? Piece of cake. One group hates them while another group sends them across the country.

Plants such as Autumn Olive, (primarily nectar and blooms April-June), Purple Loosestrife (nectar and pollen, essentially blooms July-September), and Chinese Tallow tree (primarily nectar and blooms from April-June) provide sustenance for our bees at a time when vast amounts of other sources have been destroyed for agricultural and cosmetic reasons. Contorted reasoning is the current result. Society does not want either weeds or invasive plant species, but that same concerned society does want bees everywhere to thrive. Prithee from where? If we could get back to our industry high colony numbers back (about 5.7 million), they would very nearly starve to death in this changed environment.

You see? I have finished where I always do.

New beekeepers, we are faced with a conundrum. All the old beekeepers already know the situation. I do not want the general environment mightily altered by these plant squatters. Birds, fish, other aquatic systems, plant diversity, and wildlife are negatively affected by these invaders. But, these undesired plants *are* out there – and have been out there for many years – bribing our pollinators with tantalizing food rewards, rewards our bees can no longer get from destroyed weed species. Much like punishing the entire class for the malfeasance of a single student, neither can we withhold pollination activities from all plants in an effort to harass invasive plants.

Probably to the annoyance of other groups, my only option – I cannot speak for all you readers – is for me **not** to propagate these plants in any way. I will not order or transplant. I will not nurture them. Indeed, on my parent's property, I have worked for years to eradicate Chinese Tallow that I initiated there 25 years ago. It wasn't wrong then. I had Dad's three acres completely free of Tallow, but my brothers and I have since sold the property. The Tallow tree seeds on that property will begin its recovery in just a few months as spring arrives. They will have won those three acres back.

But I cannot speak for my bees. They will be out there searching for food anywhere and everywhere. They will not differentiate between good and bad plants as it concerns invasives. That's what they do – they pollinate. Please remember that it is not just our honey bees. Many insect pollinators visit these plants. Somebody needs to do something about invaders of this type, but I am not sure it will be beekeepers. What's your opinion?

The inspiration of chatting with super-senior beekeepers

There's no smokers involved--no suiting up. Indeed, there is rarely – if ever-any bees, but there certainly was at one time. These beekeepers who are in their upper eighties or anywhere in their nineties are the ones to which I am referring. These people are tough and genuine. They have lost friends and family, but they have survived to this point. Frequently, they do not live in their original home.

To them, most bee things are memories. There is little concern over anything *Varroa* or any other current bee problem. Their bee world is the accumulated memories of a lifetime of youthful beekeeping exploits that happened oh so long ago. As it were, their bee contributions are amber, pleasant memories. They do not offer to help in your apiary. They only want you to listen as they talk of their bee days.

Like a good story, these people remember beekeeping before it morphed into the modern procedures of today. There was very little plastic anywhere in beekeeping during this time (older beekeepers seem to be mostly male in my experience) and protective clothing was very nearly primitive. There were rewarding honey crops during most seasons and swarms were disgustingly plentiful. Queens were cheap and readily available. Southern states like Alabama and Mississippi had small sized queen producers across the state. Hauling bees on a 1943 flatbed Chevy with a 6-volt headlight system provided stories and memories.

These beekeepers "lined" bees for real need and not just pleasure. Like coon dogs, the kids who are now super-seniors were sent across hills and dales to chase bees, not raccoons. Dad, the long-passed beekeeper would operate the lining box. The beekeeping family would move as a predatory group *"following the bees."* When the tree was found, ideally it would be cut down and the "gum" carried home (on the 43 flatbed).

These bee gum keepers would improve their operation by building box hives; a change that was then considered to be moving up. Today, there are hive versions that, in some ways, approximate these box hives by allowing bees to build free comb.

Yes, beekeeping had already moved beyond this phase if you had the money and accessibility. Early versions of

Seeley Lining Box.

There are still a few beekeepers in the southeastern U.S. who can remember apiaries like this. I came in at the "bottom of the ninth." I only remember a single box hive apiary and brother and I destroyed it to "make it modern."

modern equipment were available. Many of these early keepers were only doing what their beekeeping parents had done. The procedures did not need updating. I treasure these rare conversations, and today you and I stand on their shoulders.

Odds and Ends

Novel insulation board use

Last evening, Eric M., an Ohio beekeeper told me that he has had good luck in the past few winters using thin insulation board that he purchased at Lowes. The product is available at most home improvement businesses.

He described a product that is sold in smaller sizes than what I have pictured below, but importantly, the insulation product is folded three times and put beneath the outer cover. He has had no trouble with moisture. He hypothesizes that the individual sheets – folded on each other – mitigate the effects of a warm surface (inside the colony) being directly positioned above a cold surface,

This is not the exact product that was used, but this photo should help you get to the right department. It's thin at ¼ to 3/8's of an inch – depending on the product.

and thereby, reduces condensation. The temperature change is not as abrupt. He also has an upper entrance in the foam board.

This procedure has not been tested in all wintering areas of the U.S., but it's simple, readily available, not particularly expensive and seems to be working for this beekeeper.

The "swarm basket" collapsed.

The "swarm basket" sprung open.

Can this gadget be a swarm basket?

This idea is completely unbaked and not even remotely near a stove. As I was on a forced march with my adult family through a new Ikea in Columbus, Ohio, I saw a collapsible round basket or tote or whatever. In the store, they were storing athletic equipment in it. Another display showed soiled clothing being held in the basket. I immediately saw a swarm transfer basket. *(Truly, it was something interesting for me to evaluate rather than looking at more bathroom fixtures.)*

The open basket is about 17" tall and 18" diameter. The bottom does not open. My hypothetical idea for swarm capture is to shake the bees in the basket. Get as many as I can. I plan to tinker with leaving the closed basket near the swarm to attract some of the strays to the outside of the basket.

Puzzlements & Possibilities

1. Will the exterior bees stay on the basket during the ride home and not roam around in my vehicle?
2. The top screen closes just – okay – at best. There is a plastic rim that encircles the top. I was able to fold that over the top screen circumference to close it snugly. If none of this works, I could (hypothetically) just flip the basket bottom-side-up, and transport that way.
3. When I get to my apiary and wish to get the bees out – just shake them? Will they cling to the screening?

4. While confined, rather than forming a cluster, I expect the bees to cling to the side and top of the basket. Will that be helpful (if the bees do that) in finding the queen?
5. How long can the bees stay confined to the basket? No idea. How would I feed the confined bees if I held them for a while – say while rainy weather passed? I don't know, but I do think there are possibilities.
6. Could I use this gadget to introduce queens? Maybe put a pound or two of queenless bees in the basket. Leave them for a day or so. Confuse them. Shake them. Then drop a queen in the midst of the confusion. I have introduced queens in ways similar to this hypothetical method many years ago. No idea if it will work.
7. If all fails, I will use the basket to store my bee suits – minus smoker and hive tool.

Wow! I did a quick web search and folding baskets are everywhere – but none have tops that I could quickly find. I went to Ikea and the basket was right there. My key descriptors were: Ikea and FYLLEN (Ikea's product designation). It costs $8.00 plus shipping. *But you need to know, and I really hope you understand this – I have NEVER used this basket for purposes I just discussed.* Most likely you would be premature to buy it – unless you also want to tinker with it. I am simply playing with my bees.

Thanks for getting to this point

Well, if you are at this point, you may have just wasted about 30 minutes, but thanks for reading. No matter what you are told, for most cold-season beekeepers the months of December, January, and much of February are a bit bee-boring. Things like the untested basket discussion presented above keeps me engaged while my bees are dealing with Winter. Thanks for reading. BC

Dr. James E. Tew, State Specialist, Beekeeping, The AL Cooperative Extension System, Auburn Univ; Emeritus Faculty, The OH State Univ. ***Tewbee2@gmail.com; http://www.onetew.com; One Tew Bee*** *RSS Feed (****www.onetew.com/feed/****);* ***http://www.facebook.com/tewbee2; @onetewbee*** *Youtube:* ***www.youtube.com/user/onetewbee/videos***

BIGGER PICTURE

Jessica **Louque**

The Business of Bees: Part II of III

In Part I of this series, I explained how to do a Sole Proprietorship for a bee business. It wasn't until recently, particularly speaking at the Voices of *Bee Culture* (in Medina, OH, home of the A.I. Root Company) that I really began to understand that almost nobody who reads my articles understands why I'm randomly installing 500 packages of bees, or moving hives to South Dakota, and then writing about having leftover equipment to build turkey and quail pens. In Medina at the Voices of *Bee Culture* I met Toni Burnham in person and we hit it off pretty well. She asked me to speak for the Maryland State Beekeeper's Meeting in November and their meeting was close enough to Bobby's parents to drop off the kids (who really didn't want to go, except Charlie joined us) and made it a day trip. It was brought to my attention again that not only do people not know what I do, but they don't really know it's in a realm that actually exists.

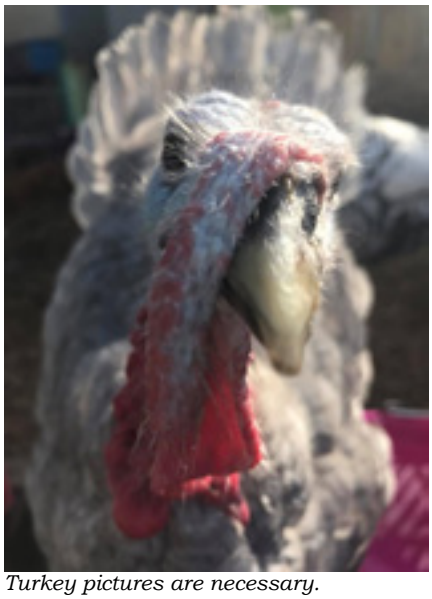
Before I dig in too deeply, let me just give props to the MD Beekeepers. They were excellent hosts and asked great questions. Cybil, their state apiarist, was totally my hero because of her decorating skills and knowledge of bee issues. When we arrived at the entrance to the MD Department of Agriculture, there were two life-sized concrete cows. They had on bee veils with hats and asked for selfies (it was a mental communication from the cows. They told me so). Toni informed me later that this was Cybil's handiwork. Allen, the MSBA president, was a great host and kept the meeting pretty friendly overall. You might wonder why it would need to be kept "friendly" but you might also wonder what I was presenting, which was on the bee business that Bobby and I do, which is contract research for honey bee effects from pesticides.

When thinking about jobs or careers that involve bees, there are the obvious ones that come to mind, like commercial beekeeper for pollination or honey production, businesses that sell packages of bees and/or equipment, and then government or academia that does bee research. My part is a little bit different. Our company tests the effects of pesticides on honey bees for governmental submission as a non-biased third party. I didn't realize until I gave a presentation at EAS in Kentucky that some people didn't know that pesticides have to be tested before they can be registered.

So how does this work for us? Well, I started my university experience at NC State in Spanish and Botany, with a focus on Ethnobotany. I dropped the double major with Spanish because NC State does not guarantee fluency upon graduation with a foreign language, but focuses more on culture, so I took all of the language classes and left it as a minor. I went straight into my Master's a week after graduation in Agricultural Entomology and worked at the NCDA in the Beneficial Insects lab for a few months once my thesis work was complete. My first full-time career-based job started before I had my thesis defense completed and was literally the same work as my graduate research in testing efficacy of pesticides. I was working for a Contract Research Organization (CRO) where an ag-chem company pays an outside company to do the testing on their pesticides. At this time, we were making sure they did what the label said it would do. When this happens, a chemical that is not yet registered is compared to other chemicals that would be in direct competition on the market to see if it works as good or better, or has other benefits (why a customer would buy it instead of a competitor?). This was a bit before the bee research became so dominant in the U.S., but it was not too long before that started. The bee business really picked up in 2010, when some of the companies who produce pesticides realized that the government was going to start calling for re-registration of said chemicals that hadn't been tested for effects on honey bees (which was most of them). Some of them were incredibly proactive in their approach and started producing data before it was asked of them. Some of them didn't want to do anything until they had to, just because of the potential for a PR nightmare. At this point in our society, I can say that their idea was pretty spot-on.

Backing up a little – how does this all work? Some academic research goes into pesticides, but they are also dependent on outside sources for the finances to support their work. Not only are they not capable of meeting the requirements for government submission, but they can't feasibly afford to produce the data on a scale that's necessary to give a true picture of what happens in a realistic setting. These students are on their way to become professional researchers and are there to learn how to design and conduct a study, and learn how to analyze the outcome. This gets them prepared to hit the ground running once they graduate to either stay in a university setting, work in

Charlie and the Beekeeping Cow at Maryland State Beekeepers Association.



Turkey pictures are necessary.

a government lab, or work in the research industry.

For research that is completed by a Contract Research Organization (CRO), it has to be in compliance with Good Laboratory Practice standards (GLPs). This is the baseline for making sure that there is no falsifying of data either for or against the pesticide. The company that produces the research normally has either an auditor on staff (or an entire Quality Assurance Unit [QAU] depending on size of the company), or they hire a contract auditor or auditing company to make sure they are internally compliant. The facility itself has to be inspected for compliance and a good company usually does one inspection a year to make sure they are up-to-date. Besides this, each chemical company will have their own Quality Assurance Unit who will inspect each company that conducts research for them to make sure the CRO meets the expected standards. On top of that, the EPA will also send an auditor as frequently as they can make the rounds (sometimes budget cuts make this spread out farther than the expected three year rotation) to be able to successfully complete studies for government submission. Separately, every single study that is conducted has to be audited at multiple time points throughout the study to make sure all the guidelines are followed. All of the paperwork is audited, and the reports are audited once as a draft and once before finalization. A CRO is considered a non-biased third party because we are not beholden to the results other than meeting GLP compliance. For me personally, I don't care if your chemical causes an effect or not as long as my data is the best and I can defend the final results with a well-run study.

When any pesticide is tested for registration, it has to complete a pretty long laundry list of requirements. Worker exposure for humans, human health risks, mammals in general, amphibians, fish, birds – and then non-target arthropods are at the end. A lot of people who have a lot of issues over pesticides right now either forget or do not realize that these "new" pesticides are designed to be insect specific. While they are effective at killing insects, they are meant to be safer for humans and other wildlife, and have replaced some particularly nasty options for pest control.

By the time we receive the pesticide for our end of the testing, we already know most of the important aspects as far as safety and use. Either we get a chemical that is in the last round of testing before product registration, or we are working on a re-registration of a chemical that was originally registered before honey bees were required on the label for effects testing. In some cases, we take chemicals that have bee effects and see what we can do to mitigate the damage. For example, maybe a chemical causes mortality when it's sprayed during bee flight on blooming flowers, but if it is sprayed at night, the damage only lasts a day or isn't substantial or doesn't have an effect at all. Sometimes it could be that we test an application timing for several different time points in plant growth stages to see how close to bloom it can be sprayed without causing an effect, or how long before bloom a soil drench can be applied. A registration can fall apart in some of these studies if there just is not a way to use the chemical without causing significant effects on honey bees in a time frame that makes it useful for whatever the target was in the first place. If a fungicide is used on blossoms, then it will have to be sprayed while there are flowers on the plant. If that fungicide causes an effect on bees (this is just an example; I've never had a fungicide cause an effect on bees so far) at all time periods that the petals are present, then there's no point in selling this chemical. It will either not go to market or it will have a huge bee warning label that will basically render it dead in the water and unsellable in many states.

I think a lot of these concepts might be foreign to some of the readers and I'm planning to explain more of the testing in future articles. For example, there are tiered levels of testing that have to be passed when working with bees and also setting up the bees themselves (FYI, it's not your normal beekeeping practices, but there are important reasons why). I might also have to inject an article here or there with our beloved turkeys or the stupidly ugly (but cute) baby chicks my idiot chickens just hatched just days before the coldest record-breaking temperatures since last Winter, but I think a better understanding of what happens with pesticides in the industry will help some of you be better informed and form a different perspective about what's happening on a larger scale. BC

Looking at a female pumpkin flower during a residue study.

Jessie Louque is the co-owner of Louque Agricultural Enterprises, LLC and Red Roof Agronomic Services, LLC with her husband, Bobby. Her career as a honey bee research scientist began in 2009 and has grown into a family business of bees. Their businesses run out of Francisco and Mount Airy, NC, with the help of their four kids, a lone dog who is scared of birds, two cats, and an uncountable number of chickens, guineas, turkeys, and quail. Jessie has her B.S. in Botany and her M.S. in Entomology, both from NC State University. Future expansion plans include peafowl, pheasants, cows, and goats...probably.

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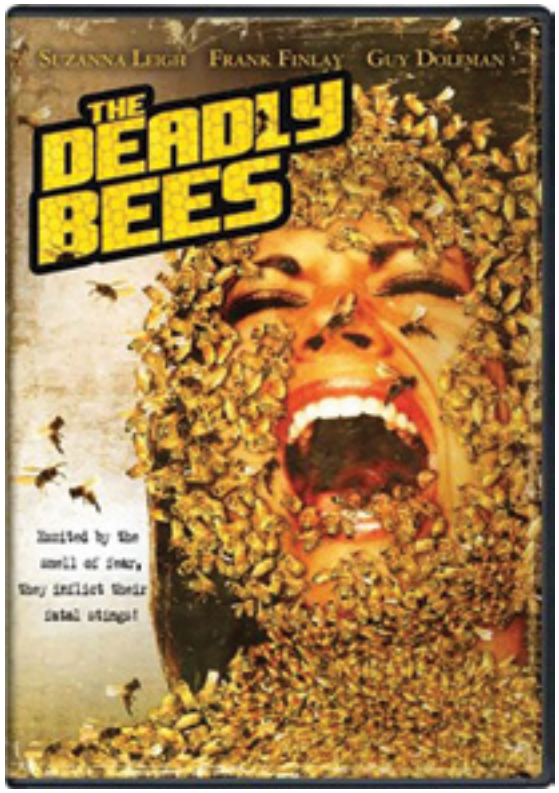
Beesploitation

The Deadly Bees • The Swarm

Ryan **McDearmont**

With their striking coloration and intricate hive aesthetics, it's no wonder that honey bees have become a favorite subject of filmmakers across the world. The unmistakable iconography of the bee has been utilized time and time again in no shortage of movies, often for differing effect. The 1973 Spanish drama film *The Spirit of the Beehive* uses bees as symbolism for an organized ideology, whereas the 2007 comedy *Bee Movie* structures no end of puns and visual gags based on audience conceptions and stereotypes of the honey bee. Although documentary programs and films such as *More than Honey* (2012) and *Vanishing of the Bees* (2009) provide a more fact-based approach to the world of bees and beekeeping, it's important to note that movie audiences across the world are likely most familiar with apiculture through the fictional films which both appreciate and demonize the common bee.

As such, it's important to look at notable bee-featuring movies throughout the years – not only to understand how bees are used and featured in film narrative, but to get a sense of how these titles affect those outside the world of beekeeping. What, if anything, do these pieces of media have to say about bees? Are bees represented in a positive or negative light, and what assumptions does this representation form in the mind of an audience? While an unassuming viewer might walk out of the aforementioned *Vanishing of the Bees* more attuned to the grave reality of colony collapse disorder, what thoughts will they take with them from a movie titled *Killer Bees* (1974), or perhaps *The Savage Bees* (1976)?



Although these luridly-titled "natural horror" titles have largely fallen out of favor (cheap goofs such as *Sharknado* aside), it's undeniable that such movies were once Hollywood's primary vehicle for the world of apiculture. From 1966 to 1978 alone, there were no less than six major films featuring bees as the sole, ticket-selling terror. These bee exploitation films, or "beesploitation," for simplicity's sake, place the humble honey bees as unavoidable, world-ending boogeymen sprung from mother nature.

Whether altered by the hand of a mad scientist or a cosmic fluke, the amped-up *Apis* of common beesploitation films prey on regular moviegoers' unfamiliarity with the truth of bees. In these movies, deadly stings are a way of life when killer bees reign judge, jury, and passionless executioner over mankind. The yellow and black drones belong to a hive, an "otherness" that no human can hope to understand, and thus, the heinous insects must be destroyed.

This appropriation of the more complex and "fearful" aspect of honey bees is the crux of most beesploitation films: the terror of being hurt, even by a sting, and the terror of a "hivemind" outside of our control make bees easy bumps in the night for those not familiar with the truths of beekeeping. To understand this general fear, it's best to examine two different beesploitation films from two parts of the world.

First, the cheesy 1966 British "horror-thriller" film *The Deadly Bees*, arguably the first ever proper installment in the beesploitation "genre." Second, 1978's *The Swarm*, a massive, terrible Warner Bros. production that's perhaps the biggest and most infamous of all bee-centered horror films. By diving into these two ridiculous titles, we can start to understand why bees are still so feared to this day . . . and maybe laugh a bit at some B movies, too.

A loose adaptation of H.F. Heard's 1941 mystery novel *A Taste for Honey*, *The Deadly Bees* originally featured a script by *Psycho* (1959) author Robert Bloch. With writing by a certified thriller veteran, and plans to star horror powerhouses Christopher Lee and Boris Karloff as competing beekeepers, *The Deadly Bees* looked ready to deliver. However, Lee and Karloff were unavailable, and Bloch's script received last-minute "improvements" from the film's director, Freddie

Francis. What resulted, then, was not a tense white-knuckler in the vein of Hitchcock's *The Birds* (1963), but rather, a cheap, stiff, and unintentionally humorous potboiler with a lot of plastic bees glued on faces.

*The Swarm! The worst movie ever made (*The Times*).*

The plot leading to the reveal of these shoddy pollinator props is fairly simple: exhausted by the popstar lifestyle, singer Vicki Robbins is sent to recuperate at a bed and breakfast on the remote "Seagull Island." Two rival beekeepers, Mr. Hargrove and Mr. Manfred, call the isle home, and it's clear they hide more than a few secrets. Vicki quickly uncovers a plot involving genetically altered killer bees, and the other characters fall victim to deadly swarms – one of the beekeepers is responsible, but which?

Featuring shaky acting, '60s hairstyles (look out for the beehive!), and a man who keeps an apiary in the walls of his home, *The Deadly Bees* is weird, silly, and immediately dated. Lines such as "I was able to hypnotize the deadly killer bees!" aren't revelations, but punchlines. By the time Vicki is thrashing in her bed, experiencing buzzing, bee-based nightmares, it's hard not to have let a few chuckles loose. In fact, *The Deadly Bees* is so ripe for joking jabs that it was featured on the ninth season of movie mocking program *Mystery Science Theater 3000*.

Despite these moments that make for easy teasing, however, it's clear to see why *The Deadly Bees* might put viewers off honey for a while. When Hargrove's wife is inevitably set upon by the eponymous killers, the film shows actual footage of bee stings, even depicting the tearing of the stinger as the bees pull away. By using this graphic visual display to magnify the pain of a bee sting in audiences' minds, it's not surprising as to why the average viewer might duck away from a harmless honey bee upon leaving the theater.

This trepidation surely isn't helped by the film's general depiction of beekeeping, which presents the practice as esoteric, and beyond the protagonist's comprehension. "It's dangerous to involve yourself in matters you don't understand," says Mr. Hargrove once Vicki dives into the island's mysterious apicultural world. Bees are kept in squalid, foreboding spaces, or (literally) behind closed doors. When we see intercut footage of a professional handling a hive, the camera moves in close on their methodical movements, and the music strikes a sinister sting.

The Deadly Bees frames the routine of beekeeping as evil; a simple interaction likened to a killer sharpening their knife. It's through this manner of presentation that apiculture is demonized in the average beesploitation movie. With a touch of horror-film flavor, the common actions of beekeeping are made menacing in the eyes of audience members; a dread only magnified by lack of understanding. With the mundane truth obscured behind filmmaking flair, little sympathy remains for beekeepers.

At least *The Deadly Bees* keeps apiculture more or less grounded in reality – the same can't be said for *The Swarm*; an absurd, bombastic Hollywood film which effectively killed the beesploitation boom that *The Deadly Bees* began. *The Swarm*, featuring Michael Caine between critical hits *A Bridge Too Far* (1977) and *Educating Rita* (1983), posits bees as weapons of mass destruction; a natural force so far outside of human control that the only method of taming is through bombs, chemicals, and scorched earth warfare.

Again, the story is easy: mutant Africanized killer bees with stings deadlier than jellyfish make landfall in the United States, decimating a Texas military base in the process. As the ravaging insects raze their way towards Houston, Michael Caine's entomologist character must work with the government to neutralize the bees before it's too late. This, of course, is an excuse for scenes of death, destruction, and decimation, all apparently at the hands (or claws) of the honey bees. Featuring between 15 and 22 million bees handled by 100 people, *The Swarm* went all-in on its depiction of an apicultural apocalypse.

The excesses of *The Swarm* make *The Deadly Bees* seem like a genteel drama in comparison. Endless slow-motion death-by-bee scenes accompany train crashes, mass fires, and a segment in which the bees cause a power plant to explode and wipe out an entire town of over 36,000 people. It's a classic American disaster movie in the truest sense: an unforgettable, over-the-top production with a huge budget, but a silly concept and unintentionally funny script. The film's penultimate sequence sees the military fighting off bees with flamethrowers when the swarm descends upon Houston – as buildings burn, General Slater (Richard Widmark) observes in dismay and remarks: "Houston on fire . . . will history blame me, or the bees?"

The grave performances, rendered humorous in hindsight, don't do much legwork in framing honey bees as a credible threat. No, that job is done by playing upon the real-life paranoia surrounding the expansion of the Africanized bee. Likely already feared by audiences at the time, *The Swarm* exacerbates such terror and misunderstanding by presenting the species as stone-cold killers, years before they made landfall in Texas. It's because of misrepresentation such as *The Swarm* that fear of the Africanized bee, and by extension, bees as

whole, thrived and continues to proliferate to this day.

However, the bee itself isn't the only fear lurking in *The Swarm*. Beneath the chitin lies the same insular, us-versus-them terror found throughout American science-fiction monster movies dating back to the 1950s. Preying on Cold War fears of (literal) foreign elements and the horror of an enemy lurking at home, *The Swarm* takes aim at lingering dread of a nuclear arms race. The military base ravaged by the bees is a ICBM launch site, a neutralization which Gen. Slater remarks has never been accomplished by enemy spies. Once the bees have annihilated the small town of Marysville, it's mentioned that perhaps this "invasion has been here sometime . . . breeding; increasing." In *The Swarm*, once benign ally shows its true colors as a sinister, alien force, and for failing to curtail it, America pays the price.

Political insinuations aside, *The Swarm* ultimately fails at being scary, at least by today's standards. The cheesy script, poor performances, and hilariously over-the-top disaster sequences are hampered even further by a bloated two hour and 36 minutes "restored" runtime, which film fans might recognize as being three minutes longer than Coppola's Vietnam epic, *Apocalypse Now* (1979). It makes sense, then, that *The Swarm* barely scraped together $7.6 million box office on an $11.5-22 million budget, currently touts a 13% (out of 100%) on review aggregate Rotten Tomatoes, and was called "the worst film ever made" *by The Sunday Times*. Despite this failure, there are rumors the American Bee Association acted against *The Swarm* for "defaming the American honey bee," but no one knows if a lawsuit was ever filed.

In the end, it likely wouldn't have made a difference. Even though the end credits of *The Swarm* feature a disclaimer that the "killer" bees featured in the film bear no resemblance to real, crop-pollinating honey bees, the damage is done. If movies such as *The Deadly Bees* and *The Swarm* do their jobs, audiences leave the theater terrified of bees, petrified that every innocent, bumbling bee will attack on sight. Existing anxieties about insects are cemented, and common misunderstandings about honey bees become concrete convictions. It's a deadly sort of presentation that, for bees at least, has thankfully phased out of public demand in recent years.

Compelling documentaries have since replaced sensationalist shockers as the primary mode of representation for apiculture in the media. Apocalyptic aesthetics give way to appreciation for the natural beauty of the bee, and tales of terror subside into engaging education. Bees have come a long way in the media since the salad days of beesploitation and the legend of killer swarms, but the effects of such movies still resonate to this day. When someone ducks away from a lone honey bee, or shudders at the concept of keeping hives, it's the breed of misinformation perpetuated by *The Deadly Bees* and *The Swarm* that fuels the fire. These movies are in the past, but unfortunately, the struggle for truthful representation is not. When we get that truth, however, it'll taste sweet as honey. BC

Samuel Ramsey and New Hope In The Fight Against Varroa

Toni **Burnham**

One thing you might hear about Samuel Ramsey, soon-to-be-Ph.D from the University of Maryland, is that he is a great speaker: during one talk, he proved that hungry ladybugs can bite by letting one chomp his arm. He won the international Three Minute Thesis Competition, beating over 1,000 other brilliant young scientists.

But this is what you *really* should know about the future Dr. Samuel Ramsey: his work represents one of those potential, "change everything" moments for which we have been longing since *Varroa destructor* began its relentless siege of honey bees.

To quote Sammy: "We've been thinking of these parasites as vampires when they're actually more like werewolves. Maybe we've had so little success in killing them because we've been trying to drive a stake through something for which we needed a silver bullet."

Ramsey's work indicates that *Varroa* do not ingest hemolymph – the "blood"– of honey bees. They attack fat body tissue, an organ responsible for essential functions related to storing and releasing energy that the bee needs. We have been laboring under a critical misunderstanding of *the most basic interaction* between bees and the existential threat of over 40 years.

How is it to change received knowledge and be greeted with excitement?

"One concern is that when you tell people that something which they have believed for a long time is incorrect, often there is a tendency to get defensive, to feel offended that you would challenge things that way. It has been great to see that this really hasn't gored anyone's ox. People are seeing that the foundation of the earlier conclusion was not very sturdy."

Was it actually explored? Did someone do an experiment with erroneous results?

Multiple studies were conducted in Russia in the 1970s and 80s. Remember, *Varroa destructor* is from Southeast Asia: when it started increasing its geographic range, it moved through China into Russia, the first areas to be hit hard. Therefore, much of the earliest research is written in Cyrillic [which already presents an obstacle]. The studies at the time used a method which was then considered OK, but which is not up to current standards. Researchers used strontium isotopes and some other things that we tend not to use for these experiments because they don't stay in the tissues where they are supposed to be!"

"They were not measuring what they thought that they were measuring. Another of the problems that came across was translation, as well."

"Using these problematic results, they stated '*Varroa* are feeding on hemolymph.' Many saw only that statement. When a paper is written in a language that isn't translated into English often, sometimes the abstract [only] is translated: this particular abstract did not include enough detail to tell that the methods used were not solid."

"Using the abstract, people began to cite this paper, stating '*Varroa* are feeding on hemolymph.' No one really questioned this until Dennis vanEngelsdorp, Allen Cohen, Jerry Hayes and I started discussing it in more detail."

"Allen Cohen, an insect diet expert, was the one who said, 'I don't think that organisms with fast reproductive rates are able to get all the nutrition they need just from hemolymph.' Hemolymph is mostly water."

"Consider: *Varroa* produce an egg that is more than 33% of their body volume. The egg is HUGE, and she does it every single day. To be able to put that much biochemical energy into an offspring of that size, you need a lot of very potent nutrition which you can't get from a source that is mostly water."

"It also fails to account for the osmoregulatory burden – to explain: if you drink a lot of water, you can overwhelm your body's ability to drain it, and your cells will grow and actually burst. They are not able to deal with the influx. Insects and arachnids that feed on things that are mostly water have special changes to their digestive systems to allow them to do so without exploding. *Varroa* does not have *any* of these changes. That was my observation."

"Allen Cohen said, 'Maybe they are feeding on the muscles? Maybe they are feeding on the fat body? They have to be feeding on something that

isn't hemolymph.'"

"That is what *really* got things going. Jerry Hayes had also thought of this, and mentioned it to Dennis vanEngelsdorp."

Joining The UMD Lab.

"When I got to Dennis' lab I was thinking, 'If I am going to do a project now – it has to go somewhere. I don't have time to start something and find that it doesn't pan out."

"I love work that's on insect behavior, parasite behavior, predator behavior. I'm very interested in the behavior of organisms, how they get their food, etc. But that particular project sounded very risky, because it's going to be a binomial answer: *Yes* or *No*. People have believed this for a long time, and they probably had good reason."

"I started looking through the literature, and it didn't look like anybody was questioning it! My concern was that everyone cited earlier papers that said '*Varroa* feeds on hemolymph,' but no one cited the original. As a researcher, you are supposed to cite the source that information comes from, not someone quoting someone quoting someone…"

"I had to trace the chain back years and years. It took me months to find the original source. When I found it, I realized, 'OK, there could be something here, because these methods don't get you to the conclusion that everyone has been using.'"

It Was Personal.

"The part that often grabs people is that one reason for this project involves my Dad. I was considering three different projects, 'Which one?' I talked to my dad after only a small amount of research, and he said, 'I don't know what I am going to do about this gout thing. I don't know what I can eat, what I can't eat!' It's a painful joint problem he'd had for months: my dad would think that he'd figured it out, but would have another flare up."

"Of course, he asks his scientist son for help to understand what gout is and how it causes problems. When I found that gout was related to purine crystals, a bell went off in my mind, "Wow, that's weird! That's what the Varroa mites use as their waste product!"

"I started trying to figure out the source of the problem with purine crystals in his blood, causing painful arthritic friction. What source is it *that* high in purines?" *[note: purine is the name for the chemical group of which guanine is a part.]*

"I thought, 'If I can figure out what my dad *should not* be eating, I might be able to find out what these mites *are* eating.' At the top of every list was *Don't Eat Liver.* I thought, 'Where is the bee's liver?' The equivalent in insects is the fat body. This is something Dr. Cohen had mentioned."

"It's hard to move forward by starting with a negative, 'It's not hemolymph.' There are a lot of things that aren't hemolymph. When the guanine, fat body connection arose, I was surprised and found a paper that discusses the functions of the fat body in some detail, and a ton of other papers looking at the fat body. It is a *fascinating* organ! I learned that the fat body is the organ that creates guanine in insects. Pieces started to fall together."

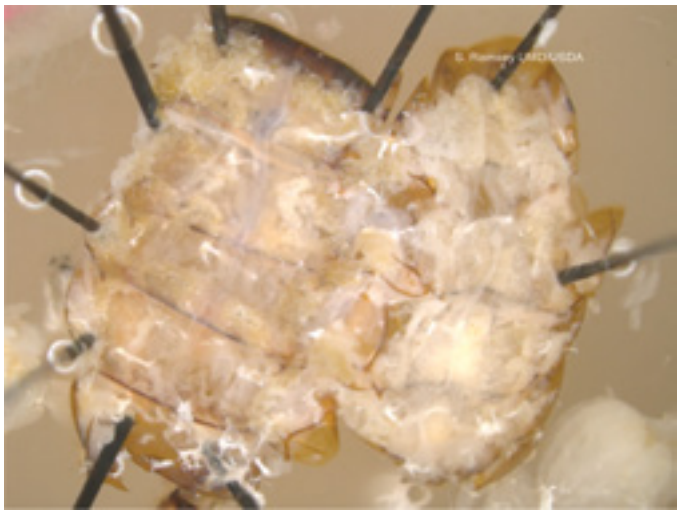
"That's the story of how things started, and I am glad for the opportunity to tell it, because it's helpful for people to know that science moves along, building on other researchers. One: when you fail to cite the original paper, it can end up being like the Telephone Game. That can create problems itself, but it also prevents people from seeing the original methods used to come to those conclusions. Most researchers probably wouldn't have continued citing that paper if they had seen the methods. But they were citing people that they trusted."

"It is also important to remember that science works as a conglomerate, we work together. Working with Jerry, Dennis, Allen, the other coauthors, I moved questions forward, and decided how things would be structured, but I could not possibly have done this without Dr. Cohen, without Ronald Ochoa, Gary Bauchan, and Connor Gulbronson."

Bee Fat, Not Bee Blood.

I'm excited about this project specifically because the pathologies that are associated with *Varroa* have been all over the place. When I first started studying *Varroa*, I was overwhelmed by the sheer amount of negative consequences that it causes – early onset foraging, reduced overwintering success, reduced lifespan, viral transmission, difficulties with metabolic functions, ability to navigate properly – all of this stuff! It seemed strange that all of this could be related to the removal of a small amount of hemolymph."

"It also reminds us not to discount how clever and important *Varroa* is. I have presented to a lot of researchers and beekeepers, and with many beekeepers there has been a disconnect. Researchers say, 'Yes, *Varroa* are very important creatures, reducing their populations is of the utmost importance.' But beekeepers will often say, "Oh, that's the lowest on my list. I never see *Varroa* in my colonies, if I see them it's just a couple. Not a big deal.' My research has helped to show that you are unlikely to see them, because the places where they are most likely to be are always going to be hidden if your bees are at any kind of natural standing or flying position.



Varroa *mites on adult honey bee. Location is close to fat body, and impossible to see from above.*

The image that we have of the mite conspicuously on the bee's thorax is misleading because they spend so little of their lifecycle there. These [results] have been helpful, because when I explain this to beekeepers now, they say, 'Why have I never heard this before?! I had no idea.' It has helped people see that there is an important utility to tests and monitoring for mites aside from just opening colonies and looking."

"It also makes the point that it is important to keep these populations low, because they perforate *the liver* of a bee. If I had a parasite on me that was the size of my hand, that was sucking out parts of my liver, there is just no way that I would let that go on!"

"It has helped these beekeepers understand, 'I've gotta do something about this!' It has created an imperative to do something to reduce the population of these parasites. What is exciting is to have beekeepers come up and say, 'This [research] has changed the way I think about beekeeping.' Some of them have been keeping bees for years, for decades. I am a young guy, it is cool to hear people say that some work I have accomplished has helped change the paradigm on something they have been doing for decades."

Is* Varroa *Resistance Possible?

"When talking about breeding for resistant stock, I ask people to think about a 'genetic arms race" or an 'evolutionary arms race.'"

"People often use the term when talking about antibiotic resistance. Antibiotic resistance works like this: we have a weapon, a drug, and we want to use it to kill the bacterium. But the bacteria have very short generation [reproduction] times. They can reproduce very, very quickly, and in a day you can have hundreds of generations that have grown and divided, and it is crazy how quickly some of them can. [Like] an arms race, every time they mate and produce new offspring, there are choosing new weapons and new defenses to block the old antibiotics. Therefore, we need to constantly use new forms of antibiotics to treat these bacteria."

With *Varroa*, this time we have two different organisms facing off. It's not a drug, it's a *bee* that we are trying to breed to have a resistance to this mite. While the bee can get a leg up, the mite can get a leg up, too. One problem is that the bee's generation time is MUCH longer than the mite's. If we think of this as an arms race, every time that bee gets the chance to choose one weapon to use against *Varroa,* the mite has the opportunity to choose *several*."

"Over the course of a year, *Varroa destructor* may have nine generations, sometimes 12 or 14. That's a lot of weapons that they get to choose. The bee? Maybe one, just one opportunity to [mate and] create a new set of offspring. Sometimes we even stop that from happening: when we stop swarming from happening, stop the colony from splitting, you don't even have that opportunity for new genetic stock to present itself."

"I am not one who believes [in a system where] people breed resistance in their own bees by letting the mite populations get really high, and that the best will survive, the other ones won't – I don't believe that it is a good method, because the mites have a head start, and too many opportunities to continue building upon their current progress. Systems that researchers are currently using in the lab [that speed up honey bee generation time] – seem promising in some ways. But I don't think that it is a good idea to let your bees die in hopes that you will emerge with this new super bee. That is very unlikely. I think it takes a lot of work and genetic conditioning and time in the lab and generation time that won't happen out in the field."

"A good example is to look at what happened to the bees in the US. Within 10 years of the introduction of *Varroa destructor*, we've lost our feral honey bee colonies. Anything that wasn't managed, died out. All the diversity that the bees had was not able to stand up to how quickly *Varroa* generation times are able to ratchet forward."

"I don't think that it is an option for us to let their [mite] populations spiral – I don't think that the permanent answer is constantly treating for *Varroa*. The amount of chemical input into the colonies currently is unsustainable. I think while we are figuring out what the answer is, we have to continue reducing their populations. It is not an option to just let them run wild."

"It is fair to say that breeding for survivor stock in the field is highly unlikely to yield a resistant bee because of the evolutionary arms race that is going on. In the field, we can't help the bee replicate at that speed."

In The Future.

"Options like RNA interference and approaches of that nature hold great potential to reduce the chemical input into the colonies. It won't get rid of it entirely, because we do need to make sure that we vary the ways used

to reduce the populations of *Varroa* to prevent resistance."

"If we can introduce something that disrupts the reproductive cycle of the mites. They feed on the bees, they get sterilized, they go into a cell and try to produce offspring, and they don't. They die."

"Or perhaps an approach where, when the mites feed, it disrupts their ability to continue digesting their food. They stop feeding, they get sick, they die."

"These kinds of things are exciting, but in some way they are still science fiction because they have not reached a point yet where they are ready to be introduced."

"There is still the concern about the Law of Unintended Consequences when a particular technology is very new. We need to look at all of the different angles of how this could affect an organism before we introduce it into the market. At the moment I am ready to say that I am happy about the potential."

Looking Forward.

"I've had the opportunity to work with a lot of different groups of people. I tend not to do just one thing – I sing, I love music, I am an entertainer – work on doing weddings with some people – I have worked with a lot of groups of people! I am very involved with my church . . ."

"One thing is that beekeepers are some of the most caring, amicable, pleasant people whom I have ever worked with. Beekeepers and bee researchers are a tight-knit group. There is an excitement around research in bees."

"Few things make me more excited than seeing people who aren't researchers being *so* interested in research. It takes a lot of work and a lot of trust to create that partnership that we are seeing. Things like the BeeInformed Partnership that help make sure that information is disseminated – also people like Randy Oliver. This is something that I have never seen before, a partnership between the researchers and people who are not, but who are so interested in their work."

"I didn't start out as a honey bee researcher: I researched predators and parasites and their behavior. When I started researching *Varroa* behavior I would think of myself as primarily a parasite researcher. But I have become so enamored of the beekeepers and the bee researchers and this incredible partnership! People talk all the time about how research rarely gets across to the people it needs to reach: they have not paid enough attention to the beekeepers and the bee researchers, because they are wonderful and now I am hooked! I am hooked!"

"I want to use my knowledge of honey bees and honey bee parasites to benefit the beekeeping community and the bee research community. This has changed the way that I think about my own career going forward. Now I want to do research on bees, and do as much research on bee parasites as I can!" BC

Beekeeping In ICELAND

Erik **Donley**

Sustainability And Survival Mark Success

Imagine Iceland. Depending on your perspective, you might envision northern lights flaring above perpetual Winter darkness or, perhaps the endless midsummer sun. Invariably, you would think about cold weather, rugged volcanic landscape, and Vikings. If you are up to date on current economic trends, you might know that Iceland possesses a wealth of renewable energy resources and almost everything there is impressively expensive. The last thing most individuals would associate Iceland with is Beekeeping.

This past Spring on "Bee Day," I was helping distribute packages of bees when I overheard a co-worker talk about his beekeeping experience in Iceland. Initially I was surprised that Iceland had a beekeeping community, but considering I keep bees in Duluth, Minnesota I guess the idea was not too far-fetched. The adventurous side of me took over, and I had to see what Icelandic beekeeping was all about. I asked for an introduction (Thank You Mike!), and to my pleasant surprise, Torbjörn from Iceland invited me, and a friend and fellow keeper Dave Worley, to help harvest his honey and begin to winterize his hives. Deep breath – flights booked!

It is one thing to have a friend pick you up at the airport. It's another leap of faith to have a stranger you met over email pick you up in a foreign country. We arrived at the Keflavík airport at 9:00 am, and after we walked through customs, Torbjörn was there waiting in his tweed jacket, just as he described. We hopped into his diesel pickup, which like every beekeeper's, was filled with feed buckets, spare hive parts and any other accessories that might be needed, and we were on our way to work his bees. We had no time to get acclimated to Iceland – just straight to work. During the drive to the first beeyard, we traversed some of the most beautiful landscapes I have ever seen. Picture the surface of the moon covered with a putting green, that would give you a good start of what the terrain looks like. We started the dialog about how and why Torbjörn decided to keep bees in Iceland. It turns out that he started in Norway with his father, and when he moved his family and medical practice to Iceland, he brought his passion for beekeeping with him.

We arrived at his first yard just on the outskirts of the capital Reykjavík. We lit a smoker using burlap that was once used for moisture wicking and started with the first hive. As we opened the lid of the styrofoam hive, a medium cluster of bees hung quietly working. Based on my experience, I felt the hive was not very robust considering it was the end of Summer, but Torbjörn could not have been happier about the cluster. He felt that this colony was in excellent shape and should fare well through the extended Winter. Despite its name, it turns out that Icelandic Winters are not horribly cold. The January average is between 28°F and 36°F compared to Minnesota where the average is between 2°F and 19°F. The greater challenge is preparing for a Winter that is extremely long while relying on a conversely muted Summer to do it. Their climate does not see the substantial temperature increases Minnesota does, therefore colony buildup is slow and bee forage is not robustly abundant. While

The back of Torbjörn's diesel pick-up truck. Sugar syrup and bulk sugar for feeding. Plenty of spare hive parts and equipment in case something goes awry.

Beekeeping Journal lying in Heather blossoms and Thistle. Bottle of honey and Icelandic króna.

Fall cluster of Icelandic bees inside medium bodied styrofoam hive. Torbjörn feels the bees need to produce less heat because the styrofoam is a better insulator, thus moisture mnagement is less of an issue.

vegetation is stunted, there are several shrubs and low growing plants that provide a variety of diverse resources. Bees rely on Crowberry, Coltsfoot, Arctic Thyme, Angelica and Heather as major nectar sources to provide the necessary resources to attempt to survive the long Winters. The cycle of Summer harvest and Winter survival is one that many of us are familiar with, but the extreme environmental situation of Iceland seems insurmountably skewed against bee survival. The symbiotic relationship between the wild vegetation, genetic strain of bee, and devoted tending by keepers is what makes colony survival possible.

In a population of 330,000, Iceland claims approximately 100 beekeepers and 300 hives. Over the history of the country there have been several attempts to import and sustain honey bee colonies, the most recent started in 1998. When bees are imported, they come from Åland, an island in Sweden. These bees have been isolated from the mainland and must be certified healthy and disease free by a veterinarian before making the voyage to Iceland. To date, Icelandic beekeepers enjoy the luxury of not having to deal with *Varroa* mites. Can you imagine what beekeeping would be like without mites and the associated complications they invoke? Torbjörn feels that it is only a matter of time before diseases and mites make their appearance, but for now, they enjoy healthy hives.

Like most quality things, imported bees come at a price. A package of bees from Åland costs $600 USD and a bred queen will run $100 USD. Since there is no equipment supplier in Iceland, all of the equipment needs to be imported as well, that will run another $500 USD or so. Expenses can add up fairly quickly, so you can understand why such a premium is placed on survival and sustainability, it is the focal point of the beekeepers there. Considering the long Winter and limited environmental resources for harvest, it begs questions such as, how do the bees make it? What kind of stores to they need to make it through a Winter? How can they harvest enough to survive? Thinking back to the colony I considered small (but Torbjörn was happy with) is the beginning of the puzzle. I would estimate that this colony going into Winter was roughly 1/2 the size of a colony we put to bed in Minnesota. We try to leave between 80 and 100 lbs. of honey per hive, and depending on the Winter temps and duration, they seem to have enough stores to make it into Spring where they can start harvesting resources again.

I asked Torbjörn what a typical harvest for his bees would be and what amount of honey he would leave them for the Winter, the numbers were quite surprising. He estimated a successful colony would harvest near 50 lbs. of honey over the course of the season, and he would leave them about 20 lbs. while adding a bit of supplemental feeding. Since he started using styrofoam hives, he feels survival rates have improved, and he calculates that his hives consume between 25 and 35 lbs. of honey during the Winter. Granted the Icelandic Winters do not produce the -20°F temperatures that we experience, but still the amount of honey consumed to get through the 6+ months of cold dearth seems almost impossible. One aspect of the equation is the genetics of the bees. While Buckfast in principle, these bees have been isolated in Sweden and Iceland for many generations and have therefore evolved into the strain that they are now. They are very gentle and easy to work with, conservative and cautious to grow, cold tolerant, opportunistic with resources, and are naturally frugal when it comes to the usage of reserves. Simply put, this population's primary goal is to survive, therefore colony success is typically judged in the Spring when the weather has warmed and Winter is over. If a hive survives, it is considered successful.

This approach is much different than I am accustomed

to in America. Here it appears that we try to build up bee populations as fast as possible, so we can either maximize honey harvest or have a colony robust enough for pollination services. The focal point is aimed towards more growth or more honey at all costs. The Icelandic priorities of survival, healthy colonies, and (if circumstances allow) steady growth and harvest, seem quite opposite to the practices here in the U.S.

Talking with Torbjörn about colony management, queen practices and overall bee strategy was very refreshing, as new ideas should be. I mentioned that I needed to replace an old queen when I head back home. He asked me how old she was? "1.5 years" I said. He looked at me and shook his head and asked "What are you doing that for? If I can have a queen for three or four years then she should stay, and if she is not doing a good enough job, then the colony will decide to replace her". Icelandic beekeepers welcome swarm cells, supersedure cells and any other behavior from the bees that display their natural and acclimated tendencies. They view these activities as signs of healthy bees and will then manage the colonies based on those expressions. If the hive has created swarm cells, then they will divide it. If the hive has created supersedure cells, then they will let it supersede and hope the weather allows for good breeding days so the colony can propagate once again. If not, then the colony will be combined with another. Again the focus is on survival and health – always preparing for tomorrow and next year based on what the bees and environment present the keepers with today. Icelanders are true keepers of bees, they protect, respect and care for the bees at all costs.

If sustainability and survival are the bell weathers of success, then some might ask what is the point of keeping bees in Iceland? On the first day we worked all of Torbjörns 20 hives, and from those colonies we were able to pull 11 medium supers of honey (all his boxes are mediums). That night at dinner we were sitting around talking about the day and Torbjörns harvest. He raised his glass of wine and thanked us for helping him with the work. While most beekeepers in America might be disappointed with 11 supers harvested off of 20 hives, Torbjörn seemed most pleased. Doing a bit of math in my head: $600/colony, $500/hive equipment, 20 hives, fuel, time, 11 supers . . . based on my perception of what honey is worth, it just didn't seem to add up. Curious, I asked Torbjörn what he sells his honey for? He looked at me with a gleam in his eye. "Well, I can tell you that my honey is not the most expensive Icelandic honey, nor will I have any problem selling all of the honey we just harvested." Ok, so I am thinking maybe $15 to $20/lb. "Last year I sold my honey for $65/lb. to retail stores." I sat there in disbelief for a few seconds. That meant we harvested over $20,000 worth of honey today! I laughed and said "That is amazing! It is unbelievable what tourists will buy!" Torbjörn quickly said, "No, mostly Icelandic people are buying my honey". "Why?" I had noticed in the stores there that they can buy imported Belgian honey for less, and I'm sure that would still be a quality product. Torbjörn explained "Because it is from Iceland, and people here understand the importance of supporting each other and because it tastes amazing of course!" This made me think a bit.

Heather blossoms, also referred to as Ling, on rocky terrain. This is a major nectar source, and produces a very thick pungent honey. Special equipment is needed to harvest Heather honey because it is so thick.

I have always been a believer in the concept that "you get what you pay for", but this price point seemed to be well beyond that threshold, so there had to be something more to it. Why in an economy that went bankrupt in 2008, where people pay 40% income taxes and gas is over $7.00/gal, would they choose to pay so much for honey? The answer is simply that the value of surviving and being self-sufficient as a country is more important than saving a few dollars. The idea of success today without a future for tomorrow is foreign to them. Long term survival for the population is the goal- a superorganism if you will. What do the Icelanders get for this kind of mindset? The economy is booming, the residents have one of the longest life spans on earth, and the country as a whole is one of the happiest places to live on the planet. The unique environmental situation of Iceland has created a population that is keen on survival, sustainability, and measured growth.

While my original goal of traveling to Iceland was to learn about managing bees in an extreme environment, what I actually discovered is that with the right priorities, values and compromises, populations will not only adapt to their surroundings but eventually learn to thrive. This is certainly true of both the Icelandic bees and the Nørdic people that support them. BC

It's January! Happy New Year!

Ann **Harman**

While it is Winter, even in the South, it's a good time to read a bee book. I often wonder how many books about bees have been written. Thousands? Tens of thousands? I don't plan to try to count them. It's now a New Year so add one to your collection. You will find reviews of new books right here in *Bee Culture*. Perhaps you did buy one during the year but haven't had a chance to read it yet. So here's a good way to start the New Year – read it.

Each year the bee equipment suppliers offer some new pieces of equipment. Since their catalogs may not be ready for 2018 yet, go online and see if anything new is featured. Hive tools once came in only one style. But now you have a wide choice of shapes and sizes. You could start out your bee year with one or two new styles. Ask at your local beekeepers club meeting if anyone has tried some of the different shapes and sizes. Suppose, after using a new one once or twice, you decide you don't like it. Clean it up of wax and propolis and donate it to your bee club's annual raffle.

Speaking of local bee clubs, you do have one in your area? And you do attend at least some of the meetings? Yes, everyone is too busy today to attend meetings, but those meetings are a great place to exchange information. Beekeepers love to brag about their successes (no swarms this year!) and grumble about their disasters (poor honey crop – too much rain during honeyflow time) but you just might learn something new.

While you are looking through the suppliers' catalogs you may come across some items you've never thought about. You've been happy with your old bee jacket or coveralls. It's been repaired and mended so many times the repairs have repairs. Perhaps it's time to replace it with a new one. The ventilated jackets and suits are increasing in popularity. They do make sense. As our seasons become warmer being able to feel a breeze on a stifling hot Summer day is indeed refreshing. Christmas is now past so there's no point in waiting a year to write Santa to put it on your 'wish list.' Think ahead – July is always hot and humid. So go and get one of the ventilated jackets or suits before bee season starts. Since they come with a veil you can now discard your old one with its annoying patches of duct tape you used to cover up holes.

Smoker bellows are another beekeeping necessity that frequently has repaired repairs using ever-faithful duct tape. Take a look at your smoker bellows. If this is the year to replace it, then the best time to do that is in the Winter when it is sitting idle. If you live in a warm climate you may well need your smoker very soon.

Some pieces of equipment never enter our minds until we desperately need them. I've got robbing screens in mind. Just because robbing has not been a problem with your bees in the past doesn't mean it can't happen. Robbing screens not only help with bees robbing bees but also if yellowjackets become a pest. We can't depend on perfect weather giving perfect forage, especially late in Summer. Robbing can start when you're not looking and can turn into a disaster in the apiary. If you haven't used robbing screens in the past, go ahead and buy one to try. It might come in handy!

Have you ever tried a frame holder, sometimes called a frame perch? (NOT a frame grabber.) It's one of those small handy gadgets that turn out to be a huge help. It really speeds up hive inspection. You don't have to search for good places to prop frames as you remove them. A frame holder will have the frames in order of removal so it becomes very quick and easy to replace them in their proper order. In addition it might also save your queen. If you did not notice her on a frame you just removed she is more likely to stay put on that frame while it is resting on the holder. Or she can wander over to an adjoining frame instead of deciding to hide in the grass by the side of a hive where she is certain to be squashed by your boot. If you are making comb honey and need to exchange frames you can hang beautiful finished ones safely to protect the cappings from damage. If you have never used a frame holder, make this New Year the time to see how you like it.

In this New Year what will be your New Project? You have several choices. One could be making comb honey. You could choose cut-comb or round section – or both. Yes, you will find comb honey information in books. If you go onto the internet you may well decide it's information overload and decide to stay with extracted honey. Start out with cut-comb. No matter what you choose to try, you will need a good strong colony to take advantage of good weather during your good honeyflow time. Without those three in combination, wait until next year.

Winter losses are a topic of bee conversations today. Although colonies that died during the Winter have always been a part of beekeeping, beekeepers today seem to be facing more than in the distant past. Anything and everything are blamed. Remember to thank the bee scientists for their research. Being beekeepers we persist. And equipment manufacturers and suppliers are helping us.

Have you tried making splits, making nucs? Today that has become a very popular way to replace colonies

lost. But nucs are also useful to increase the number of colonies in beeyards, making nucs for sale, and raising local queens. Equipment for making nucs is now readily available. Nuc boxes (deeps or mediums), choice of tops, inner covers, bottoms, feeders, shipping boxes, are all among other items available. And, of course, you can find books on creating and using nucs.

Local queens are in much demand. So some beekeepers may consider queen rearing as a New Project for this year. Grafting larvae is not for everyone. But there is an incredible amount of equipment for queen production and for queens in general. If you decide to raise some queens from swarm cells you will find queen catchers in order to mark her with the appropriate year color. You can find a queen rearing kit that requires no grafting. Raising queens is time-consuming and has a strict schedule so only you can decide whether this would be a good project for this year or not.

If an observation hive has always been on your 'wish list' why not make this New Year the year you buy or make one. The equipment suppliers offer a 'traveling' one that is basically a nuc with an observation window mounted above where a frame can be placed. It works well for visiting schools but is not for a permanently installed one in your home. Yes, two books are available that give information on construction and care of observation hives! You can design and build your own. Please just remember bee space! This is one project where the internet could be of help. Go ahead and see what is available. Then choose where yours will be located.

Observation hives do require management – their own special management. So you will need to take it outdoors from time to time for cleaning, requeening and other needs. An observation hive does very well with an older queen rather than a young vigorous one who is too enthusiastic about laying eggs. The bees that live in an observation hive can easily swarm and can even abscond if they decide they do not like the living conditions. Observation hives are fascinating and give you the opportunity to learn much about bees and their behavior.

Although you may have planted some bee flowers already, you not only need to plant more but also work in your community, whether rural, suburban or urban to encourage more plantings and conservation efforts. If you belong to a bee club you can inspire some of the members to participate in conservation efforts. As you drive around your area, notice if the Department of Transportation is doing something useful or just mowing everything down. Although we are honey beekeepers, bumble bees and the pollen bees will also benefit. Visit your local garden club; get in touch with 4H and schools to encourage pollinator plantings and habitat conservation. Your bees will benefit.

Soon it will be the 2018 bee season and you will be too busy to read as much as you would like. But you have to keep up with bee news – whether good or bad. When a bee magazine arrives, whether in your mailbox or digital, take a look through it for a 'must read' and find the time to read it. Subscribe to CATCH THE BUZZ for news hot off the press. Other good websites with information are **http://agridigest.com** done by Fran Bach (this one has excellent links) and Apis Information Resource News at apisenterprises.com/apis_news done by Dr. Malcolm Sanford. With these you can easily keep up with current events in the beekeeping world.

You may very well have thought of New Year beekeeping projects of your own. Perhaps 2018 is the year to do that. So – put this article down now and get started. Oh wait . . .

It's a New Year! It's time to buy a new roll of duct tape. You'll need it sometime this year. The one in your bee bucket is almost used up. BC

Ann Harman is getting ready for 2018 and some good beekeeping at her home in Flint Hill, Virginia.

Langstroth & Slovenian

A HYBRID HIVE

The Best Of A Langstroth and A Slovenian Hive Means No Lifting!

Allen **Schwartz**

An article titled "No Lifting" in the June edition of Bee Culture Magazine got my attention. At 79 years of age it seems the hive boxes get a little heavier every year. The article author, Brian Drebber, described a Slovenian bee hive which houses the bee frames in a cabinet type enclosure where the frames are removed by sliding out the hive back horizontally. The frames are supported on the bottom by three metal rods. The heaviest lifting is for a frame of honey. The Slovenian hive has only two chambers, a brood chamber and a honey chamber. Each can be inspected without disturbing the other by removing an internal screen door for that chamber. The no lifting and easy inspection are both significant benefits of the Slovenian hive. However it does not have separate supers or Langstroth frames which fit most U. S. extractors. I believed a hive could be built which provided the best features of both the Slovenian and Langstroth hives, hence a hybrid hive.

I wanted a hive that was compatible with my other four hives. I use the eight frame boxes with 9 5/8 inch frames in the brood area and 7 5/8 inch frames in the supers. I also wanted to use the same screened bottom board, top feeder and inner cover (with minor modifications). All these components are fourteen inches wide. So I set the inside cabinet dimension to 14 ¼ inch. This extra width allowed for nine frames in each compartment. To accommodate the inner doors the hive depth was increased but limited to 24 inches so the two side panels could be made from one sheet of plywood.

My hive has two brood/honey compartments and two super compartments, separated by a queen excluder. Each compartment has a removable screen door. The top feeder and inner cover can be placed in any compartment. A screen has been added to the inner cover to control what part

Frame spacers

Rear vent

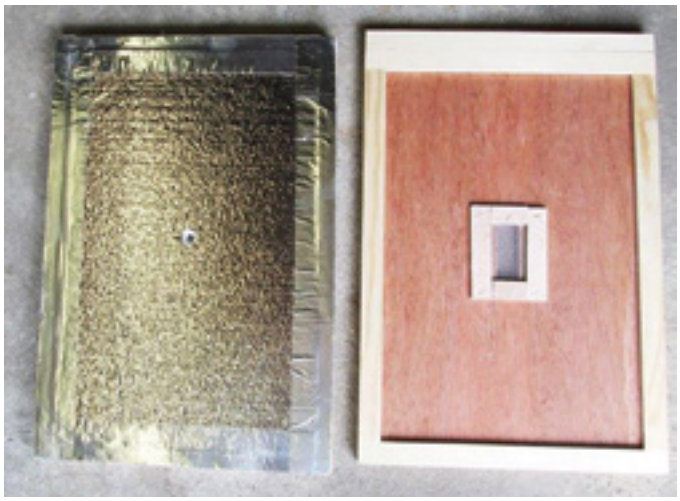
Super opening

of the hive the bees have access to. The inner cover will normally be moved up as the hive expands.

Nearly all Slovenian hives are located in a building or trailer with the hive front protuding through the wall. I chose a standalone hive as my hives are located in two 8 foot by 10 foot bee cages with a roof and two solid walls. The other walls are hog wire. This enclosure provides protection from rain, snow, wind, bears, and skunks.

The Slovenian hives provide a frame spacer at the hive front. I included this feature in the hybrid hive. I also provided a screened vent at the top of the back which can be adjusted or closed based on the outside temperature. With this vent open, great hot weather ventilation will be provided through the screened doors. I also provided an adjustable second entry opening into the super area on the hive front.

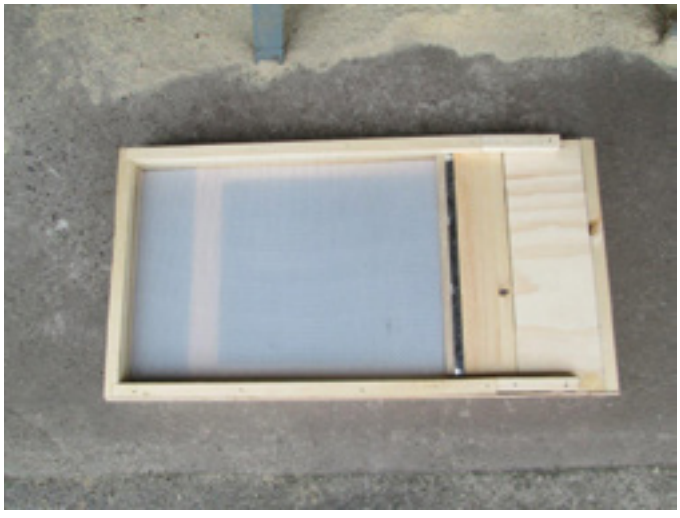
My hives are located near Malo Washington where winter lows of 15 to 20 degrees below zero are not uncommon. To protect the bees from these temperatures I designed insulation inserts to cover the screened doors. Also I made an insulation insert which can be placed over the inner cover. I provided a ½ inch hole in this insert to allow some winter circulation. If condensation occurs, it should be in the cooler top of the hive. If this condensation causes water drops to fall, they will fall on the insulation insert, not the bees.



With the hive dimensions being larger than the standard eight frame Langstroth hive, some modification was required for the screened bottom board, the inner cover and the top feeder. A filler piece of plywood was used to fill the extra depth where the queen excluder is inserted.

An extra five inches was added to the screened bottom board. An extra two inches was added to the top feeder and bottom plates were added to match the metal support rods.

The next step will to install a bee package or nuc in his hive next spring. If the bees and I like it as much as I expect, I will convert some or all of my other hives to this configuration. BC



Education is what you get when you read the fine print.
Experience is what you get when you don't.
Pete Seeger

JARS

A Lot About A Lot Of Honey Containers

Jim **Thompson**

Anchor Hocking Honey Jars

The history of the Anchor Hocking Glass Corporation of Lancaster, Ohio is one of uniting mergers. They had mergers as early as 1873, but the home office started in 1905. There are four different honey jars on display that were made by the Anchor Hocking Glass Corporation although they concentrate in making serving pieces of glassware. The trademark indicates that the jars were made during the time period of 1937 to 1968. The honey jars on display have a honey comb pattern on the top and bottom parts of the jar and a honey bee perched on the comb. One jar indicates that a patent has been applied for and carries a model number of 1232 and is estimated to have been made in 1944. Two jars carry a model number of L-627A and L-628A and the fourth jar was made in the Salem, New Jersey plant in mold number 5965 characterized by the four bands at the base.

Anchor Hocking Glass

Armstrong Cork Company
(Glass Division)

The Armstrong Cork Company of Lancaster, Pennsylvania made the two jars that are on display. The smaller Jar is approximately 5¼" tall and the larger one is 6¼" tall. They were made in a two piece mold that left a line in the center of the side. The top and the bottom of the jars have three bands to indicate layers of a skep and there is a bee in the upper right hand "corner" of the jar.

Armstrong Cork Company (Glass Division)

Armstrong Cork Company (Glass Division)

Brockway Glass Company

Started out in 1907 as Brockway Machine Bottle Company and became Brockway Glass Company in 1933. In 1959 the Brockway Glass Company acquired Tygart Valley Glass Company. Brockway Glass was in business until 1988, in Brockway, Pennsylvania. The typical manufacturers mark was a "B in a circle"; however the embossed word "Brockway" in a cursive form was used from 1950 to 1970. The bottle type 2932 is a 12 oz. honey jar with a honey comb pattern embossed on the jar. One of the bottles on display was used by the T.W. Burleson & Son Inc., of Waxahachie, Texas. They have been in business since 1907 and supply extracted and whipped honey. This bottle is estimated to have been used in 1940. A larger bottle, number 1593 holds one pound of honey. Brockway Glass was also a producer of the Queenline glass jar. The bottle that is 5-3/8" tall was made in the Muskogee, Oklahoma plant in 1944. Brockway Glass also makes the regular five pound glass jar. This jar looks very similar to a half gallon mason jar, but it is slightly smaller.

Brockway Glass Company

5 lb. Round Honey Jar

Clevenger Bros. Glass Works

The Clevenger Brothers Glass Works in Clayton, New Jersey started in 1930 and continued in operation until August 24, 1999. They specialized in making free and blow molded pieces using the old glass formulas and procedures. Thus the glassware pieces were authentic antique reproductions. The amber colored bee skep honey bottle was a limited edition ordered by Clarke County Store of Richwood, New Jersey and made in 1995.

Clevenger Bros. Glass Works

Eagle


Eagle Bottle

There are no markings on this container, but it is believed to have held honey. A long time procedure is to design or choose a container that is unusual so people will buy the product for the container rather than the product. If you analyze this container, one wonders what product it would really be suited for. There are no manufacturer's marks so an absolute identification is impossible.

Gamber Classic Jar

The Gamber Classic Jar is available from most bee supply dealers. These jars are made in different sizes and have been approved as another display container at most honey shows. Since they are slightly thinner in total thickness than a queenline jar, the same honey will appear lighter in color.

Glass Containers, Inc.

Glass Containers, Inc - Evans

Later became known as Glass Containers Corporation which was in operation from 1934 to 1968 in Fullerton, California. The honey sample bottle is from the Evans Honey Company of Los Angeles and advertised as California Orange Blossom Honey.

Glass Honey Bear

The glass honey bear was designed by E. Rachins of Brookline, Massachusetts. He received his patent number DES 166995, June 10, 1952. It is strange the glass model did not sell as well as the plastic models that followed.


Glass Honey Bear
E. Rachins

Gold Crest Honey

This is a very unusual honey jar that was used by the R.M. Gow and Company Ltd. of Brisbane, Australia. It is a very ornate bottle with lots of embossing and the hexagonal patterns are orientated in the correct direction. The reason that you do not see many of these bottles are due to the inscription that "This bottle will always remain the property of R.M. Gow" and it was produced in Australia. Robert Milne Gow established the Gold Crest brand of his food products in 1926.


Gold Crest Honey - Australia

H and H Brand Honey

H and H Brand Honey embossed bottle contained three oz. of honey. Since this bottle is embossed, it is earlier than one that I saw that had a label that was dated 1915. They had their honey operation in New York.


H & H Brand Honey

Hazel-Atlas Jars

The Hazel-Atlas Glass Company of Wheeling, West Virginia started out at Washington, PA and later plants included Clarksburg, WV; Zanesville, OH; Ada, Oklahoma; Montgomery, Alabama; Oakland, California; Pomona, California and other locations (1902 – 1964). Hazel-Atlas made the Beehive Jars and listed them in 1935 *Bee Culture* magazine. They were made in three sizes from ½ pound to two pounds. Two of the jars on display have model markings of 5110 and 5111. The Killions of Illinois were strong supporters of these jars. The Hazel-Atlas Company also made other honey jars such as the Skyline and tall cylinders. Other Hazel-Atlas Honey Jars includes the Skyline jars, round tall cylinders, and the Exceline jars. These jars were introduced to the market in 1936. The Skyline and the Exceline jars were made in ½ pound to four-pound jars. The round cylinders were made in 1¾ ounce to three-pound jars. A sample of the round cylinder jar is shown by the Land O Lakes bottle. They also made a 2½ square jars that makes an excellent chunk honey container. A two-pound vertical ribbed queenline jar is also on display.


Hazel-Atlas Glass Company (Bee Skeps)

Land O Lakes Honey - 3 oz.

Hexagonal Jars

Hexagonal Jars are available from most bee supply dealers. Some of the sizes available are: 1.5 oz., 3.75 oz., and 9 oz. These jars make good gift bottles but are generally too small for show requirements. The original patent 1,073,459 was granted September 16, 1913. Similar Octagonal jars are also available.

Eight sided jar

Kerr Mason Jar

Mason jars are not normally used to sell honey in as there are better jars to show off the honey. However this wide mouth jar was used by the Steiner's Bee Farm from Van Buren, Ohio in 1960. This type of jar is for selling chunk honey. Mr. Steiner was one of the beekeepers that changed the bee inspection system in the 90s.

Steiner's Bee Farm Honey Jar

Kraft Foods

Kraft Foods marketed honey in a 5¾" glass bear in 1988. The jar was made by the Consumers Glass Company, Ville St. Pierre, Montreal, Quebec, Canada.

Lake Shore Honey Jars

The Lake Shore Honey jars were made in many sizes and had different types of closures. They sold extracted honey and chunk honey. The most common type of closure was the sliding top, but on some models of jars a cardboard top was used. In later years a screw top cap was used. Walter F. Straub was at the helm of the company that was near Chicago, Illinois and held the three patents on the jars. The patents were granted in 1932, 1933, and 1935.

Lannese Pure Honey

The Langnese honey was produced and packed in West Germany in a six sided bulging jar. The jar on display once held 8 ounces of golden clear honey

Monarch Honey Jar

This jar is currently displayed in the museum show case.

Next time we'll continue this historical look at honey containers down through the years. BC

Jim Thompson is a long time beekeeper and beekeeping historian, living in Smithville, Ohio.

Southeast U.S. *Varroa* Treatment Decisions

David **MacFawn**

There is much confusion and misunderstanding among beekeepers as to which *Varroa* treatment chemicals to use and when. This is especially true among newer beekeepers. A common cause of confusion relates to the efficiency temperatures of the various chemical treatments. The maximum and minimum average daily temperatures also vary depending on where in the Southeast United States one lives. This is an analysis of *Varroa* treatment temperatures and options with respect to the average high and low temperatures in some areas of the Southeastern United States.

Most *Varroa* treatments have an average low temperature efficiency anywhere from 50 to 65°F. Oxalic Acid drizzle can be used in the Winter months at temperatures of approximately 35°F to 55°F range when little to no brood is present and the bees are clustered. Oxalic Acid is also only effective on phoretic mites. Apivar has no minimum temperature but loses effectiveness when bees cluster and the Apivar strips are not contacting the bees. HopGuard® II is a contact application and its efficacy increases in the Spring and Fall when there is less brood present in the colony. In the Fall, it can be used as a quick mite knock down and incorporated into a mite treatment rotation schedule. Most of the *Varroa* treatments are more effective at low or diminishing brood levels. For instance, Apiguard (thymol) is recommended to be used right after the nectar flow when the queen is tapering off her egg laying. In South Carolina and much of the Southeast, this is in the May/June time frame.

The NOAA US government web site was consulted for average high and average low temperatures in several southeastern areas/cities (**www.ncdc.noaa.gov/cdo-web/datatools/normals**) This NOAA data was integrated into the *Varroa* high and low temperature efficiencies to generate a table and graph showing the effectiveness of various *Varroa* chemicals during different times of year in various locations in the Southeastern United States. One can use graph closest to one's location area to determine what *Varroa* treatment should be most effective during a particular time of year.

Varroa Mite Treatment

Hop Guard II: Active Chemical – potassium salts of hop beta acids. Application – one strip per five brood frames; max two strips per brood chamber; leave in for 30 days. applied up to three times during the year. Cardboard strips; use no more than three times a year Hop Guard® II is most effective in early Spring and late Fall when there is less brood present in the colonies. Studies have shown that Hop Guard® II is safe to use during honey flow without any risk of disrupting nectar foraging or tainting the honey. During warmer months, entrance should be fully opened and inner cover removed.

Check Mite +: Active Chemical – Coumaphos. Application – max two times a year for *Varroa*; one strip per five brood frames; near center of brood cluster as possible; leave in for 42 days/six weeks no more than 45 days.

Apiguard: Active Chemical – Thymol 1.76 oz (50g) per tray. Application – Combine weak colonies before treatment; efficacy maximized if used after honey harvest when brood is diminishing; can be used in Spring if necessary but this is not recommended. Do not treat during honey flow. Remove honey supers before applying treatment; after two weeks replace first tray with new one. Dose higher that 1.76 oz. (50g) per application can cause agitation, absconding, increased mortality.

Apivar: Active Chemical – Amitraz. Application – remove all honey supers before application. One strip per five frames bees. Leave strips inside hive for 42 days, remove after a maximum of 56 days. Do not reuse strips. Use in Spring and/or Fall. Remove Apivar strips two weeks before honey flow starts. Do not use Apivar strips when honey supers present. Hang between two combs; minimum distance is two frames between strips. Bees must be able to walk on both sides of strips. Do not use more than twice a year.

Mite Away Quick Strips: Active Chemical –Formic Acid. Application – causes mortality to both male and female *Varroa* under brood caps as well as adult bees. Option 1: two strips for seven days. Option 2: one strip for seven days and 2nd strip applied 14 days later for 21 days total.

Oxalic Acid: Active Chemical – 97% Oxalic Acid Dihydrate. Application – use only in late Fall or early Spring when no brood present. Will not control *Varroa* mites in capped brood. For outdoor use only. D o not use when honey super present. Solution method: 35 g Oxalic to 1 liter 1:1 sugar syrup. Apply 5 ml solution directly onto bees in each bee space between frames in each brood box; 50 ml max per colony. Vaporizer: apply to outdoor colonies sealed, 1.0 g per brood chamber into vaporizer.

Apistan: Active Chemical – Tau-fluvalinate. After treatment, do not use beeswax for human treatment. One strip per five frames in each brood chamber. Hang strips within two combs of edge of bee cluster. Do not use when honey supers present strips must be in contact with brood nest bees at all times. Two deep brood chambers, hang strips in alternate corners of cluster in the top and bottom super.

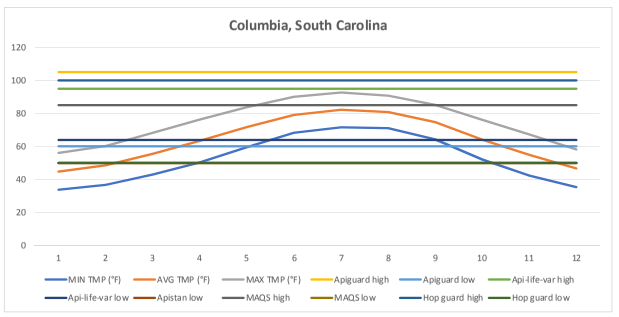
Api-life-var: Active Chemical – Thymol 74.08%; Eucalyptus 16%; L-Menthol 3.7% Application – do not use when honey supers present. The recommended dosage is three tablets per colony (need 1.5 sachets for a full treatment). Two treatments per year can be made.

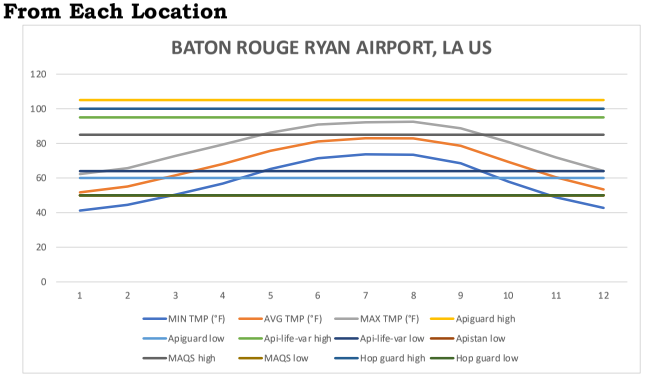
Columbia, SC

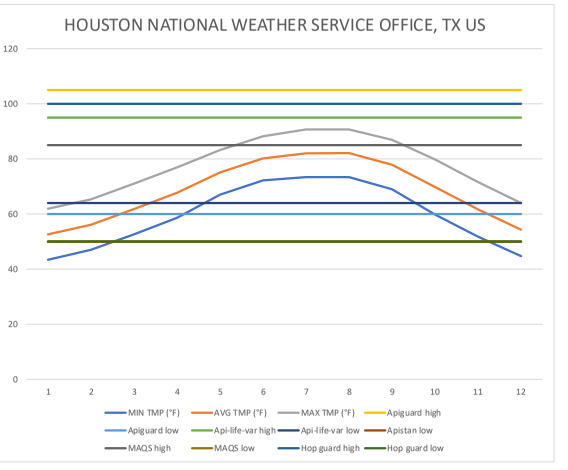
MONTH	MIN TMP (°F)	AVG TMP (°F)	MAX TMP (°F)	Oxalic Drizzle	Apivar	Apistan	MAQS	Apiguard	Api-life-var	Hop Guard
1	33.7	44.8	56	Oxalic drizzle	Apivar					
2	36.8	48.5	60.3		Apivar					
3	43	55.6	68.2		Apivar					
4	50.4	63.4	76.3		Apivar	Apistan	MAQS			Hop Guard
5	59.5	71.7	83.8		Apivar	Apistan	MAQS	Apiguard		Hop Guard
6	68.2	79.1	90		Apivar	Apistan		Apiguard	Api-life-var	Hop Guard
7	71.6	82.2	92.7		Apivar	Apistan		Apiguard	Api-life-var	Hop Guard
8	71	80.8	90.7		Apivar	Apistan		Apiguard	Api-life-var	Hop Guard
9	64.2	74.7	85.2		Apivar	Apistan	MAQS	Apiguard	Api-life-var	Hop Guard
10	52.1	64.1	76.1		Apivar	Apistan	MAQS			Hop Guard
11	42.3	54.8	67.3		Apivar					
12	35.3	46.7	58.2	Oxalic drizzle	Apivar					

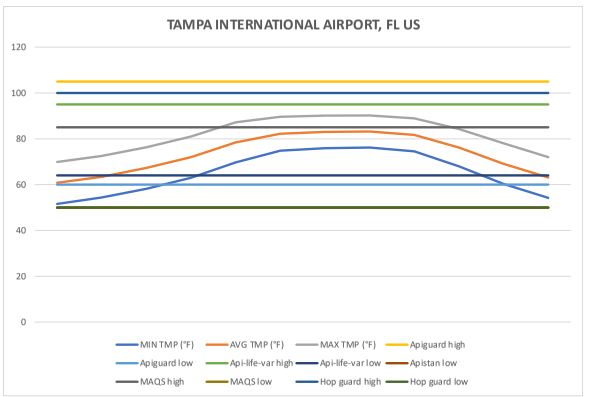
Month	MIN TMP (°F)	AVG TMP (°F)	MAX TMP (°F)	Apiguard high	Apiguard low	Api-life-var high	Api-life-var low	Apistan low	MAQS high	MAQS low	Hop guard high	Hop guard low
1	33.7	44.8	56	105	60	95	64	50	85	50	100	50
2	36.8	48.5	60.3	105	60	95	64	50	85	50	100	50
3	43	55.6	68.2	105	60	95	64	50	85	50	100	50
4	50.4	63.4	76.3	105	60	95	64	50	85	50	100	50
5	59.5	71.7	83.8	105	60	95	64	50	85	50	100	50
6	68.2	79.1	90	105	60	95	64	50	85	50	100	50
7	71.6	82.2	92.7	105	60	95	64	50	85	50	100	50
8	71	80.8	90.7	105	60	95	64	50	85	50	100	50
9	64.2	74.7	85.2	105	60	95	64	50	85	50	100	50
10	52.1	64.1	76.1	105	60	95	64	50	85	50	100	50
11	42.3	54.8	67.3	105	60	95	64	50	85	50	100	50
12	35.3	46.7	58.2	105	60	95	64	50	85	50	100	50

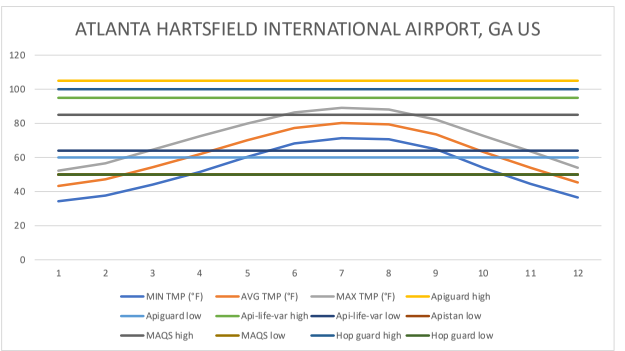
Graphs Derived From Max/Min Temp Data From Each Location

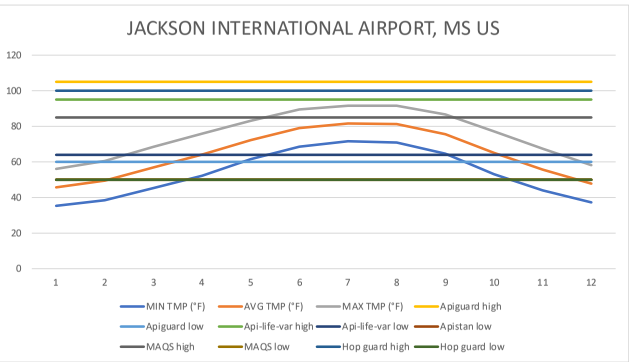












Make This Bee Lining Box

Frank **Linton**

A Package Of Cookies, Some Rubber Bands, Sticky Tape And Your Jacknife.

Improvised Bee Lining Box

Can you recall a time when you were stuck at a place you didn't plan to be, with hours of time on your hands? Perhaps you took a friend to the emergency room and there was a long wait. Whatever the cause, you're stuck there. What to do?

If you are a beekeeper, you might go outside and look at the blossoms to see what insects are pollinating them. You might see honey bees and wonder "Where are they coming from? Are there beehives nearby or is this a feral colony that is mine for the taking?"

Aha! There's a question that will take some time to answer, and you have the time. But . . . your trusty bee lining box is at home. What to do?

I suggest you improvise a bee lining box. All you need is a box of Fig Newtons – the 6.5 ounce size, two rubber bands, two bits of tape, and your jackknife.

As you know, a bee lining box has two compartments, an outer one for catching bees, an inner one for holding them; and a door between the compartments.

How to make the improvised the bee lining box:

1. Open the Fig Newton box at the designated end. Cut off the end flaps and discard them.
2. Carefully open the inner cellophane wrapper without tearing it. Remove it from the box.
3. Slide out the plastic tray containing the Fig Newtons and dispose of them. Yum.

Improvised Bee Lining Box. Showing a Fig Newton box suitably modified by cutting a flap at the left end – with a rubber band for holding the flap closed. A sliding door in the middle divides the box into two compartments. The bee catching tray is shown partially slid open at the right end. The wrapper that lines the box can be seen under the flap, where it serves as a window, and at the open end of the box where it is attached by a rubber band.

4. Cut a flap on the top of the inner compartment. Use a bit of tape to make a handle for it. Hold the flap closed with one of the rubber bands.
5. Roll up a bit of tape – sticky side out. Stick it on the closed end of the cellophane wrapper. Slide the tray into the wrapper and push the tray and wrapper into the box so the wrapper is fastened to the inner end of the box by the tape.
6. Carefully cut the wrapper at its four corners where it sticks out of the end of the box. Fold the ends of the wrapper back over the box. Hold the wrapper ends in place with the second rubber band. You may use tape for this, instead.

The tray should slide out of the wrapper, while the wrapper lines the box. The wrapper provides a clear view into the tray when the flap is opened. Next, make a door to divide the box into two compartments.

7. Find a bit of thin stiff cardboard or plastic to serve as the door. Trim it so that its width is about the same as the Fig Newton box and its length is twice its width.
8. Slide the tray out of the box by ¼ inch or so. Trim one end of the door so it fits easily into the tray.
9. Cut a slot in the middle of the box. Cut through the wrapper. Do not cut into the tray.
10. Slide the door into the slot, 'tray end' first. This divides the box, and tray, into two compartments.

Check: With the door closed (inserted into the slot), the tray should easily slide a couple inches in and out of the box.

How to use the improvised bee lining box:
Part 1. Catching bees

1. Close the flap and open the door. Slide the tray out a couple inches

Honey bees taking up Mountain Dew from a bottle cap feeder.

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2. Approach a foraging bee on a blossom, and trap it in the box by quickly putting the tray over the bee and sliding it into the box. Place your hand over the end of the box to darken it.
3. Open the flap. The bee will go to the light. Slide in the door to trap the bee in the inner compartment.
4. Repeat steps 1 through 3, keeping the door closed except when moving newly caught bees to the inner compartment. Repeat until you have caught a half dozen or more bees.

Part 2. Feeding the bees you caught

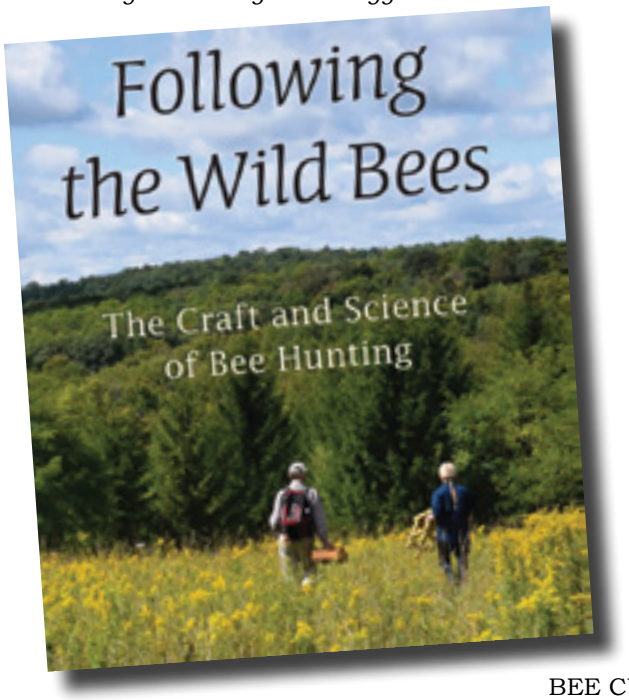
1. Buy a bottle, not a can, of the sweetest soda in the shop. Fanta Grape is said to be very sweet, as are cream soda, root beer, and Mountain Dew.
2. Put some soda in the bottle cap. Put the bottle cap carefully into the outer compartment. Open the door between compartments. Cover the whole thing with a dark piece of cloth (e.g., your jacket). Wait a full five minutes for the bees to fill up on the soda.
3. Uncover the box and slide open the tray.

The bees will orient to the box, fly home, and if you are lucky, will bring back their sisters, starting a beeline you can follow to their home. For details on following a beeline, see any of these books:

- Following the Wild Bees by Tom Seeley, 2016.
- The Bee Hunter by George Edgell, 1949.
- Hunting Wild Bees by Robert Donovan, 1980.
- Bee Hunting by John Lockard, 1908.

To conclude, the main point is that you can improvise a bee lining box from materials found in any corner store, and perhaps the items you need are already in your truck, in the trash bag. Use your imagination and make do with whatever you find. Finally, be kind to the bees and switch out that soda for 1:1 sugar syrup. BC

Frank Linton is an EAS-certified Master Beekeeper. He is the author of The Observation Hive Handbook. Version 2 is now available from the Cornell University Press. Frank hosts the websites ***http://thebeepeeker.com****, a guide to observation hives and* ***http://colonymonitoring.com,*** *a guide to colony monitoring technology.*



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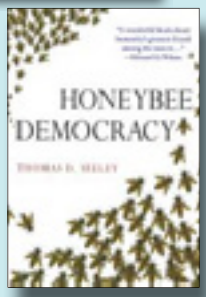

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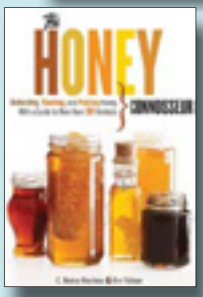

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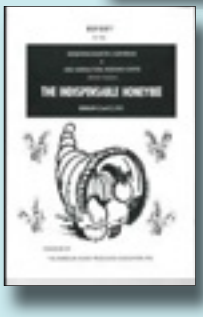

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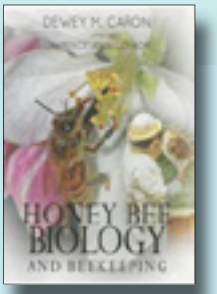

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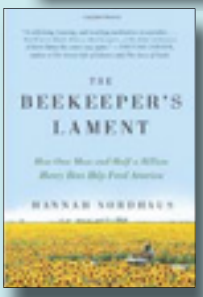

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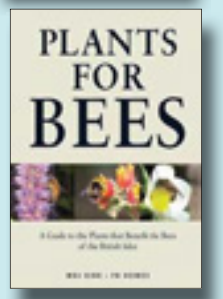

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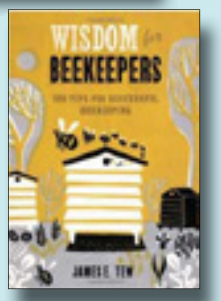

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♦ARIZONA♦

The 11th meeting of the Organic Beekeepers will be in Oracle, AZ, March 2 – 4.

Contact Dee A. Lusby 520-748-0542 eve. Registration $240/person due in advance to Dee Lusby, HC 65 Box 7450, Amado, Arizona 85645. Indicate organic beekeepers meeting, with check made out to Dee Lusby. Send self addressed stamped envelope for receipt and information on YMCA ranch/camp in Oracle, plus liability /medical form to be filled out. $240 fee is a straight fee whether sleeping /eating at camp or not. Event is two nights lodging on Friday and Saturday, six meals, and bring blankets for rented cabins and lodge. For additional information contact Keith Malone (Alaska) 907-688-0588.

♦CALIFORNIA♦

American Honey Producers Association January 10-13 at Double Tree Mission Valley, San Diego.

For information visit **www.americanhoneyproducers.org**.

♦CONNECTICUT♦

Back Yard Beekeepers – each month hands on inspection workshops, bee school, mentor program and more.

Speakers include January 30, Howland Blackiston; March 27, Christy Hemenway; April 24, Roberta Glatz; May 22, Peter Borst; June 26, Dinner meeting; September 25, Richard Coles; October 30, Dewey Caron; November 27, Bill Hesbach.

For more information **visit www.backyardbeekeepers.com**.

♦MICHIGAN♦

Michigan Beekeepers Association Spring Conference March 9-10 at Kellogg Hotel and Conference Center, East Lansing.

For information contact Adam Ingrao, **ingraoad@msu.edu** or visit **www.michiganbees.org**.

♦MISSOURI♦

Three Rivers St. Peters has a beginning bee class starting January 19, 2018 at 6:00 p.m. Contact Bob Leslie at orchral@fidnet.com. Cost is $75.

Eastern Missouri Beekeepers will hold their annual beekeeping workshop and banquet at Maritz in Fenton, February 10.

Speakers include Elina Nino, Becky Masterman, Ana Heck, Ramesh Sagili and more. Tuitiion is $85/person befor January 21 and $95/person after that.

For information **visit www.easternmobeekeepers.com**.

♦NEVADA♦

American Beekeeping Federation January 9-13 at Grand Sierra Resort, Reno.

For information visit **www.abfnet.org**.

♦NEW YORK♦

Southern Adirondack Bee Association Seminar wil be held March 10 at the Hudson Valley Community College TEC SMART building in Malta.

Speakers include Diana Sammataro, Michael Palmer and Samuel Ramsey.

For information contact Mary Jo Crance, **mjc.river@gmail.com**.

♦NORTH CAROLINA♦

Back To Basics, Free Beginning Beekeeping Course, February 3, 10 and 17 at McDowell Technical Community College, 54 College Drive, Marion. Textbooks will be available. Class runs from 8:30 - 4:40

For information and to register visit ww.mcdowellhoneybees.org.

♦OHIO♦

Tri-County Beekeepers Association 40th Spring Workshop March 2-3 at OARDC, Wooster.

Register early as space is limited. Watch website for opening of registration. Speakers include Randy Oliver and Jamie Ellis.

For information visit **www.tricountybeekeepers.org/register**.

♦PENNSYLVANIA♦

The 8th Annual Philadelphia Beekeepers Guild Natural Beekeeping Symposium will be February 10 at the Frankllin Institute in Philadelphia.

Speakers are Tom Seeley and Leo Sharashkin.

For more information visit **www.phillybeekeepers.org/symposium/**.

The 2018 Western PA Beekeeping Seminar will be February 16-17 at the campus of Gateway High School, 3000 Gateway Campus Blvd, Monroeville.

Speakers include Meghan Milbrath, Dwight Wells, Neal Kober, Mark Beougher, Jamie Walters and Fres Blosat. The cost is $60/adult and $40/youth.

Register online at www.bit/ly/BeeSeminar2018.

♦TEXAS♦

Austin 7th Annual Beekeeping Seminar January 27 at Norris Conference Centers, 2525 W. Anderson Lane, #365, Austin.

For information and to register visit **www.aabaseminar2018.eventbrite.com.**

♦VIRGINIA♦

EAS 2018 Youth Scholarship To Attend Ages 18-25, win $1000 to attend entire week at Eastern Apicultural Society.

Applications due by April 20.

For details visit **www.easternapiculture.org**.

♦WEST VIRGINIA♦

The Mid Ohio Valley Beekeepers' Association in conjunction with the **West Virginia Extension Services** will hold their 16th Annual Honey Bee Expo January 27 on the campus of WVU Parkersburg.

The featured speaker is Larry Connor. There will be workshops for beginners and advanced. Cost is $20/adult and $8/12 and under before January 12. After that the cost is $25/adult and $8/12 and under.

Visit **movba.org** for updates.

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Last November down by the Colorado River, Paul and the boys stacked four-way pallets of bees three high. Semis rolled in three and four times a week to haul the little darlings to the land of almonds and honey. Derrick and his crew pamper them through the California Winter with pollen patties, sweet syrup and oxalic acid. In February they move them into the almonds. By late March, they're home again, cheerfully bustin' out of their boxes. In a good year.

I piggybacked most of my best colonies on one of Paul's loads. I had 'em jacked up on pollen substitute, and on the day I'm going to tell you about, I was getting them all sorted and ready to go.

About 11 a.m. the landowner came by on a four-wheeler with some hunters in tow. He asked Paul how long we were going to be, because his hunters wanted to shoot at some elk bedded down by the river. We'd be in the background.

Paul said we'd be finished by noon. Well, I wasn't going to be finished by noon, but Paul assured me that they were just going to take a few shots, and then it would be over. "You'll be fine after one o'clock," he counseled.

I ate lunch up the river under a mighty ancient cottonwood, then stretched out and tumbled into dreamland on the banks of the Colorado. I awoke to a rainbow of sunlight shimmering on a gentle riffle. I found this magical moment so satisfying that I went back to sleep.

A little before one, I heard repeated gunfire from downriver. "Let 'em have their sport," I mused. "They'll move on, and I can go back to work."

By 1:30 I was back on the job, pulling Apivar mite strips – slow going, because they can be hard to find suspended between the frames. You sometimes have to smoke the bees off the top bars to see the strips.

I was under the gun, because I was behind schedule, which for me is pretty typical. Paul was coming back the next day to do the final hive stacking. The truck schedule kept changing, but he wanted to be ready.

A couple of hours later, I was still pulling strips, when I heard shots again. Across the river two or three hundred yards away, someone in blaze orange was shooting at elk running along the riverbank. I was directly behind the elk.

I hit the deck, and sprawled behind four-way pallets of bees. Very undignified! The firepower was impressive. It sounded like the Battle for Mosul. I have no idea how many animals got shot or how many hunters were shooting. I waited for a lull, then took a peek. I saw more hunters but no dead animals. Could they have missed that many shots? Then I heard another volley. Were they warning me to get the hell out of there? The whole situation felt creepy, not to mention unsafe, so I closed up the hive I'd been working on, grabbed my smoker and hit the road, leaving gear scattered everywhere. You could call it an inglorious retreat.

Things move pretty quickly at the holding yard. Itineraries change. Trucks roll in. Bees get loaded and trucks roll out. The next day I never had time to combine a handful of colonies that had fewer than the requisite ten frames of bees for the almonds. You do what you can. In the bee world, nothing ever goes quite as planned. I'll pay the shipping to send all these bees to California, and once they arrive, Derrick can combine the ones that need it. That's just the way it is. As the gal Marilyn likes to say, "Don't let perfection be the enemy of progress!"

I always keep some bees back to Winter in Colorado. I don't like to put all my eggs in the same basket. I have some apricot pollination

customers near Grand Junction. They need bees in March, normally before mine return from California. I make less on these contracts than I would shipping those bees to California, but I enjoy the ritual of taking them into the orchards and watching them work their magic in the fruit blossoms. My growers are grateful to have a reliable supplier of pollinators. I feel it's a public service.

Did I ever tell you how I combine hives in the Fall? I'll tell you again. First I dump all the bees from one weak hive into a single brood super and put two pollen patties on top. Next, I dump all the bees from another weak hive into a single brood super, and put that super on top of the first hive. I don't put newspaper between the two colonies – only the two pollen patties. I let the queens duke it out, or not. This technique generally works. At least the little darlings have some extra warm bodies to huddle with through cruel December.

It's nearly mid-November as I write. My bees arrived in sunny California, as far as I know. They're in Derrick's hands now, and God's. The home bees are well fed. I have a little beeyard puttering to do, but I'm basically ready to take a break until February. Maybe I can catch my breath.

Ed **Colby**

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