ABOUT BEESWAX • MOTHER EARTH

ROOT PUBLICATIONS

Jun 2014

Catch The Buzz™

Bee Culture®

The Magazine Of American Beekeeping

www.BeeCulture.com

Elderflower Mead

Summer Nucs And *Varroa*

$4.99

If There Is A Label It's Removable

Features . . . . . The Rest

Monsanto Puff

As a very long time subscriber to *Bee Culture*, I was very disappointed to read your very uncritical and (to my mind) overly friendly puff piece about Monsanto. I won't go into details (unless you request it) as you don't seem to take well to criticism.

Can't switch to *ABJ* since their Q&A guy works for Monsanto. So I'm renewing only because you're the only game in town.

Jim Lowe
Red Hook, NY

Editor's Response: *Monsanto is in the Bee Business. They bought Beeologics and want to explore the technology developed by that company to further the work started in* Varroa *control, and to use with other pests. Our article was no more, nor do we feel no less different than writing an honest review of a book about beekeeping. That the publisher had the book printed in China isn't part of the equation in the review. That the publisher also publishes books about modern warfare isn't part of the equation. That the publisher makes Amazon a more favorable customer than your local book store isn't part of the equation in the review.*

For this industry to ignore players as large, and potentially important as Monsanto, and now Bayer CropScience would be foolish. We tried to provide the information necessary for us to judge them in their new roles in the bee business. I'm not sure I'm qualified to judge them in other aspects of their business. I wonder if any of us are?

Clean Chickens

I really enjoyed the wonderful article "The Birds and the Bees" by Gail Damerow. Even though I've kept chickens for years and have studied and started to keep bees, I learned a few things which were surprising.

The mentions of cleaning the coop and chickens being a smelly problem made me want to write this email to help Ms. Damerow and others who might be considering chickens in their backyard. Recently I was successful in changing our local ordinance to allow 10 hens in any backyard in our city. As with all ordinances it had provisions for hygiene, smell and noise (no cocks). The cleaning and smell were never a problem for me because of the design of my coop and the bedding I used.

My coops can be built by most people. One feature is they are built on 24" post legs and have large doors so you don't even have to bend over to clean them. I can reach each corner of the 4' x 7' coop and it's even easier to clean the corners with a stiff brush. The other feature is the slide-out bottom. The Masonite floor slides out to expose 1/2" x 1/2" welded wire floor. The manure can be rinsed out in the Summer so it falls through underneath the coop and in Winter I simply change out the pine shavings and put it all in the compost pile. The solid bottom can be disposed of come Summer (less than $10 for a new one) and my girls walk on the wire while enjoying good ventilation during hot Texas Summers. The solid bottom and pine shavings keep my girls insulated during our few freezes and would work well in northern states.

So, there you have it. You don't even have to change shoes (or clean them) because you never step in the pooh. It always smells nice and I can clean it up in minutes. If you don't publish this, please pass it on to Ms. Damerow so she can take cleanliness and smell off the cons list for raising chickens. Oh! Did I mention the nest boxes open from outside the coop for easy gathering?

Keith Lowery
Texas

No More Chickens

There has been a disturbing shift in the content of *Bee Culture* magazine away from beekeeping and towards such unrelated topics as raising chickens. In my opinion even the somewhat related topic of horticulture has been overdone. Any such article should have a clear relationship with beekeeping, which not all recent articles have. Apparently the editor has a personal relationship with one of the authors of some of these chicken articles, which is alluded to in the magazine. The appearance given is that this has clouded his editorial judgment, which is a pity as it degrades the magazine and the efforts of the other authors.

Please, I pay good money to read about beekeeping. I do not want to waste my money on a watered down magazine that tries to be all things to all people. The name of the magazine is *Bee Culture*, not Chicken Culture.

Russell Adkins
Illinois

Editor's Note: *We've made a conscious choice to offer information on some other topics in* Bee Culture. *Chickens being one, but also gardening and plants, mead making, wax. Plus, we haven't cut back on beekeeping information at all. In fact we've* added *writers this year and last. You can count the pages if you'd like. More pages, more bees, more information. Besides, all of these go well with beekeeping. And most of us don't just keep bees – we do other things too. Until now all of the comments have been favorable about the new topics. So, Russell we will continue to try and please as many of our readers as possible, but obviously we can't please everyone. We hope someday you'll consider raising a few chickens. It's really a lot of fun. Thanks for your comments.*

Thank You

Just wanted you to know that I received your package today with the issues you sent to replace what I lost in the house fire. I want you to know that I appreciate that so much.

Thank you.

Thelma Allen

More On Bait Hives

Please, please, please send Dennis LaMonica a *Bee Culture* article entitled Research Review from March 1997, by Roger Morse – pages 19-20.

The scouts will find deadout hives inside buildings as far as 20 feet or more from the building entrance. Also bait hives on the roofs of existing colonies will be found. Even five-frame nucs can be used as a bait hive as a large swarm excess will hang from the bottom like a half of a football. This is with daily checking them.

Enjoy good beekeeping and what a year this has been, 2013.

John

Move Or Die

Thank you very much for sending us the "Move or Die" Catch The Buzz (www.BeeCulture.com/BUZZ). The information provided is both vital and overwhelming for our bees. At this time, right as spring requires us to spend many hours checking our hives set for pollination, I have decided to simply say "NO". This means I will not place any hives on or near crops to be treated with pesticides. Effectively, **we're going on strike!** The EPA, big agriculture and pesticide manufactures they represent may desire to push ahead with their current plans which basically disregard ALL pollinators, but I for one have had enough. Our profits will not occur this year, but knowing that we're in for one tough situation this early in the season is much better than financing soon to be dead bees. That's it, we'll keep our bees in the apiary and let the agriculture industry suffer for a change. **We are now officially on strike.**

Mike Stanley
Woodhinge Farm & Apiary

Extreme Customer Service

I have been reading a few older *Bee Culture* magazines, from a local beekeeper. I thought you might be interested in a kindness story.

On a side note, if you know anyone wasting their money on Carbonite, the computer back-up service, tell them to save their money, it's a scam. They "Purged" all of my pictures, dating back, probably 10 to 15 years. All Gone! So today, when this happened it brightened things up, quite a bit.

O.K. So, today I got stung, real bad, by Carbonite.

While, still fuming from them DELETING all my information. I received a call from Blue Sky Bee Supply, in regards to an attempted purchase through eBay.

About three weeks ago, I found a nice looking stainless steel smoker, free shipping and all. I put the smoker in my cart and tried to check out. I usually have a heck of a time trying to find the alternative payment area, so I don't have to use PayPal. I looked, and looked, and couldn't find any way around PayPal. So, I contacted the seller. It turns out, it was Blue Sky, out of Navarre, Ohio. They wrote back, and told me that I could call them for an alternate payment. I got busy and didn't read the email for a few days, during which they sold out of the smokers. Big Surprise! I kept checking back to see if they were going to have any more of the smokers, only to find, they didn't have anything listed. Uh Oh.

I wrote to them and received a call, which I missed, but immediately called back. The lady I spoke to, was very pleasant. I explained that I had missed a buy from them earlier. She told me to hold on. She came back on, and told me that the owner had said he could make the same deal on a larger smoker. Then told me that they could also do the free shipping on the order. I responded, and told her to tell the owner, that he didn't have to go to this length to satisfy me. I understood he had to be losing money on this deal. She said that it was okayed by the owner, and that was that.

As a New Bee, ain't got no bees yet, bee – well, I don't have any to keep yet, this was a breath of fresh air today. Many many thanks for the extreme customer service, shown to me, by Blue Sky Bee Supply.

Al

Bees Give Respect?

Prior to being drafted into the Army in 1952 I had worked at a paper mill for two years.

Upon returning in 1954 I went back. There were several new

employees that had come while I was serving. My seniority put me ahead of these guys, which was only right. One fellow who was bumped back seemed to blame me and as we had to work together it was a little tough sometimes.

I was a fourth hand on the rewinder, he was *my* spare hand. My job included keeping track of the tonnage when we rewound the paper. This was kept in a ledger book.

We were working the swing shift – 4:00 p.m. to 12:00 a.m. The day before my brother and I had cut a bee tree for the honey. We had done this quite a few times before. We very seldom got stung because of all the protective gear we wore. But upon bringing the honey home we had to separate all the wood and stuff, cut the comb and put it in cheesecloth to drain behind the old wood stove. Invariably we would grab a comb with a bee on it and get stung. At that time I would swell up quite a bit.

When I got to work both hands were quite swollen and made it hard to write the tonnage in my ledger. My spare hand noticed and with a sneer on his face said "What's wrong with your hands?" Instantly I saw a way to help our working relationship.

I said "I got in a fight after work last night." As I continued his sneer left him.

"Yeah some big guy invited me outside the tavern I had stopped in. Must have been something I said. Anyway I told him we shouldn't fight. That's when he swung and missed. The fight was on. I have to give him credit for being so tough. I hit him so many times I think I broke both hands!"

My spare hand looked at me and said "Balony, you don't have a mark on you."

"Yeah, he couldn't touch me. I'm so fast."

We worked together for another year then he quit and went to Boeing. In that year we got along fine.

Twenty years later we met at a retirement party, and he remembered my story. When I told him the truth he looked stunned and the rest of the evening every time I looked at him he laughed.

The bees made my job easier.

Jim Cowan
Aberdeen, WA

MiteZapper Info

First, I would like to thank you for including the MiteZapper in your recent article regarding "Too Many Drones."

Please note the following regarding the operation of the MiteZapper.

You mention that you are concerned about the electrocution of the queen or worker bees. Please note, that the MiteZapper kills the *Varroa*/drones by heat. The name "MiteZapper" sounded better than "MiteHeater" so we went with that.

During the heating cycle, the queen and the bees roaming around on the MiteZapper frame or next to the MiteZapper frame, are 100% safe and are not affected by the heat whatsoever. Only the drones and the *Varroa* trapped inside the cells will feel the heat and be affected; the heat is absorbed by the brood.

I would appreciate if you could note this correction.

Please contact me if you have any questions.

George Sinanis
MiteZapper LLC

Pretty Boxes

Looking to add a touch of fun to your local beekeeping meetings? The Fort Bend County Beekeepers in Texas held a box decorating contest with great success. Kids, Teens and Adults all had a category and 23 entries were submitted. The club gave place ribbons, 'Lil-Smoker" Trophies and gift certificates from Dadant and Brushy-Mountain to the Champions.

Member Jack Richardson spearheaded the competition exclaiming "There is so much talent and imagination in our club." Beekeepers from age seven to 70 participated and every member got one vote per category. "We gave everyone a red, a white and a blue poker chip to vote for their favorite in each of the three age divisions. You dropped your chip in the bag sitting inside the box you liked best", said Jack. "Participation was terrific and everyone was wearing a smile!"

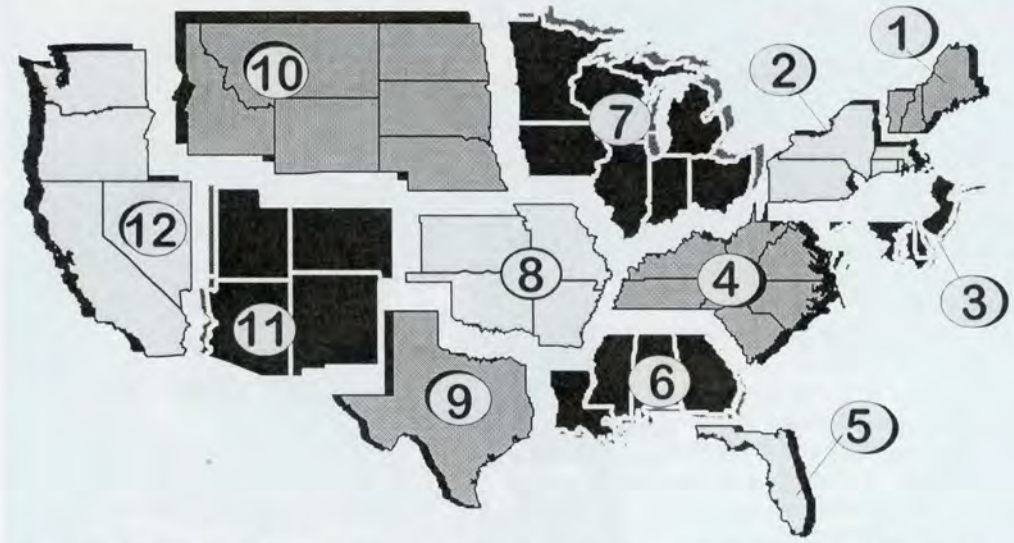
Sharon More
Texas

CORRECTION

Small type and too much in a hurry made us get some numbers misplaced in the honey report last month. MI was inadvertently dropped from the Top Ten list. It should be in position #9, and GA should be in position #11. Sorry for the error Spartans, Wolverines and Bull Dogs.

State	2013 x1000 Col.	x1000 Prod lbs.
ND	480	33.2
MT	159	14.9
SD	265	14.8
FL	220	13.4
CA	330	10.8
MN	130	7.5
TX	106	5.2
LA	50	4.9
MI	85	4.7
WI	59	3.5

JUNE – REGIONAL HONEY PRICE REPORT



So, Spring has come, and is almost gone. And most folks are glad it's gone. Winter was bad enough, but this Spring wasn't any better. So, looking at conditions this Winter and Spring, how are colonies shaping up, and how was Spring, really? Let's take a look.

Region 1. Cold, enough rain, way way behind for the most part and average 31% colony loss. Range 10 50.

Region 2. Cold, wet and cold. Enough to too much rain, and way, way behind. 51% avg Winter loss. Range 10 – 90.

Region 3. Cold, cold, cold. Enough rain it seems, so on time to a bit ahead, with a 40% Winter loss. Range 0 – 80.

Region 4. Cold, wet, cold, wet. Enough to just a tad too much rain, so somewhat behind is all, with 37% Winter loss. Range 1 – 80.

Region 5. Hot and dry mostly. Enough to not quite enough rain, so ahead of the curve. And only 13% loss reported. Range 2 – 25.

Region 6. Cold and wet and cold and wet. Way too much rain, so most are somewhat to way behind, and a 29% loss reported. Range 10 – 55.

Region 7. Cold, cold, and did I say cold and wet. Enough to too much rain, so folks are somewhat to way, way behind and average 33% loss. Range 10 – 67.

Region 8. Cold and more cold. Enough rain to just a bit too much, so way, way behind. And a 63% loss. Range 40 – 75.

Region 9. Cold and dry, so not nearly enough rain, so a bit to way behind. 30% loss. Range 24 – 47.

Region 10. Cold and dry and cold and dry. Not enough rain obviously, but things about where they should be. A 38% loss, with a range from 10 – 50.

Region 11. Too dry, too dry, dry, with not nearly enough rain. But only somewhat behind to where they should be. 27% loss, with range from 2 – 85.

Region 12. Too dry. Too dry, not enough rain. But on schedule to a bit ahead. With only a 20% winter loss reported, range 0 – 32.

Over all, the reported overwinter colony loss was 34%. So it seems that 30 something % is the new normal. We'll see where the BIP survey comes in.

	REPORTING REGIONS												SUMMARY			History	
	1	2	3	4	5	6	7	8	9	10	11	12				Last	Last
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS													Range	Avg.	$/lb	Month	Year
55 Gal. Drum, Light	2.22	2.45	2.22	2.02	2.40	2.13	2.43	2.26	1.80	2.25	2.15	2.45	1.80-2.65	2.22	2.22	2.26	1.97
55 Gal. Drum, Ambr	2.09	2.25	2.09	1.99	2.05	1.92	2.48	2.26	1.60	2.09	2.02	2.23	1.60-2.60	2.08	2.08	2.07	1.86
60# Light (retail)	125.40	202.50	175.00	187.00	180.00	195.00	216.33	170.00	177.50	171.00	177.50	235.00	125.40-285.00	190.62	3.18	196.67	182.19
60# Amber (retail)	125.40	210.00	175.00	182.80	160.00	160.00	194.50	170.00	150.00	193.31	166.50	213.75	125.40-285.00	181.42	3.02	192.28	169.47
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS																	
1/2# 24/case	90.88	85.98	66.80	70.47	76.70	76.70	60.51	76.70	76.70	51.84	79.08	99.00	45.60-108.00	76.60	6.38	78.34	69.42
1# 24/case	126.98	124.18	110.00	96.40	132.00	113.04	93.81	103.00	96.00	106.32	108.32	126.50	79.20-168.00	113.70	4.74	113.63	105.55
2# 12/case	116.84	107.49	102.60	89.50	90.00	94.14	83.47	108.00	75.00	97.44	96.00	102.50	70.00-144.00	97.90	4.08	97.79	93.76
12.oz. Plas. 24/cs	111.24	85.58	71.40	81.24	75.00	72.00	72.02	98.80	72.00	74.40	105.90	96.50	48.00-118.80	85.01	4.72	88.97	80.77
5# 6/case	154.07	124.19	100.54	93.17	114.00	121.69	96.66	114.20	90.00	102.30	110.40	122.50	83.10-175.00	114.33	3.81	117.85	103.81
Quarts 12/case	170.00	187.48	149.03	122.00	120.00	108.67	137.28	117.00	149.03	125.64	131.40	147.20	76.00-252.00	134.07	3.72	139.09	122.38
Pints 12/case	99.50	86.95	102.00	86.50	90.00	132.80	90.43	60.00	66.00	165.01	96.80	93.00	54.00-410.00	98.02	5.45	85.14	74.91
RETAIL SHELF PRICES																	
1/2#	5.33	4.99	3.67	4.01	4.50	4.00	3.23	2.99	4.50	3.80	4.33	5.00	2.50-7.25	4.13	8.26	4.12	3.79
12 oz. Plastic	6.63	5.83	3.95	4.68	5.00	4.49	4.24	4.88	4.99	4.73	5.23	7.06	3.52-8.99	5.07	6.76	5.17	4.78
1# Glass/Plastic	6.50	6.99	6.46	6.23	7.50	6.90	5.20	6.63	5.99	6.31	5.74	8.33	3.00-10.00	6.43	6.43	6.40	5.98
2# Glass/Plastic	12.00	10.91	11.27	9.88	11.00	10.00	9.48	10.94	9.00	9.70	10.42	13.50	6.00-18.00	10.65	5.33	11.09	9.68
Pint	10.00	11.98	11.00	8.14	6.50	6.87	10.08	6.00	6.00	9.67	8.99	11.96	4.25-14.50	8.84	4.29	8.55	8.34
Quart	16.50	17.36	14.58	14.29	13.00	12.42	14.41	15.88	16.12	16.41	12.19	17.55	8.25-27.00	14.62	4.87	14.09	13.42
5# Glass/Plastic	29.13	23.58	24.42	23.05	29.00	24.75	21.77	19.25	21.99	23.90	21.13	30.00	14.98-36.00	24.00	4.80	24.66	21.41
1# Cream	10.25	7.64	8.28	7.17	8.26	8.26	6.72	8.26	8.26	7.22	8.36	12.00	4.90-12.00	8.07	8.07	8.04	7.27
1# Cut Comb	10.75	6.00	9.63	8.45	9.41	5.50	10.33	8.00	9.41	10.00	10.75	9.41	4.50-15.00	9.07	9.07	8.74	8.57
Ross Round	12.00	7.48	8.25	6.67	8.53	8.53	9.00	11.00	8.53	8.53	10.00	8.53	5.00-12.00	8.56	11.41	9.00	8.55
Wholesale Wax (Lt)	7.10	7.81	6.00	4.84	3.20	4.12	5.20	5.50	7.00	6.00	3.86	4.63	2.85-11.00	5.57	-	5.53	5.00
Wholesale Wax (Dk)	4.75	5.63	6.00	4.54	3.10	3.25	4.79	5.50	4.79	4.79	2.83	5.00	2.00-8.00	4.58	-	5.09	4.50
Pollination Fee/Col.	96.67	62.50	89.17	63.40	90.00	43.33	71.25	90.00	94.55	80.00	95.50	123.13	30.00-185.00	81.60	-	76.52	78.47

INNER COVER

The second week of April part of our crew headed south on an extended trip. It's hard being away from the office for more than a couple of days, and this trip was five long days, leaving early Friday and returning late, late Tuesday. Elsewhere you can read about the exact destinations we headed for and why, but here I just want to share the sheer joy of the journey.

First, consider the quote from Henry Van Dyke, a Princeton professor of English Literature, author and poet and Presbyterian minister, who also served as Ambassador to the Netherlands and Luxembourg in the early 1900s.

"The first day of Spring is one thing, and the first Spring day is another. The difference between them is sometimes as great as a month."

In our case it wasn't quite the first day of Spring, but rather two weeks later, yet snow was in the air, the temperatures cool, the weather overcast and gloomy and there had been very few days warm enough to be outside, let along work the bees. Rain and snow and cold and rain and snow and cold were the regular diet of the day and there was no escaping it, improving it or fixing it. Most of you already know this, but I wanted to set the stage.

We were headed for Ashville, in western North Carolina, about nine hours and 500 miles south of Medina. Now Spring moves northward at about 16 miles a day, or about 100 miles a week. So Ashville should be about five weeks ahead of us I figured. But it turns out they were almost as far behind in their Spring weather as we were.

But we didn't know that then. We headed south and a little east from northeast Ohio into West Virginia, where we saw the first of any blossoms showing. A few ornamentals in yards and small town streets, probably those worthless ornamental pears, but they were a stark white in contrast to the dull and drab browns and grays of the yards and wooded areas. A few redbuds showed up, just starting to bloom, showing a pink haze almost drowned out in the Winter drab, but still – a pink haze is better than no haze at all for bloom thirsty beekeepers.

Still heading south we burst into Virginia, where forsythia were in full bloom in neighborhoods, along the freeway, and even in the middle of the freeway roads. Highway departments had planted them years ago it looked like and they had naturalized and spread and were a glorious yellow-gold tangle of color. So, so sad bees don't like them...but the explosion of color was a feast. In lots of places daffodils were up and blooming, mostly shades of yellow, some white, all, however, breakfast, lunch and supper for the bees able to find them.

Virginia had, and at the time still had maple bloom going strong on the soft maples. Some of the trees were simply fuzzy with blossoms on every branch, while others will still deciding if it was warm enough to venture out. The bees . . . the bees just love those maples, so the more the merrier. And finally the ornamental crabs were showing color, finally. Pink and red and white and a little green starting to show. Bees love the blossoms, beekeepers love the fragrance, everybody loves the colors.

Tennessee had more of the same, but a lot more of the same and lots more to boot. We saw our first, and what turned out to be our last dandelions in that state, along a stretch of two lane road just outside a small town. A few, then gone, and no more until the last day in North Carolina. But dandelions! The first real, true sign of life, again, finally. But the redbuds were in their glory. Every one was in full hearty pink, lining the roads, spotting the hillsides, everywhere a blank spot yesterday was a full red redbud today. You could smell them even in the car, and the way the sun was shining, they were almost blinding the driver. What a treat. And green. There's a million shades of green in Spring, and the first few hundred were just starting up. Green tiny leaves on shrubs, tufts of grass, pastures greening on southern facing slopes, and just globs of green on the forest floors. Great, Glorious Green.

It stayed that way into North Carolina, with a few mustards showing long-side the road more and more as we got closer to Asheville. Into town ornamentals in backyards flashed signs of color, but I couldn't tell what they were, but they were everywhere. Azaleas, not a bee plant, but a flower lover's plant were showing color and other things I don't even know were blooming like mad.

The best show though, was saved for last. Along the freeway there were miles of blooming wisteria vines, climbing as high as they could in leafless trees, and dripping, running, oozing down onto the road. It was a honey bee's purple haze.

Between the wisteria curtains were clusters of bright red redbuds, with white dogwood sprinkles mixed in for effect. It took your breath away.

We left at 8:00 a.m., got there at 5:00 p.m. – 500 miles, and five weeks of advancing Spring – all in a single day at 70 miles per hour. What a trip.

•

Have you been hearing about monarch butterflies? Sadly, as monarchs go, so go the bees when it comes to habitat loss. After this past migration season the number of butterflies overwintering in Mexico covered less than two acres of forest. That's down from 45 acres at their peak in 1996. There's some good information on loss of monarch habitat on Dr. Chip Taylor's blog, **http://monarchwatch.org/blog/category/monarch-population-status/**, that beekeepers can well relate to. Dr. Taylor, from the Univ. Kansas, is the lead on a group called Monarch Watch, keeps an eye

Heading South. Not Enough Food. Help Wanted.

on these things. He used to be into bees more than butterflies, and he still does swarm demonstrations for the Kansas State Beekeeper's meetings so he isn't far away. I've pulled some quotes from his most recent blog on the status of these beautiful insects, and some of the reasons for their decline . . .

Three factors appear to have contributed to reduce monarch abundance: degradation of the forest in the overwintering areas; the loss of breeding habitat in the United States due to the expansion of GM herbicide-resistant crops, with consequent loss of milkweed host plants, as well as continued land development; and severe weather.

The role of common milkweed in the lifecycle of the monarch butterfly has increased interest in the presence of this weed in the north central United States (milkweed is an exceptional honey plant). An initial survey conducted in 1999 found that low densities of common milkweed occurred in approximately 50% of Iowa corn and soybean fields. In 2009, common milkweed was present in only 8% of surveyed fields, and the area within infested fields occupied by common milkweed was reduced by approximately 90% compared to 1999. The widespread adoption of glyphosate resistant corn and soybean cultivars and the reliance on post-emergence applications of glyphosate for weed control in crop fields likely has contributed to the decline in common milkweed in agricultural fields. Common milkweed was present in only 8% of Iowa corn and soybean fields in 2009 compared to 51% in 1999. The area occupied by common milkweed in infested fields declined by 90% from 1999 to 2009. Widespread use of glyphosate likely is a main factor in the reduction in common milkweed.

(Overall) loss of habitat in the Summer breeding grounds is another factor that could be contributing to the decline in monarch numbers. My conclusion is that at least 167 million acres of monarch habitat has been lost since 1996. Not all of the corn and soybean acreage occurs within the Summer breeding range for monarchs (but does for honey bee habitat) so the total loss of monarch habitat due to HT crops is lower (150 million) than the total area (174.5 million) planted in 2013 (honey bees take the whole 174.5 million acre hit, however). The 24 million acres of grasslands, etc. converted to croplands since 2008 have been included in the estimated loss to HT crops. Add to this number the estimated loss due to development and the total is 167 million acres (of just butterfly loss, but 174.5 million acres of total habitat loss) lost but this could easily be an underestimate since there are losses such as roadside management that we can't account for. To give you some perspective on the area that is represented by this figure, consider the following: 167 million acres = 261 thousand square miles – an area just below the total acreage of MN, Wisconsin, Iowa and Illinois (266 thousand square miles) and Texas (266 thousand square miles). Plus, the additional 7.5 million acres of non-butterfly habitat lost that was feeding bees, which is the total land area of Connecticut and New Jersey, combined, not just crop area).

For more of Dr. Taylor's observations, check out **http://monarchwatch.org/bring-back-the-monarchs/campaign/the-details**.

So although the monarch folks are looking at only the loss of milkweeds, we know that where once milkweeds grew, so grew other honey bee and pollinator forage. And they grow there no more.

Because it is profitable, and now because they can, farmers have eliminated fencerows, field edges by roads...any place that can be planted has been planted to grow more corn and soybeans including conservation land, previously unused land, practically anything that isn't moving land to grow more corn and soybeans.

They can because herbicide tolerant plants have made possible fewer trips across the field and just plain more plants in the ground. But they could have done that before, right? They could have sprayed preemerge once, planted in no-till, and then come back to catch those late weeds mechanically. Now, they plant and come back and spray once. Fewer trips, fewer chemicals. Less cost. So first they had both more cost and no incentive. Now there's less cost and still profit. There is no second reason. Better tools. More profit.

The seed and chemical companies didn't make this happen. Farmers wanted better tools. There's not enough good food for bees or butterflies because they don't eat corn or soybeans.

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While I've got my neck out here, let's look at another issue that's always near the surface, just for kicks. Planter dust – are the machine guys fixing that, or just ducking the issue and letting the coating people take the heat. And what about spray drift? Any farmers out there saying, geeze, sorry, my fault, but I just had to do it today 'cause I got more to do tomorrow? But don't stop there because there's plenty to share. Contaminated beeswax. Do you hear beekeepers saying, oh, wow, I didn't know using that stuff five years in a row would mess up my wax, or, well, the legal stuff was too expensive, but the cheap stuff worked just as well, or – I think you see my point. When things go wrong and unintended consequences happen, be careful when pointing . . .

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Looking for a good job in a commercial beekeeping operation? The May issue of The Alberta Bee News, a publication of the Alberta Beekeeper's Commission, has, in their classified ads, 215 job openings in commercial operations in that Province for this season. Not surprisingly, they only want to hire trained individuals who can show they are trained because they have graduated and have a title listed in Canada's National Occupational Classification guidelines. Apiary Technicians for instance, or General Apiary workers, or Beekeeper helpers, or Apiary harvesters, or even an Apiary Foreperson are some requested. A few are full time, but most are for nine or 10 months during the year, usually beginning in March and ending in November. Pay is C$12 - $20/hour ($13 - $22US), depending on experience, skill and sometimes the NOC recommendations. Almost all offer accommodations, but you work 45+ hours a week, some weekends and evenings, and you have to be in good physical shape, able to work in a team environment, and be able to actually work with bees. Speaking English and having a license is always a bonus. Interested? Send $5.00 to Gertie Adair, 11434-168 St., #102, Edmonton AB T5M 3T9. She'll send along all of the listed jobs and you can go from there. Good luck. Let us know what it's like when you get back. Take pictures. BLOG!

It's Summers Time –

Neighbors, Trees, Chickens . . . And A New Computer

Wow, the June issue already. Can you believe it? It's late April as we're getting this one ready to go to the printer and it's still a little cool here. There have been a couple of days where we didn't need a long sleeve shirt or a jacket – but only a couple. But daffodils, hyacinth and tulips are finally popping through. Everything is slow this Spring and we're seeing some damage to plants and trees from the long hard Winter. The chickens and the cats are finally able to be outside and so they are very happy.

We're getting equipment ready for packages which should arrive this week – about two weeks late. The new beekeepers that took our Spring beginner's class are all getting very anxious. Kim and I have 10 packages coming. Two will go into the two observation hives that we manage, two will go to the Cleveland Botanical Garden for their hives and that leaves us six. I'll let you know how it goes.

We live outside the city limits – in the country, but we have neighbors all around us. Not right on top of us, but neighbors. Northern Winters keep folks pretty secluded from those neighbors. You have to make the effort to get to them. And with our closest neighbors we do. But now it's finally Spring and so there are neighbors again, more easily accessible. We have five houses that are close enough to be called "neighbors." Four of those five are absolutely wonderful, delightful people and we all enjoy each other as much as we can.

Then, there's that one neighbor – we've all had these neighbors some time or another. It seems like they just have no desire to be a good neighbor and indeed spend a good bit of time and energy actually being a bad neighbor. Well, we have one of those. Last week one of his several very large hogs escaped – as they do on a somewhat routine basis. The hog headed straight for our backyard and chicken pen. It was Good Friday and I had gone to pick up trees in the next county over. And Kim, well he was sick in bed with one of those really nasty stomach things – enough said about that! The hog, after trampling around a bit in the mud, took his snout and just lifted up part of the fence to the chicken pen.

Now here's the part where the really good neighbor jumped in and took care of things after she realized we were not available. She got the chickens back in the pen, temporarily fixed the fence so they couldn't get back out and somehow managed to coax this hog back across a very busy road to his own yard just in time to hand him off to the young owner arriving home. This might not sound too difficult except for the fact that our good neighbor Anne is about 100 pounds. She's tough.

Trees – Kim and I love trees and every year we go a little crazy. I picked up over a hundred seedlings last weekend, some of which will go for our club beeyard, some for home. Yesterday we picked up another 70 here in Medina County. We have two and a half acres at our place and then we have a house in town, on a large city lot, where my son lives. So we'll plant a bunch over there in his backyard – the spruce and buckeye do well there. And we'll plant a bunch in our yard and usually we end up giving a few away. Every year the Soil and Water Conservation Department sells these seedlings. You get 10 seedlings for $10.

This will be the third Summer for the chickens and they are doing just fine. Egg production is lower than that first year, but not bad – still getting an average of five a day. These girls have been pretty low maintenance. We really haven't had any disease or pest problems. And I'm somewhere in the middle as far as cleaning. I do the best I can with the time I have, but I'm not a fanatic. We still haven't discovered the perfect watering system so we keep experimenting with that. I think we've missed our window for getting more chicks this year – not home enough. Next on the agenda might be a few ducks. I've been talking to a lot of people who have both chickens and ducks and they do quite nicely together.

This June issue is being done on my brand new computer with brand new updated software. I've needed a new one for awhile, but there is never a good time as far as having down time. We just don't have any down time here at *Bee Culture*. So this last week or so has been a little painful, a little stressful and a little scary. Hopefully you won't notice any difference as I work my way through this process. Our goal is always to get the magazine to you on time but also to make sure it is the best issue we've ever done.

We had an absolutely amazing time at the Mother Earth News Fair in Asheville, NC. More about that on page 74. We will also be at the one in Seven Springs, PA in September. If you are close enough and get a chance I encourage you to go.

I'm off to Reno as I finish this issue up. A few days relaxing and watching my younger son bowl in a tournament out there. I'll let you know how he does.

Kathy Summers

A Closer Look

BEE BREAD

Clarence **Collison**

Honey bees typically do not consume raw pollen as it is collected and packed in the pollen baskets in the field.

From a nutritional standpoint, protein is essential for the normal growth and development of honey bees. Pollen is a vital resource for honey bees providing protein, amino acids, lipids, vitamins, minerals and sterols in their diet. Pollen represents the colony's only supply of protein, essential for brood rearing and the glandular development of young worker bees (Winston 1987).

Honey bees typically do not consume raw pollen as it is collected and packed in the pollen baskets in the field. Instead, workers process pollen that they collect by packing it into brood comb cells, adding glandular secretions to it, and sealing it with a drop of honey (Gilliam 1979a). Pollen stored in this way undergoes a fermentation process and becomes what is called "bee bread" (Herbert and Shimanuki 1978). This stored pollen undergoes a number of biochemical changes which may be responsible for increased stabilization of the product or may lead to chemical changes that increase the digestibility and nutritive value for bees (Herbert 1992).

The conversion of pollen to bee bread and the accompanying biochemical changes have often been postulated to be the result of microbial action, principally a lactic acid fermentation caused by bacteria and yeasts (Foote 1957; Haydak 1958). This fermentation process is believed to be brought about by substances added to it by the bee during collection and storage. The pollen rapidly loses it power to germinate, its acidity is increased, and the amount of water-soluble protein it contains is almost doubled (Morse and Hooper 1985).

Chevtchik (1950) as reviewed by Gilliam (1979a) conducted microbiological analyses of fresh pollen and pollen stored in comb cells and reported four phases of microbial development in fermenting pollen that occurred during seven days from the time of the appearance of lactic acid bacteria, yeasts, indole-producing bacteria (*Escherichia*) and sporulating aerobic bacteria. The first phase lasted 12 hours and was characterized by the development of a heterogenous group of microorganisms including yeasts. In the second phase, anaerobic lactic acid bacteria (*Streptococcus*) utilized growth factors produced by the yeasts and putrefactive bacteria and lowered the pH of the pollen. The third phase was characterized by the disappearance of *Streptococcus* and the development of *Lactobacillus* that produce more acid than *Streptococcus*. The fourth phase, which began at the end of the seventh day, was characterized by the disappearance of the lactic acid bacteria and certain yeasts due to the large quantity of lactic acid produced. The pollen became microbially sterile, and the pH was approximately four.

Pain and Maugenet (1966) reported that three microbial genera (*Lactobacillus*, *Pseudomonos*, and *Saccharomyces*) were important in the modification of pollen during storage. *Lactobacillus* caused a lactic acid fermentation that stabilized the pollen, by increasing the acidity, but the roles of *Pseudomonos* and *Saccharomyces* were not well understood. They thought that Pseudomonads probably contributed to the anaerobiosis (life in the absence of free oxygen) required by *Lactobacillus* and to the degradation of the walls of pollen grains since they developed rapidly as soon as the pollen was packed by bees into comb cells but disappeared almost totally after two to three days. Then lactic acid was produced by *Lactobacillus*. This lactic acid fermentation was completed by the end of about 15 days though the responsible organisms maintained a stationary population for several months. The yeasts, which were present in small numbers initially, increased after fermentation and subsisted in stored pollen longer than other organisms.

To better understand the involvement of microbes (bacteria, yeasts, molds) that are present and may be involved in the pollen-bee bread conversion process, Gilliam (1979ab) and Gilliam et al. (1989), did an extensive survey of the microbes associated with pollen and bee bread. The microbes associated with almond pollen removed from the flower, from pollen pellets from traps placed on bee hives in the almond orchard and from pollen stored in comb cells of the hive (bee bread) for one, three, and six weeks were investigated. One-hundred and thirteen yeasts belonging to seven genera were isolated from the almond pollen samples. *Torulopsis magnoliae* was the most common isolate and was found in all pollen samples except pollen from the flower. Thus, the bees

may have added it to the pollen. The number of isolates and species decreased with time and storage. In general, most of the yeast species from pollen from the flower and the trap were not found in bee bread. Also, yeast isolates from pollen from the flower and the trap fermented more sugars and assimilated more carbon compounds than those from bee bread (Gilliam 1979a).

Forty-one bacteria belonging to the genus *Bacillus* were isolated from almond pollen samples. Thirty-three of the 41 isolates were *Bacillus subtills*, the only species associated with all pollen and bee bread samples. *Bacillus megaterium, B. licheniformis, B. pumilus* and *B. circulans* were also isolated. Since the greatest number of *Bacillus* isolates and species were found in pollen from the trap, the foraging bees may have added the organisms to the pollen (Gilliam 1979b).

One-hundred and forty-eight molds were isolated from the almond pollen samples. The majority of molds identified were Penicillia (32%), Mucorales (21%), and Aspergilli (17%). In general, the number of isolates decreased in pollen as it was collected and stored by the bees. Each type of pollen sample appeared to differ in regard to mold flora and dominant species. *Aureobasidium pullulans*, *Penicillum corylophilum*, *Penicillium crustosum* and *Rhizopus nigricans* were among the molds that may have been introduced by bees during collection and storage of pollen. *Mucor* species, the dominant mold in floral pollen, was not found in corbicular pollen (bee's pollen basket) and bee bread. Tests for 19 enzymes revealed that most of the molds produced caprylate esterase-lipase, leucine aminopeptidase, acid phosphatase, phosphoamidase, β-glucosidase, and N-acetyl-β-glucosaminidase. Thus, enzymes involved in lipid, protein, and carbohydrate metabolism were produced by pollen molds. Molds could also contribute organic acids, antibiotics and other metabolites (Gilliam et al. 1989).

Vasquez and Olofsson (2009) identified a large flora of lactic acid bacteria in the honey stomach of the worker honey bee. The presence of this flora in bee pollen and bee bread was investigated. Pollen collected from the legs of foragers and two-week old and two-month old bee bread from the brood combs was analyzed. Bacterial isolates from these pollen samples were identified. The majority of the honey stomach lactic acid bacteria flora was recovered in a viable state from both the pollen and the two week old bee bread, but not from the two month old bee bread. It was demonstrated for the first time that bee bread is probably fermented by the honey stomach lactic acid bacteria flora that has been added to the pollen via regurgitated nectar from the honey stomach. This discovery helps to explain how honey bees standardize the production of bee bread and how it is stored. The presence of the honey stomach lactic acid bacteria and its antimicrobial substances in bee bread also suggests a possible role in the defense against honey bee diseases since the bee bread is consumed by both the larvae and the adult bees.

Eggs, prepupae, pupae, and worker bees emerging from cells as adults are usually free of internal microbes. Microorganisms acquired by larvae through ingestion of contaminated food are usually eliminated through the single defecation that occurs at the end of the feeding period prior to pupation. Emerging adult bees acquire intestinal microflora by food exchange with other bees in the colony and through consumption of pollen (Gilliam 1997).

Bee bread and pollen from seven geographical locations in the U.S. were analyzed for moisture, protein, reducing and nonreducing sugars, lipids, sulfated ash, starch, pH, pectins and crude fiber (Herbert and Shimanuki 1978). The levels of protein, moisture and lipids differed little between pollen and bee bread. However, there was no detectable starch in any of the samples of bee bread; and starch was present in all seven samples of pollen (mean value of 1.77%). In addition, bee bread contained higher levels of reducing sugar and crude fiber than pollen but lower levels of ash. The ash of pollen samples ranged between 2.4 and 3.4% of the dry weight. The pH of bee bread averaged 4.1 compared with 4.8 for pollen.

Bee bread is chemically different from pollen: it has a higher vitamin content (Haydak and Vivino 1950), lower amounts of complex polysaccharides, a shift in amino acid profile (Standifer et al. 1980) and lower pH (Herbert and Shimanuki 1978; Loper et al. 1980). It is routinely suggested that these changes in nutritional composition are a result of the metabolic activity of the microflora that is present in stored pollen (Gilliam 1979a; Vásquez and Olofsson 2009; Herbert and Shimanuki 1978), although the organisms that are actively involved in this metabolic transformation have never been definitively identified (Mattila et al. 2012).

Bee bread is more nutritious to workers than unprocessed pollen. Honey bees fed bee bread live longer than those that are fed pollen (Beutler and Opfinger 1949) and are better able to offset physiological damage from pests when bee bread is abundantly available (Janmaat and Winston 2000). Because of the way bee bread is inoculated, matured and distributed its microbial community acts as an extended gut for the colony and the benefits of its activity are shared amongst all colony members (Mattila et al. 2012).

Stored pollen is presumed to be inoculated with bee-associated microbes prior to maturation into bee bread. Mattila et al. (2012) found that 207 bacterial species are mutually shared between the bee gut and bee bread. A substantial percentage of the species found in bee guts, however, were not found in bee bread and vice versa (75% and 46%, respectively). *Oenococcus* and *Paralactobacillus* were the most active microbes in bee bread comprising 52% of the bacteria found which are genera that are associated with fermentation of human-produced foods and fermentation in other habitats. *Oenococcus* is a genus not previously known associated with honey bee colonies. Of the 18 bacterial species in bee-bread samples that each made up at least 1% of the active bacterial community, 17 of these species were facultative or obligate anaerobes. These species included many lactic acid bacteria (*Oenoccoccus*, *Paralactobacillus*, *Bifidobacterium*) as well as enterics (*Enterobacter*, *Escherichia/Shigella*, *Klebsiella* and *Serratia*). The overwhelming activity of anaerobes associated with bee bread and bee guts suggests that their presence may be critical for converting pollen into a bee-bread food product that is suitable for long-term storage in colonies.

The influence of bee genotype on the conversion of pollen to bee bread and on the protein titers of bees feeding on it was examined using European and Africanized honey bees (EHB and AHB) (DeGrandi-Hoffman et al. 2013). Bee bread was more acidic than the pollen and that made by EHB was slightly more acidic than AHB. Protein concentration in bee bread was similar for both subspecies and lower than in the pollen. In general, amino acid concentrations

"Because of the way bee bread is inoculated, matured and distributed its microbial community acts as an extended gut for the colony and the benefits of its activity are shared amongst all colony members."

were higher in bee bread compared with pollen. The only exception was tryptophan. Concentrations of most amino acids in bee bread made by either EHB or AHB were similar. Both subspecies consumed more bee bread made by AHB than EHB. EHB and AHB consumed similar amounts of each type of bee bread, but protein concentrations in AHB were higher than in EHB. Differences in protein acquisition between AHB and EHB might reflect environmental adaptations related to the geographic region where each evolved and could contribute to the successful establishment of AHB populations in the New World. BC

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Clarence Collison is an Emeritus Professor of Entomology and Department Head Emeritus of Entomology and Plant Pathology at Mississippi State University, Mississippi State, MS.

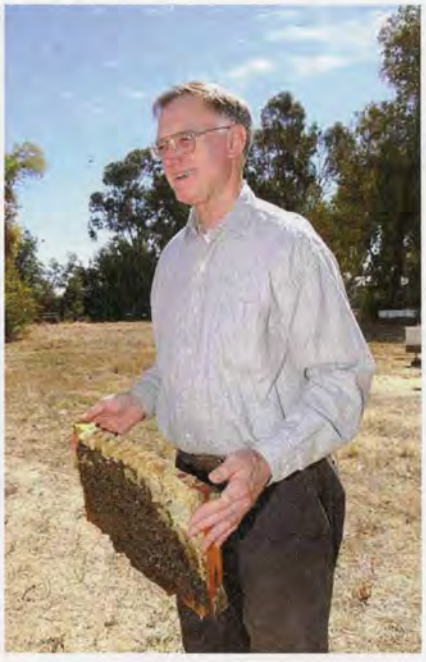
The Pollinator Stewardship Council

CALIFORNIA'S "GO TO" BEE EXPERT RETIRES

DR. Eric Mussen Is Moving On

Gene **Brandi**

Dr. Eric Mussen began his career as the University of California Extension Apiculturist in 1976. Those of us in the bee industry who have been privileged to know and work with Eric appreciate his vast knowledge of honey bees as well as his great communication skills. Whether he was engaging with scientists, beekeepers, growers, government officials, the media, or anyone else, Eric has been the "go to" person for bee related expertise in California and beyond since 1976.



Eric's involvement with a number of industry and professional groups has enabled him to stay abreast of the current issues facing the bee industry. The fact that he is in demand as a featured speaker throughout the USA, as well as internationally, is evidence that others appreciate his great knowledge, as well. Here in California, the California State Beekeepers Association, the California Bee Breeders, many local and regional beekeeping and agricultural organizations, and others rely on Eric to be the source for the latest honey bee related information. His newsletter: "From the UC Apiaries" is read throughout the beekeeping world and is a source for the latest news of interest to the bee industry.

Dr. Mussen's service as a member of the California State Beekeepers Association is legendary. He has been an active member of the CSBA Board of Directors for 38 years. Eric's expert advice in many areas has been of great benefit to the CSBA, especially as coordinator of projects for the CSBA research committee, as he sends out the requests for proposals every year and then assists the committee in analyzing the merits of each proposal. Any time the industry has needed Eric's expertise at a meeting, an industry or government hearing, to compile industry data, to write an article for publication, or for any reason whatsoever, he has always been ready, willing, and more than able to accomplish the task.

The California State Beekeepers Association has honored Eric with the Distinguished Service Award and, even though he does not own a beehive, honored him as 2006 Beekeeper of the Year!

Eric works with the National Honey Board and the Almond Board of California as he solicits research proposals and assists in their analysis for their respective Research Committees. He also serves as a scientific advisor to Project Apis m, a non-profit industry funded bee research organization.

Dr. Mussen has been involved with a number of bee research projects while at UC Davis. In addition to his research on fungicides, antibiotics, mite treatments, etc., he is one of the foremost experts on nosema disease of honey bees in the country.

In summary, Dr. Eric Mussen has been an extremely valuable asset to the beekeeping and agricultural industries of California, the United States, and beyond throughout his distinguished career. BC

The Voice Of The South

It's Not VHS or Betamax, It's VSH

After several recent presentations on the topic of breeding honey bees for resistance to *Varroa* mites, I realized that there continues to be some misunderstandings about honey bees bred to express the trait known as *Varroa* Sensitive Hygiene (VSH). Obviously, scientists may not be the best people to name types of honey bees that will be sold to other beekeepers, but a large number of folks call these bees the 'VHS' bees. That's when I usually tell the joke written in the subtitle of this article, which is usually followed by blank stares. I should face the truth that even the reference to 'VHS versus Beta' is too archaic for younger audiences. Or maybe it's just not that funny?

I could probably tolerate someone getting the acronym for these bees wrong, but the fusion of two breeding programs that were rooted at the USDA Bee Lab in Baton Rouge needs correction. Too often I have had someone ask me where they can find those VSH Russian Bees or those Russian VSH Bees. At first, I thought that these people wanted to purchase a hybrid cross of ARS Russian honey bees mated to VSH honey bees, which is something that some folks have created with breeding. However, subsequent questioning of these people showed that they were simply confused about the breeding projects.

So, to clarify, two breeding programs were initiated in Baton Rouge in the mid-nineties. Dr. Tom Rinderer led (and continues to lead) the ARS Russian honey bee breeding effort. This project imported honey bees from far-eastern Russia near Vladivostok to serve as the base of a closed population breeding program to produce a stock of bees that are resistant to tracheal and *Varroa* mites while retaining good overwintering characteristics for northern climates.

Dr. John Harbo initiated the breeding program for what became known as the VSH trait jointly with Dr. Roger Hoopingarner, who was at Michigan State University. Their goal was to try and identify genetic qualities of bees that conferred resistance to *Varroa* mites. They began by selecting queen parents from those colonies that grew mite populations more slowly than typical colonies of bees. I joined the VSH program shortly afterward as a post-doc, and I continued up until a couple of years ago. Dr. Bob Danka currently leads the VSH breeding program at Baton Rouge (Dr. Harbo retired in 2005).

The base population for the VSH breeding program was derived from honey bee queens found throughout the U.S. They were not from survivor colonies, as has been suggested by more than one person on the beekeeping list services. This point of confusion comes from a third breeding effort that was initiated by Dr. Bob Danka and Dr. José Villa. These two scientists field tested queens that were voluntarily mailed to them by beekeepers. They asked beekeepers to send them queens suspected of surviving *Varroa* mite infestations. They then crossed the best performers and repeated field selection through a total of three years. Although progress seemed slow, the team started to see possible *Varroa* resistance after the third season. However, progress in the other two programs seemed to be quicker and more pronounced, and the Lab discontinued the effort to breed from suspected survivors.

What are SMR Bees and how do they relate to VSH Bees?

Another source of confusion is that VSH bees were once called something else. I have already confessed that scientists probably should not be allowed to name things, but to begin with one three-letter acronym and shift to an entirely different three-letter acronym several years later is a little crazy. However, these clumsy changes in name reflect some major changes in our understanding of how these bees are able to resist *Varroa* mites.

The cornerstone for the breeding program in the early days was the

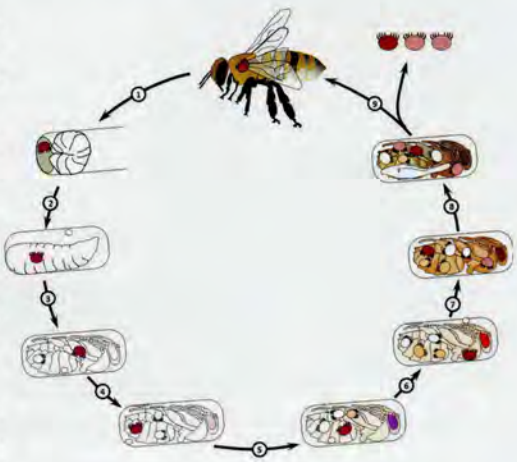


Figure 1 – Life cycle of the Varroa Mite: ***1*** *– Adult female mite invades brood cell ca. 15 hours before brood cell is capped.* ***2*** *– She lays her first egg about 30-35 hours after invading cell. Usually this first egg is her son.* ***3 thru 6*** *- She lays 3-4 eggs that become her daughters. She lays a single egg every 30 hours. Each offspring progresses through two nymph stages.* ***5*** *- The male mite becomes an adult before his sisters. He is lightly tan colored.* ***6*** *– The first daughter matures to adulthood and mates several times with her brother.* ***7*** *– The second daughter reaches adulthood and mates with brother. The oldest daughter continues to darken.* ***8*** *– The bee pupa expands wings and about a day later emerges from the brood cell.* ***9*** *– The mother mite and 1-2 daughters leave a worker brood cell with the emerging bee.*

Figure 2 – Mechanism of resistance in VSH bees. *Honey bees selectively bred for high resistance to* Varroa *mites by hygienically removing mite-infested pupae from capped brood cells. This trait of bees is* Varroa *Sensitive Hygiene, and the bees are called VSH bees.*

use of a standardized field protocol in which colonies were made to have uniformly sized bee and *Varroa* mite populations at the start of an experiment. The only major differences between colonies were the genetic backgrounds of the queens installed in them. These short experiments ran for 10-16 weeks, which was enough time for mite populations to grow from a few hundred mites to thousands. Adult female mites invaded worker brood to initiate reproduction (Figure 1), and we did not allow drone brood in these tests. The hope was that colonies growing the smallest mite populations during that time had some sort of genetic or heritable quality in the worker bee population that conferred *Varroa* resistance. After several years of breeding, John and I became convinced that we had identified a heritable trait in bees that led to slower growth of mite populations.

I am truncating several years of work, but the slow growth of mite populations was highly correlated to high rates of infertility among the mites found in what appeared to be the most resistant colonies of honey bees. Most of these infertile mites simply did not lay eggs; others laid a few eggs, but the development of the mite offspring was abnormal or retarded. All colonies of honey bees seem to have a background level of infertile mites of 15-20%, but our selection produced colonies in which >80% of the mites were infertile. It seemed that somehow our selected bees were "suppressing mite reproduction", and the bees were called SMR bees.

Initially, we thought that perhaps some physiological property of the resistant bees was blocking normal reproduction in the mites. It took several years and some suggestions from other scientists (Dr. Marla Spivak, University of Minnesota) before we finally discovered the major mechanism of resistance in these bees. Again, I am truncating several years of work, but it turns out that our highly selected bees are very good at smelling mite-infested pupae in capped brood cells. They uncap these pupae, and ultimately they hygienically eat or pull most of these mite-infested pupae from the brood cells (Figure 2). Although this action kills their own family members, it effectively stops the reproductive cycle of the mother *Varroa* mites. The offspring from each mite are killed, but each mother probably survives the ordeal.

So, the bees became known as the VSH bees. I should emphasize that *Varroa* Sensitive Hygiene actually describes a trait that can probably be found in low levels among all populations of honey bees. We maintained the trait in purebred lines, but the trait is probably everywhere in low frequency. You could probably select for it from bees in your back yard.

Although we do not fully understand how *Varroa* Sensitive Hygiene produces high infertility, we do know that VSH bees prefer to remove mites that produce offspring. This bias can leave more infertile mites in capped brood cells, which gave us the impression that mite reproduction was somehow inhibited. However, VSH bees also frequently manipulate brood cells containing mite-infested pupae. They uncap and recap brood cells many times in a few days, and sometimes these pupae are eventually left recapped with an adult mite inside. More often than not, such a mite will not have offspring, and it is also possible that the hygienic actions of the bees inhibited her reproduction. There is still much to learn about these bees.

How do I use VSH honey bees in my operation?

One of the nuances of the VSH breeding program is that the trait is best delivered to the beekeeping

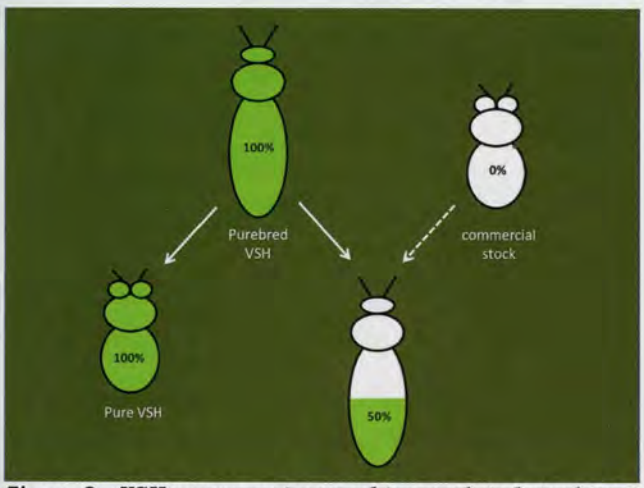


Figure 3 – VSH queens outcrossed to unrelated stocks are best for use in production colonies. *The worker population and daughter queens are only 50% VSH, but all drones produced by the queen are pure VSH. Hybrid colonies express half the resistance of the purebred lines.*

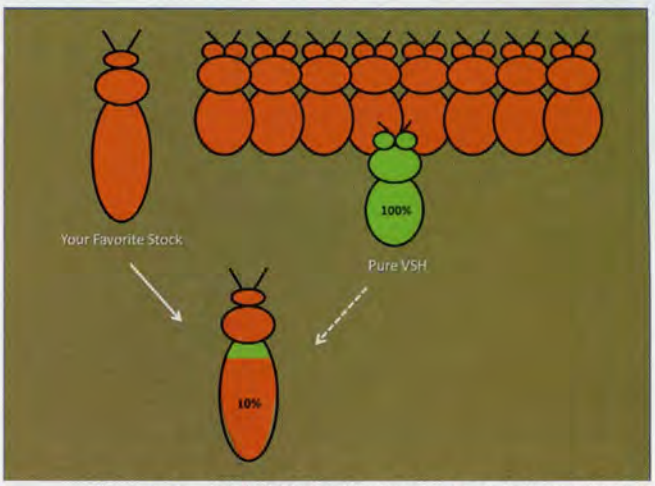


Figure 4 – Add VSH trait slowly to existing stocks.

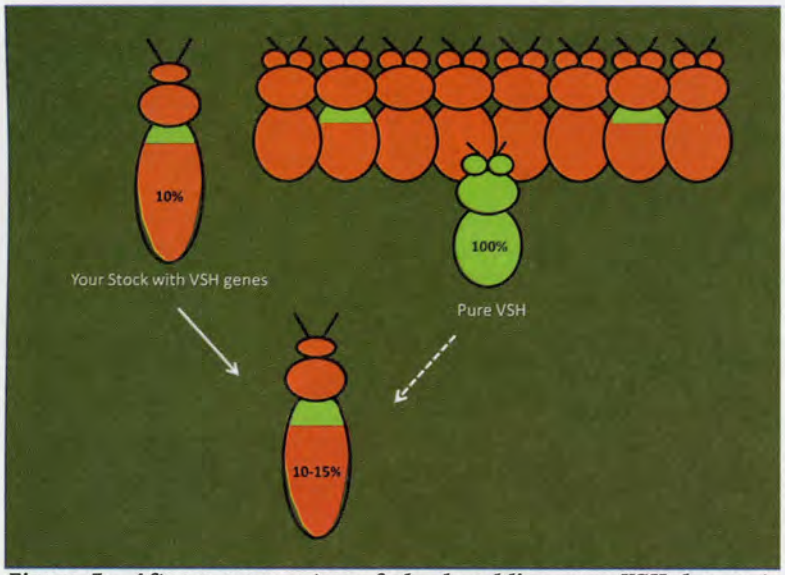


Figure 5 – After a year or two of slowly adding pure VSH drones to your breeding population. *Your selected stock will carry VSH genes. These queens will produce drones with varying levels of VSH genes (orange drones with green slices) that will contribute to your breeding pool. The breeding pool is also continually supplemented with pure VSH drones (all green) until the desired level of resistance is reached (which could take many years).*

industry in hybrid crosses (Figure 3). We thought this approach was best given that some of the purebred VSH lines from the Baton Rouge Lab were genetically less variable than desired commercial stocks. This often happens in selective breeding; focusing on any one characteristic can lead to a loss of genetic variability of other important characteristics. This trend is particularly problematic in honey bees. Nature has produced in the honey bee a creature that functions best when queens are mated to 20-25 drones from genetically diverse backgrounds. Selective breeding can reduce genetic variability.

Understanding this issue, the VSH breeding team conducted a variety of field trials over many years to measure the levels of resistance from colonies headed by purebred VSH queens that were mated to unrelated and non-VSH drones. VSH queens mated to a variety of commercial stocks produce hybrid colonies with about half the resistance of the purebred lines, BUT this level of resistance significantly reduced the growth of mite populations when compared to unselected commercial stocks. Additionally, by outcrossing the VSH queens with drones from commercial stocks, much of the genetic variation for other traits was returned to the worker populations in these colonies.

It is easy to obtain VSH queens mated to other stocks because of the efforts over many years to produce and distribute purebred VSH breeder queens by Tom and Suki Glenn. They sold the breeders to queen producers, who in turn mated the VSH daughters to commercial stocks that are sold to beekeepers. For example, you can find VSH × Italian or VSH × Carniolan crosses in the advertisements within this issue. Tom and Suki have retired, but purebred VSH breeder queens can be obtained from Dr. John Harbo (harbobeeco.com) or Adam Finkelstein of VP Queens (vpqueenbees.com).

Finally, I often get the question of how to incorporate the VSH trait into "my favorite stock" of bees. Many folks are breeding locally adapted stocks, or stocks that perform best in their geographic part of the country. They want to add the VSH trait but do not want to lose the good qualities of the existing stocks. This can be tricky. When in doubt, proceed slowly (Figure 4).

Start by holding the proportion of VSH drones at 10-15% of your total drones so that you do not dilute those characteristics that are most important to your stock. You would then select the resulting colonies using your usual criteria and some

measure of varroa resistance (e.g. mite populations at the end of the season). After this first year or so, you may not detect any discernable *Varroa* resistance. However, if you continue the slow introduction over several years, measurable *Varroa* resistance should appear.

Each subsequent year you would obtain VSH hybrid queens to be your drone sources. These VSH queens need to be as unrelated as possible to drone sources used in previous years to avoid inbreeding. You can offset inbreeding by including selection of good quality brood patterns (inbred queens will produce shotgun brood). Over time, your selected colonies will produce drones with varying levels of VSH genes (Figure 5), and you will continue to supplement the breeding pool with VSH hybrid colonies that produce pure VSH drones. If your initial stock is Italian-like, you probably want to use VSH queens mated to commercial Italian stocks as your drone sources. If your favorite stock is Carniolan-like, you probably want to use VSH queens mated to Carniolan drones as your VSH drone sources.

Why should I use *Varroa*-resistant honey bees?

No matter the scale of your beekeeping, from five colonies in the backyard to a 10,000 colony commercial operation, you face a never-ending battle to control *Varroa* mites. More often than not, there is a tendency and necessity to use chemical control methods for this purpose. I have often stated that the small scale beekeeper can do non-chemical control methods more easily than a commercial beekeeper because of the added time and/or expense involved. For example, I have let the commercial beekeepers 'off the hook' with regard to using drone trapping as a method for slowing the growth of mite populations. The technique works well, and small scale beekeepers can incorporate it into their hobby. Commercial guys must pay for the labor. The profit margin is what drives any business, and it seems unlikely that drone trapping could be used in a large commercial operation.

However, this does not mean that non-chemical methods are beyond the realm of the commercial beekeeper. Ultimately, I think that fully *Varroa* resistant stocks of bees will be routinely used by commercial beekeepers. They will have to do something different for several reasons. First, regardless of the chemical control methods (legal and illegal) being used, populations of *Varroa* mites will likely become resistant to most of the chemicals used to control them. This has already happened for *tau*-fluvalinate, coumaphos and amitraz. It may be more difficult for *Varroa* mites to become genetically resistant to chemicals like thymol and formic acid. These chemicals seem to disrupt multiple physiological systems in the mites, which makes it harder for the population to develop resistance. This does not mean that it cannot happen; it just may take a much longer period. Second, the use of chemicals in hives contributes to the contamination of hive environments and combs. The costs of comb replacement are high, but the possibility of sub-lethal effects from chemical contaminants in combs that weaken honey bees has to become part of the profit equation. Can beekeepers afford those chronic losses of bees that may be related to chronic exposure to hive contaminants? BC

Jeff Harris is the Extension/ Research Apiculturist in the Department of Entomology at MS State University.

Early Summer Increase

SWARM CONTROL
NECTAR FLOWS
POPULATION MANAGEMENT

LARRY **CONNOR**

Northern beekeepers are confronted by the tremendous pressures of a bee season compressed between late March to early June. That's less than three months. Many well organized, highly energetic beekeepers are able to meet their management objectives during this time period, but for the rest of us, there are many chores waiting when the first round of supers are finally in place. Anything that delays full activity, from rainy weather to truck problems to even a brief illness, will throw the schedule out the window. If, of course, you ever actually had a schedule.

Mid-Atlantic beekeepers are faced with very early nectar flows from plants like tulip poplar. For these beekeepers, the major nectar flow is over by late May or early June and the remainder of the season looms heavily. As Summer arrives, the beekeepers are faced with the challenge of making up Winter losses and growing the operation.

For both groups of beekeepers, making increase colonies in the late Spring or early Summer are viable options for growth, extending the season through most of the Summer. There are supporting biological reasons why Summer increase works.

Advantages of making early Summer increase

Late Spring and early Summer queens. Some of the best queen rearing conditions exist in the late Spring or early Summer and coincide with your area's natural swarming season. Small-scale beekeepers may use natural swarm cells to requeen colonies or adapt one of the several queen rearing methods that do not require the transferal of larvae (methods by Miller, Smith and equipment by Jenter) or by transferring larvae in what is commonly called the Doolittle method of queen rearing.

Summer bees, swarms, nectar flows and population management. Most beekeepers have seen graphs showing that bee populations peak in late Spring or early Summer and correspond to a key nectar flow. If you have a flow from mid-June to mid-July from clover, the brood should peak three to six weeks prior to that flow. This allows future honey gatherers to emerge, perform house bee duties and start foraging. During a nectar flow, the number of eggs laid per day is reduced. Supersedure often occurs during the flow.

Unless you have an active swarm prevention plan in place, colonies with older queens are likely to swarm before the flow begins. Beekeepers that inspect the brood nests in their out-apiary colonies less than once every three weeks will miss these swarms. If you checked the brood nest before apple blossom and could not do it again until the July 4th weekend, you may never know which colonies swarmed unless you had installed marked queens and you find an unmarked queen in a hive.

Most beekeepers are better off developing a plan that manages colony populations by taking brood from strong colonies to boost weaker colonies and making increase colonies (nucleus or full sized units). This practice may start before fruit bloom and continue on a two- to four-week rotation through to the middle of Summer. Each apiary visit potentially generates new colonies or nuclei for the beekeeper. This way, the beekeeper has control of the bees and maximizes the beekeeping operation. Lost swarms are a loss of your time, equipment, medication, feed, and your emotional energy, so converting bees into increase colonies is an efficient method of hive management.

A break in the mite cycle. A break in the brood cycle interferes with *Varroa* mite population buildup. Such a break may occur at any time in brood rearing, but a mid-season break sharply truncates rapidly growing varroa numbers. This queenless period is accomplished when brood is removed from one colony to make up a nucleus colony and a queen cell is used to provide the new colony's queen. If the cell is within 24 hours of emergence, it will take two weeks for the queen to emerge, mature, mate and start laying eggs in the brood nest. Combined with mite-tolerant stocks, drone trapping (destructive removal of sealed drone brood) and mechanical devices like screened bottom boards, a break in the brood cycle provides one more tool the beekeeper may use in an Integrated Pest Management program to reduce *Varroa* populations using fewer chemicals. These methods may be used during a nectar flow if no chemicals are involved.

Using breeder queens. Fortunately, we have a growing number of valuable genetic stocks offered in the

Double mating nuclei in medium depth equipment. A piece of Masonite™ divides the unit from floorboard to cover. A JZsBZs queen cage in each unit.

form of breeder queens. While they can be expensive, they are a valid and ultimately economical means of getting mite tolerance and other good characteristics into your stock, often in a very short time period. The use of VSH/SMR, hygienic, Russian, New World Carniolan and the other stocks in late Spring and early Summer will allow you to produce genetically improved daughter queens mated in your own apiary. You should evaluate these colonies during the summer. Incorporate several of these genetic stocks into your own colonies, using virgins from these grafting mothers mated to your local, diverse drone supply. Or, stimulate drone production from these queens and get a high concentration of these drones within your area. At the same time, reduce the number of undesirable drones by drone brood destruction. Use different colored plastic queen cups, letting each color represent a different breeder queen.

Queen rearing from local survivor stocks. The single largest and most important behavioral shift that needs to occur in this industry is the widespread development of vigorous, productive stocks from local survivor stocks acclimated to the local conditions. These are colonies that are tolerant of *Varroa* infestations (either naturally or from genetic material introduced from purchased breeders) and are successful in all other ways: wintering ability, spring buildup, honey production, disease resistance (hygienic behavior) and are workable under unfavorable weather conditions. These local stocks should be propagated by local beekeepers.

Take the time and effort to evaluate local stock queen lines alongside established lines like the VSH/SMR strains. Look at physical features, buildup rates, annual brood cycles, gentleness, productivity, queen longevity and other characteristics so you'll be able to compare your bees to others used in your area. This skill will enable you to evaluate the qualities of captured swarms for use in your beekeeping operation by identifying the traits that you find desirable.

Become a queen producer in your area and work to fit queen rearing into the rest of your beekeeping activities. To be successful, northern queen producers may need to educate their customers on how to use summer queens or queen cells. Offer an evening or weekend workshop to do this.

Management advantages

Most beekeepers agree that early Summer is a grand time to replace an old queen – after all, she has done her job, bringing the colony population to the nectar flow for one or more seasons. Unfortunately, finding queens in the Summer is very difficult, even for the most experienced beekeeper. Using the Summer increase technique, you will replace queens with a minimum of effort. If you use a method like the modified Doolittle method of making increase nuclei, you can remove brood bees and brood during a nectar flow and only have a minor impact on overall nectar collection.

The use of Summer queens gives the beekeeper three management tools. First is the ability to keep track of the queen (has the queen cell emerged, mated and is she laying correctly?). Second, the colony may be evaluated for its brood pattern and other characteristics after the bee population has turned over. Several quick

Original Buckfast Abbey mating yard in England, photo taken in 1983. The program used two-way and four-way nuclei managed year-round in this yard.

yet purposeful inspections (when bees are moved to full-sized equipment) will tell you if the new stock or new queen is meeting your expectations. Third, you may evaluate the new queens for physical characteristics like color, size (weight), anatomical defects and certain behaviors, like her tendency to remain quiet on the comb so you can find her.

Young queens are often less likely to swarm the first season if they have not yet generated a full season's worth of bees. This is important to busy beekeepers during that March-June interval when they do not have time to check every frame of every hive for queen cells. Any natural reduction in the swarming instinct benefits the beekeeper. While Summer increase queens raise brood in the summer, they have not taken a colony through a full season.

Brother Adam, developer of the Buckfast strain of bees, used a variation of Summer increase colonies at Buckfast Abbey. In his system, the nucleus colonies were permanent and four nucleus colonies were made inside one large hive body. These colonies were located

Using different colored plastic cell cups for different genetic lines allows a beekeeper to identify queen stock if other record keeping methods fail.

A stack of newly constructed and painted double increase nuclei at the University of Nebraska outside Lincoln. These colonies are run with four frames on each side, which reduces possible injury to the queen and bees.

in an often-photographed apiary in a remote area outside of Devon, England. He mated new queens in the nucleus colonies each Summer and monitored them through to the next Spring. When I visited Brother Adam in 1983, his assistant showed me these nucleus colonies and emphasized the value of putting one-year-old, tested queens into production hives. Adam argued that by putting a queen through the Winter and observing her Spring buildup, he was able to predict her overall success as the mother of a full-sized colony. This worked very well as he worked to select for tracheal mite resistance, while maintaining vigorous honey producing colonies. It also selected a queen stock with good queen longevity, an increasingly difficult trait to find.

Often called the father of modern queen rearing, American beekeeper G.M. Doolittle kept bees in New York, outside Syracuse. He maintained permanent out-apiaries with a set number of colonies in each location. If a colony died, Doolittle used Summer increase to replace that colony. He raised queen cells in his home apiary and carried ripe cells to the out-apiary by horse and wagon or by automobile. In June, he removed frames of sealed and emerging brood from strong colonies and made new colonies. He carefully shook all bees off all combs so as to not harm the queen. The colonies were made strong with added frames of honey and pollen. He then placed the bee-free box of brood on a queen excluder over the brood area of another strong colony and closed the cover. After working the other hives in the apiary he returned to find that the nurse bees from the strong colony underneath the excluder had moved up and had covered the brood. Doolittle then carried the hive to its permanent location in the same apiary. He did not lose bees because only young nurse bees had covered the brood. Since they had never flown, they did not know the way back to their original hive. Soon the brood would be emerging, and these new bees would help maintain the brood nest. Since it was June, the chance of extremely cold weather was over. This is not a technique I would try in April in a cold climate, but in June, I find it to be very successful, quick and efficient to use.

For Doolittle, these increase colonies were as strong, brood-wise, as other colonies in the apiary. Adding a queen cell from his breeder stock allowed some control of the genetics of the hive. Once the queen was mated and laying, he worked this colony just the same as others in the apiary. Doolittle was extremely passionate about keeping a minimum of three frames of honey in every colony at all times and made his increase colonies with plenty of added honey as well. He argued that, whenever a colony had less than 20 pounds of honey, it did not grow as well as it could be expected to if it had more food; colonies are more expansive with more honey. BC

From the newly revised Increase Essentials, Second Edition. Published Wicwas Press May 2014. Available from your favorite bee supply dealer or ***www.wicwas.com***

USING NUCS

The Best Tool You Have In The Beeyard

Ross **Conrad**

Throughout the Northeast, the month of June is typically a time full of swarming activity. The clover and alfalfa (that hasn't been cut) is coming into boom, hives that have not been provided with additional space to expand are getting crowded, and the weather most days tends to be warm and sunny. Beekeepers who planned ahead, anticipated this situation and made up splits or nucleus colonies during May. In doing so, they provided room for their colonies to expand which helps to delay the swarming impulse. June is also the time when the nucs that were created in May need to be inspected and managed.

There has been a move by some in recent years to a system of making up nucs that are kept in reserve from Spring through Autumn, and whose worker bees or frames of honey, pollen, or brood are used to beef up weak colonies. Others may use spring nucs as a source for queens, that can be used to requeen colonies that have either gone queenless, or have queens that are judged to be inferior. My tendency is to raise spring nucs either for sale, to help expand my apiaries, or make up for Winter losses.

Rather than make a split and try to introduce a queen and get the workers to accept her, I prefer to leave my splits to raise their own queen from young larvae or eggs that were provided at the time that the nuc was made up. May is the ideal time to make nucs in the Northeast if the intention is to allow the nascent colony to build up and store away enough honey on their own to get through the upcoming winter. June (about 30 days after the nuc is first created) is therefore the month when nucs need to be inspected to see which ones successfully raised a new queen and which ones failed to do so.

Since a nuc typically consists of only four or five frames, a queen is relatively easy to find in a nucleus colony. However, it is not necessary to find the queen to confirm that she is present and has mated successfully. One only has to find eggs, laid one per cell, standing at attention in the center of the back of the cell to know that a fertile queen is present. A new queen just starting to lay her first eggs may sometimes be confused with a drone layer. This occurs when the new queen misses the back of the cell and hits the side, lays eggs that flop over on their sides rather than stand on end, or lays more than one egg per cell. When such signs are observed and raise questions as to the fertility and viability of the queen, I like to wait an additional week or so before checking again to see if the new queen was just learning the ropes, or is actually in no condition to be able to lead the colony.

Sometimes when inspecting nucs for a lying queen, sealed brood is present. This is especially common when queen cells are included in the nuc when it is being created. The presence of sealed worker brood makes it easy to determine if the eggs that the queen is laying are fertile or not. The presence of capped drone brood may mean that a fertile queen is not present in the nuc, however this is not always the case. Sometimes, a new queen that has been recently mated will lay some infertile eggs that the workers raise into drones. This happened to me last year when I found capped drone cells while inspecting my nucs for fertile queens. Thinking that they were unsuccessful in raising new queens and were drone layers, I left them alone, with the plan that I would use them later to boost up the populations of other weak hives that were queen-right. A week or two later, when I opened up the nucs to combine them with my weak hives, I was surprised to discover large areas of capped worker brood. There was drone brood here and there, but clearly the queens leading these nucs were indeed fertile. It is important not to jump to conclusions too quickly when finding sealed drone brood in a hive that should have a newly mated queen.

When nucs are created properly and at the right time of year, 70 percent or more of them can be expected to successfully raise a new queen on their own. When a virgin queen fails to successfully mate for some reason, I like to use the remaining bees, and frames of honey and pollen to strengthen a colony in need. Sometimes the colony in need is a weak hive that can benefit from the influx of new bees and/or food resources, and sometimes the queenless hive is combined with a nuc that has just recently raised their own queen. The boost in population and the addition of combs filled with honey and pollen give the nuc a big boost in getting them prepared for the Winter. It is recommended that newspaper be placed between two colonies that are being combined so that the bees will have time to get used to each other while they are chewing away at the paper. No newspaper is needed when combining a queenless nuc and a queen-right nuc since there is no queen in the queenless nuc fighting among workers from the differing hives who smell the scent of a different queen does not take place.

When a nuc is successful in raising a new queen, the

best way to use the nuc to re-queen a hive is to simply combine the bees and combs from the queenless colony with the nucleus colony. As long as one of the hives being combined has been queenless for at least a day, I don't worry myself with using newspaper between the colonies. Even colonies that have been queenless so long that they have become drone layers can be combined with a nuc that has a fertile mated queen who is actively laying. As long as the cluster of bees in the nuc are not disturbed too much during the combining of the hives, the bees in the queen-right hive will protect their queen from the bees in the drone layer hive until eventually the workers from the drone laying hive get used to the new queen, accept her and cease their drone laying ways.

Once a nuc has been confirmed to contain a fertile and laying queen, the focus for me is to get them ready for Winter and that means lots of honey. I like to wait until a nuc has filled up eight of the 10 frames in its hive and are working on the last two frames *before* I add another super. This way, I am able to add additional space to the hive just before the colony is likely to need it. When additional supers are added to a hive that has filled up less than about 80% of the hive body they occupy, the bees often ignore the frames on the outside edges of the hive body and get to work filling up the frames in the super above. This creates a chimney effect, where the bees fill up and cap the center combs with honey and leave the combs on the sides of the hive empty. By reducing the chance for empty space to occur in the hive going into Winter I eliminate a lot of time and money spent on feeding. In addition, when the hive is chock full, the wintering bees are less likely to eat their way into an empty corner and starve before Spring.

It used to be that a single shallow super full of honey on top of a deep hive body filled with bees, brood, honey and pollen was enough to get most nucs through a Vermont Winter, however this seems to be changing. Recently, Winters have been unusually mild, resulting in hives being more active than normal and requiring more food stores than normal. This past Winter however, was unusually harsh filled with dramatic temperature swings and long bouts of cold that kept the bees from making cleansing flights and delayed the onset of Spring-like weather and its accompanying plants to forage on. In both these cases, additional food is needed to ensure colony survival over Winter and a strong hive coming into Spring. This is why I have started to leave two shallow supers full of honey (the equivalent of one deep super full of capped frames of honey) above the brood chamber on each hive in Autumn. I find that the peace of mind that comes with not having to scramble to feed the bees and knowing that my hives have plenty of food is more than enough compensation for the loss of additional honey harvested. After all, not leaving enough honey on the hive in Autumn and instead feeding during the Winter is challenging. It can be hard for the bees to move to the feed, the excess moisture from syrups can be harmful to a hive during the cold months, and it is just not as pleasant visiting the beeyard during Winter when it is freezing out and the wind is biting, compared to a warm, sunny day in late Summer or early Autumn.

Nucleus colonies can be a great way to expand an operation, provide backup queens, bees and food resources for weak or failing hives, or generate additional income through sales. To manage them successfully, it just takes a little extra thought and attention. Given the many reports of problems beekeepers have been having with purchased queens, raising nucs and allowing them to raise their own queens is an attractive option. Purchased queens can sometimes be really good, and sometime really lousy. Queens raised naturally by a nuc, if they are successfully mated, are almost always really great and go on to lead highly successful colonies. BC

Ross Conrad is author of Natural Beekeeping, 2nd Edition *and will be teaching beginning and advanced beekeeping courses in Lincoln, VT during the month of May. Visit dancingbeegardens.com for more information, or call 802-349-4279 to register.*

Bayer Bee Care Center

Kim **Flottum**

In mid-April we took a road trip to the Mother Earth News Fair in Asheville, NC where we gave talks, sold books, met with Asheville's Bee City Representatives, listened to experts in all manner of good-earth things, watched demonstrations and tried to do everything we could in the little bit of free time that we had. It's an experience difficult to share because there's so much to tell. You have to go to one to see for yourself.

This was the first part of the trip. It was a drive-down-Friday-set-up-that-night day, then the all-day-Saturday-and-Sunday marathon and then tear-down-Sunday-night finale. Then, rest one night and early Monday start the second leg driving over to the University of North Carolina in Raleigh where we met up with Dr. Dave Tarpy and his crew at the lab in the country where they keep their bees, and then on to the University lab in town where grad students, Post Docs and the rest do other kinds of research Dave is involved in. Don Hopkins, the NC State Inspector was there too, so we got a good taste of the NC bee world. It's always exciting to actually see science in action, even though seldom is it as glamorous as it sounds. Mostly, it's just plain hard work and long hours to get the answers wanted. We'll have that story in a month or so, once we get settled.

After visiting Dave and the gang the third leg began. We headed over to a local Inn that evening for a reception hosted by Bayer Cropscience, in preparation for the Grand Opening of their new Bayer Bee Care Center the next day in near-by Research Triangle Park.

Yes, Bayer.

You've probably already read the News release:

In celebration of Bayer CropScience's more than 25-year commitment to pollinator health, the company celebrates the grand opening of its North American Bee Care Center at its North American headquarters in Research Triangle Park. The $2.4 million center brings together significant technological, scientific and academic resources, with goals of promoting improved honey bee health product stewardship and sustainable agriculture. A 6,000-square-foot, state-of-the-art facility, the Center will complement the Eastern Bee Care Technology Station in Clayton, N.C., and a Bee Care Center at the joint global headquarters campus of Bayer CropScience and Bayer Animal Health in Monheim, Germany.

Bee Culture was invited to attend this event some time ago and the coincidence of being in NC at the same time made it possible to swing by and take in the opening and tour the facility. Because we were the only Bee Press in attendance we had the opportunity to talk to some of the representatives there and visit with both local and distant visitors who came for the party. But there was a lot of press there, mostly local because much like Monsanto, Bayer is a player in the area, and other agricultural news people were interested in seeing the show. Some I knew, most I knew of and all were curious.

It's a strange world we live in anymore, isn't it? Last year Monsanto got into the bee business and had a meeting we attended. This year it's Bayer. That we report these events – after all, we are the Bee Press – is our responsibility. That you are aware of what is happening allows you to be better prepared to accept, confront or ignore the world around you. But at least you have access to the information from someone not associated with the press release you read above. Someone not influenced by the Grand Opening party, and someone who has not partaken of the kool aid. More about that later.

But for starters, recall that Bayer is in the bee business. They've manufactured a miticide used to control *Varroa* almost since *Varroa* came here. And because they kept bees alive when only one other manufacturer was doing the same they are on the very short list of those who kept us in business. Yes, they've had their fingers in our hives for years. Just in case you've forgotten.

So we drove to the opening at their headquarters in Research Park. Interestingly, they had more security at their gated headquarters there than even Monsanto did, but the guards were casual and friendly when we were stopped at the gate. My name was on the list so we got in.

The building isn't big enough to hold all the people invited so they put up a tent just outside in the parking

Kim interviewing Sarah Meyers.

lot. In the back there were munchies, a cake, and sandwiches for lunch later. Next to the food tables several researchers had posters displayed telling of their recent work looking for better bee health, or for the reasons bee health was less than desired.

The ceremony itself was low key. Jim Blome, President & CEO of Bayer CropScience North America started off and was followed by Dr. David Fischer, the North America Bee Care Center Manager. He introduced Steve Troxler, the NC Ag Commissioner and then Rich Linton, Dean of the Agriculture College at NC State. All were pleased to be a part of the new center.

They in turn introduced others associated with the Center. Becky Langer, the Bee Care Program Manger, Dick Rogers, the Bee Health Manager and one of the travelers on the Bee Care Tour which has been on the rounds at several Universities, and Sarah Meyers, the Center's beekeeper and Event Manager among others.

After the introductions there were tours of the facility, showing off labs, meeting rooms, workshops, where the 10 hives will be, the pollinator garden, the display of the honey bee year, a honey tasting table, beekeeping equipment, and even a beekeeper examining a hive outside the window of the Center, easily visible, while everybody stayed safe, inside.

According to the speakers and the information available, Bayer has a boatload of bee health projects in the works. These include developing a bee repellent to keep bees out of sprayed areas, some small hive beetle research, developing a bee incident investigation program, setting up sentinel hives to monitor bee health, developing the '*Varroa* gate' to keep *Varroa* out of hives, screening new varroacides, studies on developing bees with resistance to *Varroa*, and hosting a series of conferences on pollinator health, the first being on bumblebee health with researchers from both the U.S. and Europe.

Because I was invited Press I was able to conduct short interviews with some of the notables who were there. I first talked to Sarah Myers, the resident beekeeper.

Sarah has a degree from NC State in entomology and has been a beekeeper for several years. She runs the Center's colonies, including those in their five other locations nearby. Plus she has 20 colonies of her own and she is active in her local county group. Sarah is the person who coordinates tours of the Center and is one of the folks who goes on the road to talk about the Center and Bayer's role in the beekeeping industry. She is incredibly enthusiastic about her role there and what's going to be accomplished. She has goals, and she has concerns. But in the end she is pleased to be a part of the process going on around her. If you would like Sarah to visit your group you can contact her by contacting the Center at http://www.bayercropscience.us/our-commitment/bee-health.

The other person I talked to was Annette Schurmannn, the person in charge of the twin bee lab Bayer runs in Monheim, Germany. Annette has a more global perspective of the role Bayer plays in agriculture, and comes to the table with a background in vet science. Her lab has 30 some colonies on site with about 15 staff and students. They do things a bit differently in Germany, as the lab is actually on the University campus there, but built and funded by Bayer. She worked closely with the planners of this lab so it would go smoothly.

I also talked briefly with Kerry Grossweiler, who is directly involved with the planter dust issue. He talked about the new product that has been developed, a fluency agent that reduces both dust and the amount of active ingredient in the dust when planting corn. His role is to get this new product into the hands of the farmers that plant the corn. He's been in the seed business for more than 30 years, working for a seed company before being purchased by Bayer.

There's one more thing. Last year Bayer initiated an annual Bee Care Community Leadership Award, which recognizes an individual who has utilized beekeeping to create innovative projects that benefit a community. It's $5000.00 to help someone help a community. Applications are submitted and a panel of judges selects one that seems committed to the project they describe and can assist the most people. Dave Tarpy of NC State, Darren Cox, Beekeeper of the year last year, and myself raised our hands when asked to judge these submissions and choose a worthy cause.

Now, the kool aid.

Not surprisingly, our organization here has taken some flak for even mentioning Monsanto and Bayer on these pages. Some consider that both are, should we say, less than ideal corporate citizens and in that mode out to harm the very world they are a part of. Some time ago I wrote a piece here about trusting anything BIG. Big organizations have money, influence and power. All big companies do. And almost all, or maybe all do things many of us consider not in our best interests, but certainly in their best interests. Chase bank. General Mills. General Motors. Monsanto. BP. Bayer. All have made headlines recently for doing things not in our best interests, but certainly in theirs. Big companies are about shareholders, market share, the bottom line. At the end of the day it is about money.

At the same time all of the companies above have done some things with that money that are good for people. You may question the motivation – guilt, buying a good name, whatever – but good things sometimes come from those companies we consider bad. It's our job to follow both, to gather the information so you can make an informed decision. And yes, I know, you may already have made that decision. So be it. I'm not trying to change your mind, just give you as much information as we can so you know.

So Bayer has a Bee Care Lab. Now you know. Let's see what they do with it. BC

BEESWAX

THE FIX IT'S IN, AND A WAY TO FIX IT

M.E.A. **McNeil** & Maryann **Frazier**

In 1199, before the Magna Carta protected anyone's rights for anything, The Worshipful Company of Wax Chandlers was formed in London to guarantee the purity of beeswax (Crane 1983). That the first of all such guilds was formed to treasure unblemished beeswax is evidence of a preciousness that reaches back deep into prehistory and forward into our quest for clean beeswax today.

Not so long ago, University of Georgia researcher Jennifer Berry needed some pure beeswax foundation. She was taking the usual first step for a scientific study: eliminating variables. A control was necessary to examine the effect of miticides on bee health.[1] She quickly discovered that commercial foundation from the top five U.S. bee supply companies has been shown to contain pesticide residues. Beekeeping friends who considered themselves chemical free seemed a logical source. But, even though they had used no in-hive treatments, their samples came up with miticides and a breakdown compound. Berry looked to Brazil, where wax would not contain chemicals for *Varroa* treatment, since they are not used on Africanized bees. That proved true, according to tests of that foundation, but the presence of numerous other agricultural chemicals made it unsuitable for the study (Berry 2009).

How did we get here? The question leaves Berry in her lab, scratching her head in frustration, to digress into the history, biologic origin and composition of this vital stuff.

Jennifer Berry of the University of Georgia was on a quest to find clean wax as a control for a study. (photo courtesy Jennifer Berry)

Beeswax was more valued than honey in ancient times (Schmidt & Buchman 1992). It provided light, preservation, waterproof caulking – important in trade for millennia as evidenced by some of the earliest written records, dating back 5000 years (Crane 1983). Coated writing tablets and wax seals were once the iPads and security of commerce. But wax was more than a commodity: The bees were revered, making wax a sacred substance (Fife 1939). Cakes of beeswax from a late Bronze Age foundry, still preserved, are evidence of its use in casting, with figures often used in ritual, especially funerary, in many cultures (Crane 1983). Fine ancient Egyptian tomb icons survive in modern museums (Brown 1995). And, still today, beeswax content is specified for altar candles (Brown 1995, Crane 1983), with the Catholic Church requiring over half to three-quarters beeswax content, depending on the use – the highest for Easter candles. The tradition comes from the concept of bees as virgins creating light, a metaphor for Mary and Jesus (Fife, 1939).

Scientifically, the word "wax" has no specific definition, but beeswax is the unofficial standard, and the word includes anything similar in physical properties (Christie 2012). Many plant, animal and petroleum-derived products have now replaced the use of beeswax in industry; in fact, the Wax Chandlers now count among their members producers of other such waxes. But for beeswax, the guild made it law since the 16th century that "corrupted wax", often cut with resins or tallow, could be seized and fined (Crane 1983) and the cheaters liable to imprisonment or time in the pillory; persistent offenders were to "forswear the city, and all torches and such work" (Wax Chandlers 2014). Pure beeswax still holds special value for producers of cosmetics, pharmaceuticals and other products – and, most importantly, beekeepers.

Wax tablets, such as this one in a wall painting from Pompeii, before 70BCE, were written on with stylus like the one in the woman's hand. She could receive an answer to her message returned on the same erasable tablet. (Wickipedia Commons)

Left – Beeswax candles probably relating to religious ceremony dating to late 6th or early 7th century CE found in a German cemetery. (Creative Commons) Right – Modern liturgical candles for Easter services. (A.I. Root photo)

Beeswax is produced physiologically, in the bodies of bees, as are venom and royal jelly – unlike pollen, nectar and propolis, which are collected. It is not unusual for insects to produce a waxy epicuticle, the outermost surface of the body that provides a moisture barrier (Coggshall and Morse 1984), but honey bees are unique in their use of wax in quantity. It is invaluable to the bees, as it provides material for building a home with a pantry, nursery, pharmacy and a dance floor (Shimanuki et al 2007) – a vibrating communications center. Beeswax is essential to the beekeeper, too, as an ingredient for hive management.

By an extraordinary metamorphosis, all of the compounds that have been identified in beeswax are derived from the carbon, hydrogen, and oxygen in the honey consumed by bees (Coggshall and Morse 1984). No other substances are added to fresh wax as the bees chew it in preparation for building. That mastication, however, mechanically aids the molecular crystalline structure – needles radiating star-like or in spherical wavy patterns (Coggshall & Morse 1984).

As for the complex chemistry of beeswax, it was not well understood until analysis by gas liquid chromatography (Schmidt and Buchman 1992). Of the 300 compounds identified (Coggshall and Morse 1984), over half of the wax is comprised of 21 major ones (Krell 1996). The composition is: 70-72% esters, 14-15% free fatty acids, 12% mostly saturated hydrocarbons, 1% free alcohols, 1% water and minerals, 0.5% lactone, 0.3% dyestuffs (Brown 1995).

Beeswax is classified into European and Asian types, according to differences in saponification value, a measure of chemical decomposition of esters. The wax produced by different races of *Apis mellifera* (including African *adansonii*) has the same composition, but components can vary in proportion (Bogdanov 2009). In contrast, the composition of wax from Asian honey bee species (*Apis florae, Apis dorsata and Apis cerana*), called ghedda, resemble each other much more than any of the *Apis mellifera* waxes (Tulloch 1980). They are much simpler and contain fewer compounds in differing proportions (Krell 1996). Although they do not have a significantly lower melting point, ghedda waxes are softer and more plastic and cannot be used as substitutes for *Apis mellifera* wax (Warth 1956).

What produces that unmistakably pleasant wax fragrance? Some 48 compounds are found to contribute to aroma (Ferber and Nursten 1977, reviewed in Krell 1996). Interestingly, bees confined to a diet of sugar syrup produce wax without odor or taste (Coggshall & Morse 1984).

Spring normally brings on wax production with a nectar flow, but bees fed sugar syrup late in the season have been prompted to produce wax as well (Donhoff 1855, Kustenmacher 1922, Farrar 1927, reviewed in Hepburn 1986). At about two weeks of age, after newly emerged bees have first developed hypopharyngeal glands for feeding brood, their wax glands develop; wax

A house bee exuding wax scales from glands that develop in one of her later roles, before she becomes a forager. At that time, the glands atrophy, but they can become active again if she is recalled to house duty. (photo by Bonnie Morse)

Clear, newly exuded wax scales in size comparison to pollen granules and a match head. (Wikipedia Commons)

secretion and comb building are later roles of house bees before they become foragers (Hepburn 2009).

With the physiological transformation to forager, wax glands degenerate (Shimanuki et al 2007). In the event that a forager is recalled to augment the work of house bees, the atrophied glands can rejuvenate, with the epithelium enlarging and becoming functional again (Schmidt & Buchman 1992).

As a colony prepares to swarm, wax glands of young bees become hypertrophied [enlarged] in preparation for comb building at the new nest site (Seeley 2010). An average swarm of about 20,000 bees could carry about two pounds of honey – far less than enough to fuel the building of sufficient new comb. The swarm needs a nectar flow; free from tending brood at first, the bees can draw out enough comb in the first week to store adequate provisions. Young wax bees engorge with honey and then rest as they festoon, clinging in chains. It takes a day or so for them to begin to secrete clear, sequin-shaped scales of wax, which they continue to make as they are supplied with incoming honey (Brown 1995). Summer wax production follows a circadian rhythm (Hepburn 1986).

The wax is secreted as an oily liquid from synthesizing glands, called oenocytes, with four pairs located on the last four plates of the abdomen. Pore-laced transparent membranes exude a thin layer of wax from the oenocytes onto shallow plates, called mirrors, at 35°-36°C (95°-97°F). The wax solidifies when it comes into contact with the plates and the air (Brown 1995). As the process continues, a single scale is created with three to six laminates (Hepburn 1986). No two scales are identical in size or shape (Coggshall and Morse 1984).

When the wax bee removes her own wax scale, she is thought to impale it on the tibial spine on her middle leg (Goodman 2003) and transfers it to her mandibles (Brown 1995). She masticates it to consistency for use and deposits it at the building site – with the whole process taking, on average, one to four minutes (Coggshall and Morse 1984). Other bees mold the wax into cells, but not without rechewing it several times (Krell 1996). Typically, building a single cell is a team effort, with an individual bee rarely finishing one that she has started (Coggshall and Morse 1984).

Bee-stat geeks can relish the numbers: Considering that estimates of the number of scales per pound of beeswax range from 500,000 (Brown 1995) to 800,000 (Coggshall 1949), the cumulative time spent to create it would add up to about a year.

Wax bees building comb as wax scales are exuded from a bee. (photo by Michael Simone-Finstrom)

Under ideal conditions, it is estimated that a colony of 50,000 bees can produce about half a pound of wax per day (0.23kg) (Shimanuki et al 2007). The weight of a colony with 30,000 or more workers weighs from 2.4 to 3.6 kg (5.3 to 7.9 pounds), with the combs covering an area approximately 2.5 m^2 (about 27 ft^2) and weighing about 1.4 kg (about 3 lb) (Seeley and Morse 1976).

Any way it's figured, it's an expensive business, wax production. One gauge estimates a pound of wax would

It has been shown that pesticide exposure can reduce egg laying, prompt early supercedure, increase queen cell rejection and reduce ovarian weight in queens.

take about 10,000 bees three days to create. Others find the amount of honey consumed for the production of a pound of wax to be from 5-6:1 (Brown 1995), 8.4:1 (Whitcomb 1946, reviewed in Coggshall and Morse 1984) up to 19.8:1 (Buchmann, unpubl).

In any case, the price of wax as a structural commodity is so high for bees – in time, resources and seasonal limitation – that beeswax is removed, reshaped, molded and reused within the nest (Schmidt and Buchman 1992). Beeswax is used not only for building and capping comb, but it is also mixed with resin to make propolis for use as antimicrobial caulking (Simone-Finstrom 2010).

If the production of beeswax is wondrous, its structural function challenges the imagination. A pound of comb can hold 22 pounds of honey (Brown 1995). A hanging comb 30 cm (1 ft) long supports 1320 times its weight in honey (Coggshall and Morse 1984).

A cluster of bees forms wherever wax is worked to maintain enough warmth to keep it pliable, as the temperature requires (Brown 1995). During cell construction, the bees keep the wax between 33.6° and 37.6 °C (about 93-99°F) (Bauer 2013). Building is gradually extended, with drone cell walls nearly double the thickness of worker cells. Adjoining angles vary as much as 3-4%, with transitions between worker and drone comb or replacement comb varying more.

Although newly exuded scales are transparent, comb only a day old will begin to show colored residue (Brown 1995). The difference appears to be color picked up from pollen (Hepburn 1986). Some pollens color wax, such as goldenrod, pussy willow and dandelion, more than others (Coggshall and Morse 1984). As experienced beekeepers know, in addition to pollen, cocoon silk and larval debris darken comb over time in a hive (Krell 1996).

Anyone who has handled wax foundation in heat or cold knows that, depending on temperature, beeswax can vary from brittle to plastic. It melts at relatively low temperature, 62°-64°C (143°-147°F) – a range that accommodates variations in the composition of components. It becomes pliable at 32°-35°C (90°-95°F). Even though beeswax can still look solid, melting begins at about 40°C (104°F) (Buchwald 2008). Heated above 85°C (185°F), it becomes discolored (Krell 1996). Heat also alters the characteristic ratio of ester values to acids (Tulloch 1980). Minor beneficial compounds, especially volatile ones, are damaged by overheating (Krell 1996), as the disappointed beekeeper knows from wax too long in a solar melter.

A caveat, from terrifying experience, is that wax expands rapidly with heat, and its temperature over a flame rises alarmingly fast; melting over water is recommended for safety. The flash point of beeswax is 204.4°C (399.9°F) (Krell 1996).

Gauging Adulterants

Beeswax can still be found on the commercial market that is adulterated with other products, including paraffin or plant waxes such as carnauba (Coggshall and Morse 1984) – although A.I. Root has eliminated this part of the problem (Flottum 2014), as have other major processors. Components can be determined with physical tests or chemical analysis. For the layperson, establishing the melting point of the substance is the simplest method. The temperature is measured when the first liquid wax appears during slow heating. It should be between 62° and 65°C (143.6°-149°F): this range is characteristic of beeswax, but not a guarantee. Another indicator is that wax in ethanol will become clear at or below 65°C (149°F) if the sample is unadulterated. Sensitive detection of adulteration can be made in the lab by gas liquid chromatography (Maia 2013).

The presence of ghedda, Asian wax, is considered an adulteration. For that reason, the major American processors use only domestic wax. The A.I. Root Company found an imported Chinese sample containing *Apis cerana* wax to be "as soft as fudge" (Flottum 2014).

A New Look at Contamination

On a late afternoon in October, 2006, Dave Hackenberg pulled into his Florida yard with a truckload of bees. The previous years had been hard on commercial beekeepers, but he was feeling hopeful that he finally had control of the mite problem. "Something told me something was wrong," as he looked over the unnervingly quiet hives brought there three weeks before. "I opened hives and found them empty, but there were no dead bees on the ground. Frantically, we went through the hives . . . Loaded up a bunch of that stuff and brought it back to the University" (Hackenberg 2007).

Maryann Frazier remembers well the day that Hackenberg brought the bees to the lab at Penn State – and the subsequent mysterious pattern of deadouts that followed. "I ran into a colleague, Chris Mullin, in the hallway, and he asked me if I thought pesticides could be playing a role in this," said Frazier. Mullin is an entomologist and toxologist, bringing a rare combination of skills to the question. He had read French studies of disoriented bees linked to systemic pesticides in nectar and pollen, so he surmised that it was a possibility worth investigating, and Frazier agreed (McNeil 2011).

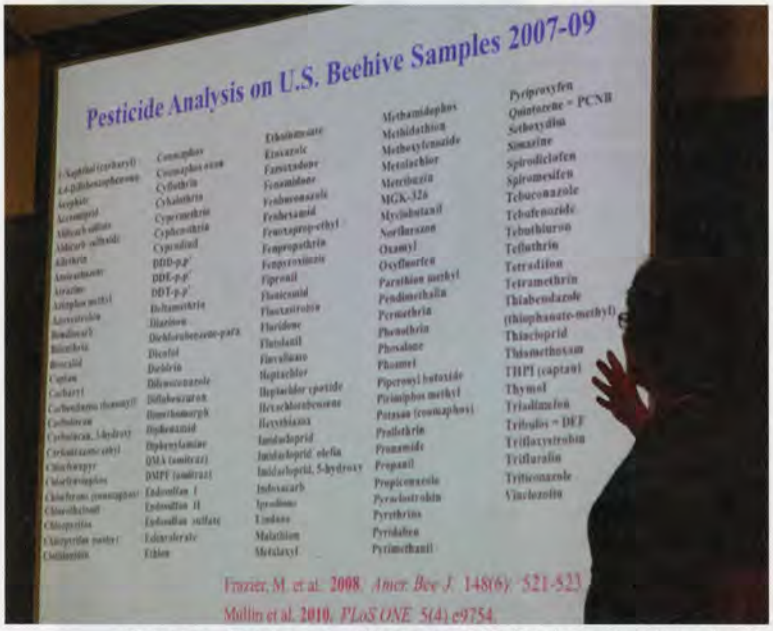
What was known was that beeswax had long been used as an ideal ingredient for some medical preparations and cosmetics. Pure beeswax, which is inert and can pass through the human body unaltered, was considered safe for human consumption by the USDA. However, it was also known that fat soluble agricultural toxins are absorbed by beeswax. Pesticide residue had been detected in honey bee comb from around the world (Thrasyvoulou and Pappas 1988, Van Buren 1992, Bogdanov 1996, Wallner 1999, Chauzat and Faucon 2007, reviewed in Wu 2011). It is possible for the toxins to be released later when the wax is consumed as food, used in cosmetics or given to bees in foundation sheets

Maryann Frazier of Penn State University was part of a team that found ubiquitous pesticide residues in American beehives. (photo by Kathy Keatley Garvey)

(Krell 1996). Wax burned in candles can exude toxins as well (Flottum 2014). Wax has been found to absorb several times the amount of toxic residue as honey (Estep 1977).

Beekeepers were increasingly concerned about problems with failing queens long before CCD. Researchers exploring the problem have shown negative effects of coumaphos and fluvalinate on queens and drones (Haarmann 2002). Anita Collins (2004) found that the presence of coumaphos in queen rearing cells reduced the number of functioning queens at six months by as much as 75%.

The scientists studying the phenomenon called colony collapse disorder (CCD) were finding a range of problems, but no one cause. "I was obsessed with this stuff," said Frazier, who convinced her husband, Jim Frazier to join the pursuit of the pesticide question



Maryann Frazier, speaking at a UC Davis entomology forum, shows the list of 121 pesticides found in U.S. beehives by her team at Penn State University with the USDA. In beeswax alone, 87 pesticides and metabolites were discovered. (photo by Kathy Keatley Garvey)

– thereby adding an insect physiologist with an understanding of how chemicals work in the body of the bee.

Knowing now the revelations of their research makes it hard to realize how much determination it took to create them. They were faced not only with skepticism over the value of their investigation but a lack of access to sophisticated equipment they needed for analysis. Samples piled up with no way to test them. They launched into a dead end.

The CCD story was told to the nation when Penn State entomologist Diana Cox-Foster and others testified before Congress. As luck would have it, that story reached a person who became a key team member – Roger Simonds, who runs the USDA lab at Gastonia, North Carolina, which monitors pesticides in agricultural crops and commodities. "Talk about our stars aligning," said Frazier, "He is also a beekeeper."

Simonds' lab is equipped with mass spectrometry (to identify compounds by vaporizing them in a precisely measured column) and various types of chromatography (to quantify them to one part per billion). Jim Frazier likens 1 ppb to a square of toilet paper in a roll that reaches from New York to London.

Simonds and Mullin put their heads together to design a scan and identify a protocol for extracting pesticides from wax, pollen and adult bees – difficult matrices. They used LC/MS-MS^2 and GC/MS^3 with a modified QuEChERS^4 method. They narrowed the investigation to screen for 171 pesticides and metabolites, breakdown products, to the parts per billion level, an analytical feat "probably unique in the world" (M. Frazier 2014).

The results were "really mind-blowing to us", she said (2014): contamination was pervasive. In the first 887 samples, 99% had detectable residues; they found 121 of the pesticides in the screen, some of which had not been registered for many years. The most difficult news for beekeepers is that the chemicals most often found at the highest levels are those that they have put into their hives to control mites over the last two decades. Beeswax proved to be a sink: in 259 samples 87 pesticides and metabolites were discovered, with an average of eight per sample and up to 39 different detections in a single one (Mullen et al 2010).

Almost all comb and foundation wax samples (98%) were contaminated with up to 204 and 94 ppm, respectively, of fluvalinate and coumaphos, and lower amounts of amitraz degradates and chlorothalonil, a widely-used fungicide. As for systemic pesticides, nearly 60% of the wax samples contained at least one. "Not only that," said Frazier, "Some combinations of pesticides are more than additive; in combination they can become more biologically active" – for one common example, coumaphos combined with fluvalinate (Johnson 2009, Mullen et al 2010).

So what? How does it matter that there are chemical residues in beeswax?

Immature worker bees develop in wax comb cells for up to 22 days, during which they can be exposed not only to contaminated food but to contaminated cell walls. Egg-laying queens have repeated abdominal contact with contaminated comb. It has been shown that pesticide exposure can reduce egg laying, prompt early supercedure, increase queen cell rejection and reduce ovarian weight in queens (Haarman 2002, Pettis 2004).

"We feel quite confident that pesticides are potentially a problem for bees," said Frazier, but how they are impacted, "That is a complex inquiry. We can demonstrate a lot in the lab on individual bees, but working in the field is frustratingly difficult."

Recent lab work at Penn State tested larval tolerance for four of the pesticides most commonly found in beehives: chlorothalonil, a broad-spectrum agricultural fungicide currently deemed safe for bees, based on its LD50; chlorpyrifos, a widely used organophosphate; the araracides fluvalinate and coumaphos. They found that all, at various residue levels, more than doubled larval mortality. In addition, synergism of pesticides was found to intensify negative effects. A common "inert" ingredient, N-methyl-2-pyrrolidone, was unexpectedly found to be highly toxic to larval bees (Zhu 2014).

"Laboratory studies have clearly indicated sublethal impacts [of some pesticides] on honey bee learning, immune system functioning, and synergism of insecticide toxicity by fungicides," said Chris Mullen. (Raloff 2010).

The number of other researchers pursuing this work can be counted on two hands: Among them are Jamie Ellis at the University of Florida; Keith Delaplane and Jennifer Berry at the University of Georgia; Reed Johnson at Ohio State; Jeff Pettis and Anita Collins at the USDA; Marion Ellis at the University of Nebraska; Brian Eitzer and Kim Stoner, Connecticut Agricultural Experiment Station.

A finger specifically pointing to adverse effects of pesticide residues in beeswax is the research of Judy Wu published in 2011. That data indicates sub-lethal effects of such exposure on workers. For Wu's study, at Washington State University, eggs were laid on both control and contaminated comb containing 17 different pesticides – including nine systemic compounds and five neonicotinoid insecticides. By the fourth day nearly a quarter of eggs remained unhatched in contaminated comb, and, by the eighth day nearly half the larvae in that comb were developmentally stunted or delayed. The workers reared on contaminated comb lived on average four fewer days than bees reared on comparatively uncontaminated comb in cage trials.

Such reduced adult longevity causes a domino effect in the colony: replacement bees begin foraging prematurely, shortening hive duties such as brood care, food processing and storage, queen care and hygienic behavior.

In addition, a reproductive advantage for *Varroa* is created by delayed adult emergence. A pregnant mite enters a larval cell and lays four eggs in 30 hour intervals. The first is male, followed by females – all of whom feed on the hemolymph of the pupating bee. Normally, the third daughter has little chance of maturing to mate within the cell before a worker emerges at around 21 days, but delayed emergence of her host gives her time to develop. Such a pattern has the potential for contributing 25% more mites to the colony.

One conundrum Wu's research demonstrated is that brood mortality was higher on newly drawn control comb than on older comb; the reason is that accumulated brood pheromones on the old comb attract nurse bees. But *Varroa* are attracted by the same pheromones; pesticide residues and disease also persist in old comb – all of which compromise the health of the hive (Berry and Delaplane 2001, Piccirillo and De Jong 2004).

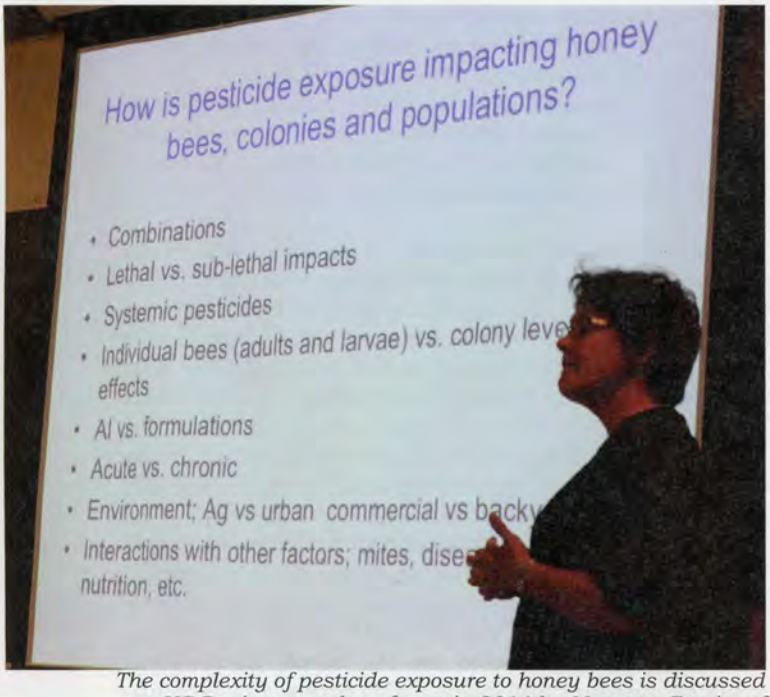
Both Wu's current work, at the University of Minnesota, and her previous study began with the ubiquitous problem – finding uncontaminated comb. In both, coumaphos was found in newly drawn comb – possibly from contact with contaminated bees or from flowers (Wu 2014).

Wu concludes that "The high level of pesticide contamination in brood comb is disconcerting." Because "sub-lethal effects from pesticide residues through developmental exposure of contaminated brood comb may be subtle and indirect but can have serious colony level consequences" (Wu 2011).

Frazier agrees, citing a Penn State study in which contamination from commercial apple pollination was found to decrease forager longevity by half and more (Frazier 2014).

How can we clean up what Frazier calls the bees' "toxic house"?

There is no shortage of ideas. Jennifer Berry came up with an interim solution for her project, but she is looking for something more manageable. Part II of this article



The complexity of pesticide exposure to honey bees is discussed at a UC Davis entomology forum in 2014 by Maryann Frazier of Penn State University. (photo by Kathy Keatley Garvey)

will attempt to sort out the unwieldy, impractical, crazy-making and just plain dangerous from some possible answers to the problem of contaminated beeswax. Some may be challenging or idealistic – but that never stopped a beekeeper. BC

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Footnotes

[1]The study was for a USDA grant with Clemson University.

[2]Liquid chromatography–mass spectrometry (LC-MS, or alternatively HPLC-MS) is an analytical chemistry technique that combines the physical separation capabilities of liquid chromatography (or HPLC) with the mass analysis capabilities of mass spectrometry (MS). LC-MS is a highly sensitive and selective technique oriented towards the separation, general detection and potential identification of chemicals in the presence of other chemicals.

[3]Gas chromatography–mass spectrometry (GC-MS) is an analytical method that combines the features of gas-liquid chromatography and mass spectrometry to identify different substances within a test sample.

[4]QuEChERS stands for Quick, Easy, Cheap, Effective, Rugged, Safe, the acronym for an analytical approach that simplifies the analysis of multiple pesticide residues.

Springtime Apiary Preparation

Not exactly the way it once was

I know, I know – things change

I was recently told the obvious – beekeeping things change. The difference this time was that it was implied that I should change some, too. In my defense, in most areas, I have tried to change and keep up. I can barely use my phone but I still try to get the latest "app" that everyone else seems to be using. I just got a new set of hearing aids that will do all kinds of things when all I really wanted was just to hear better. And I don't even know all the new things that are critical to the well-being and full life of my grandkids, but I do know that the electronic game, *"Minecraft"*, is very important to them.

So, I know, I know – beekeeping things change, too

Once upon a time long, long ago, most bee colonies did not die in the Winter, and if they did, abundant springtime swarms could be expected that would readily help make up the winter loss. Package bees and queens were readily available. Populous colonies could be split into multiple colonies. Bees could easily be used to make bees. Blah, blah, blah. That was then and this is now.

At the time, beekeepers of the day thought things were tough and complained appropriately. Now beekeepers can only dream of those halcyon days. Swarms are not nearly as common as they once were. In some areas, they are essentially non-existent. And as for established colonies, they are occasionally listed in estate auctions and such, but in general, buying fully functional colonies is no longer a common option.

So, last Fall, I officially changed – some. I ordered a few packages and some splits based on the previous experience of recent Winter seasons. At the time of my order, I had all the colonies I wanted, but I just knew that come spring my colony count would be lower (again). It was, but do I dare say it? My loss was not as bad as I feared. Even though by Ohio standards, the Winter was brutal, I experienced ***only*** a 38% Winter loss. You see, that's part of the change in beekeeping because that means that I had *62% survival* rate. In this new bee world, that's not terrible. If you have *some* bees, you can grow *some* more bees.

Change #1: Increasingly, I focus on the percent of the Winter survivors rather than the percent that perished during the Winter.

Package bees for replacement

During the last decade or so, most established beekeepers – I am one – clung to the hope that solutions would be developed to address the *"Winter weakness"* malady that now seems to affect our colonies every cold season. I tried better mite control procedures and made a feeble effort to manage queens better. As I have described during past articles, during some seasons, my colony losses were dramatic.

Apparently, I should ***not*** be treating for Nosema anymore, but I ***should*** keep healthy bees going into Winter. I'm unsure how to do that and my recent luck has not always been great; so what should I be doing to maintain bee colonies in great shape – throughout the year. So, last Autumn, for the first time, I ordered packages and splits that I was not sure that I would need.

Change #2: In the Fall, I order packages and splits that I may not have needed the following Spring. My logic now is that I would rather have bees I don't need rather than wait until Spring to try to place orders. Then, I would only be able to purchase "cancelled" bees or bees that someone preordered and then reneged. That is about as haphazard as hoping to be called for swarms to help replace my Winter losses. I can always sell some if I truly get too many.

Package bee releasing procedures – some tweaking

In the grand scheme of things, today's packages are released just as they have always been. Either you shake them out or you don't.

In years past, packages did not cost so much and replacement queens for package queen problems could be obtained quickly. In shaking the bees out, there was a risk of problems but I could not tell that it was a great one. For the most part, I have always just shaken packages to release them. They were out quickly. It was fun. Confused bees were flying everywhere, but they would settle into the hives by nightfall – *I suppose*. Settling into the correct hive is always what I hoped would happen, but I could never actually prove that all those lost, flying bees actually found an accepting colony.

Package bees being released by shaking them out.

Package bees being released slowly.

The two splits I bought last year.

Change #3: Increasingly, I am releasing packages slowly rather than the abrupt shaking procedure.

Both methods of releasing package bees have good and bad attributes. Just to release a few packages in the backyard is no big deal, but if the yard is a distance away and requires driving time and energy to come and go, releasing quickly would be more appealing. If the bee yard is to be located nearby and possibly the weather is bad, I would definitely release them slowly.

As you would expect, there is no standard way to release package bees slowly, but basic components are standardized. The queen should be taken out and put within the hive between frames and very near the open package. The open package can be in an empty bottom deep with a second deep filled with frames or the empty deep can be on top. The good part of this procedure is that bees are forced to familiarize themselves with the equipment and its location. I sense that fewer bees are lost.

The bad aspect of this procedure is that bees can be goofy with all that open space and wire package inside the hive. They will usually cluster around the queen, but they will also begin to build burr combs in all the wrong places. If left more than a couple of days, surely a cross-combed mess will have to be addressed. Also and just a bit odd, the rare package of bees will choose to stay (mostly) within the package and begin to build combs there. I guess it must make sense to them at the time, but ultimately, it's a bad idea.

If you decide to release package bees slowly, the procedure will require more equipment and will take more time, but it will not be as dramatic a procedure as releasing by shaking.

Buying colony splits

The concept of splitting bee colonies is as old as dirt. Experienced beekeepers have been making splits through the years for a host of reasons. As I've aged and as my bee interests have morphed from wanting a great number of colonies to only wanting a few, buying colony splits from others has become more attractive to me. Since I now keep about 10 colonies, constantly knocking them back in size to take splits would lock me into perpetually having smallish colonies that are always challenged in the Winter and never producing a meaningful honey crop.

Change #4: I buy a few splits in the Fall in anticipation of some unknown number of upcoming Winter losses

Buying splits is a bit more challenging than buying packages. I seek out average beekeepers who are willing to split a colony some and provide a new queen to the split. I usually get a five-deep frame split that is made of three frames of brood with bees and two empty frames. The brood frames should be obviously covered in thick mat of bees and some honey should be included in the frames. Currently, I pay $110 - $150 per unit. This is not an exact procedure. I probably don't get as many adult workers as in a three-pound package, but the brood more than makes up for the difference.

Since splits have brood, they build up much faster than packages and have good potential for quickly becoming productive colonies. It is a bit like buying cuttings from a desirable plant? How many cutting? How large are the cutting? How will the cuttings be managed?

Oddly, I have plenty of honey in frames

A change I did not ask for that has occurred in recent years is that I have had colonies die during Winter that had plenty of Winter stores. I have been supposing that my winterkill issue was related to mites and the viruses they vector. I have no proof of that. In recent years, I have begun to just blame mites for all my bee woes. Others of you blame pesticides while still more blame GMOs. Our bees die too easily so we must blame something.

This honey appears to be okay. It has not granulated or fermented. There is no fecal spotting on the honeycombs. There is occasionally light mold but I see that on the honey stores in seemingly healthy colonies. Even so, I don't want to use it for human consumption and I do not want to extract it just to dump it, so I reuse it.

Change #5: I (unintentionally) save deep frames of honey to be given to packages and splits.

I know what some of you are thinking. That is my problem. Bad honey. Maybe so, but when I put a few frames of this food source in a package colony or in a split, they clearly thrive more than they do when I try to mix and feed sugar syrup. If the frames are old and misshapen and the amount of honey is small, I am *trying* to discard the frame. This

is a big change for me. Like so many other beekeepers my age, I cut my bee teeth on the premise that frames could be used nearly indefinitely. To toss a frame for no other reason than it is old and black is still somewhat new to me. But I do agree with the change.

Change #6: I try to replace about three frames per year in brood nests of my colonies. The colony is not shocked by the removal and over about three years, the combs are replaced in the brood boxes.

Queens

There is absolutely nothing I can say about queens that has not been said for decades and decades past. Queens are the genetic repositories of the colony. It follows that a perfect queen will produce a perfect colony. I have never had either. We are always searching for the perfect queen and consistently being unhappy when we don't find one.

Average queens no longer live for two to five years. Most are now only good for about a season. Everywhere, queen classes are being taught and beekeepers are scampering about trying to find the best source of queens. Queens – any queens – are always in short supply. There is seemingly something up with our queens (or with our drones or both queens and drones).

Increasingly, I am suspecting that queens should be replaced on a timetable rather than on egg production performance. This is not a recommendation but rather a conversation that we are having here. Earlier, I mentioned my hearing aids. I have finally come around to changing *both* batteries when one battery begins to fail. Would it not be better and more predictable just to change all the queens at once and do it annually? Now I readily admit that I will have trouble with this one. *"Fixing something that is working"* is rarely the right thing to do, but *preventive maintenance* is perfectly acceptable.

Change #7: One way or the other, I will replace queens on an annual basis.

Personally...

I am relieved that the Winter season is over. By the time you are able to read this, it will be a distant memory and concerns for swarm control will be on your mind, but I'm not there yet. I am still relieved to have any bees at all survive what we all just lived through.

Considering the Winter's ravages, my bees and I did okay and not a single bit more. Surely we can do better – so I came up with changes that I am either considering or implementing. These are my changes. They may or may not fit your needs. BC

Dr. James E. Tew, State Specialist, Beekeeping, The Alabama Cooperative Extension System, Auburn University; ***tewbee2@gmail.com; http://www.onetew.com; http://www.facebook.com/tewbee2; twitter@onetewbee; http://www.youtube.com/user/onetewbee.***

OF HERBS AND HONEY BEES

Many acknowledge herbs as bearing medicinal value to people and honey bees.

R. Michael **Magnini**

Bee on apple mint.

Many naturopaths and pharmacologists acknowledge herbs as bearing considerable medicinal value to people. I contend that this attribute is also true for honey bees.

It has been well established in the literature that honey bees are polyphageous in regard to nectar and pollen. It has been demonstrated that the bees' vigour is improved when given a wide spectrum of nourishment. To extrapolate this concept it should be evident that the nectar and pollen of certain herbaceous plants would provide enhanced elements of nutrition and provide anabolic or optimized metabolism.

These phytonutrients may provide precursors, e.g. plant sterols, for the bees' autoimmune system, and developmental hormones for sexual reproduction. Other phytonutrients may act as antioxidants to extend the life span of individual sisters. Further to this are the phytochemical toxins that are species specific, harmless to bees yet potent inhibitors to their pathogens.

Herb (the common name for an herbaceous plant) is defined as a plant that has leaves and stems that die down at the end of the growing season to the soil level. They have no persistent woody stem above ground. Herbaceous plants may be annuals, biennials, or perennials.

From this definition it is clear that many thousands of species are in this group. Although the nectar and pollen from alfalfa, sweet clover and thistle produce and provide nutritious food for bees, these herbaceous plants do not contain significant amounts of medicinal phytochemicals. The list of herbs with significant and active organic compounds that are beneficial to our bees can be reduced to dozens. These plants, also used in human nutrition and medicine, are of significant value to our bees.

Before entering a discussion on individual herbs I would like to describe the beauty and benefits of the whole herb garden. I advocate, for reasons that will be apparent later in this article, the planting and cultivating of significant mixed herb gardens in close proximity to beehives and apiaries. Most herbs do not require rich soil and are usually drought resistant (see specific herb for details). To prepare the ground for herb planting it is important to remove all roots, grasses and sapling trees. As per the definition, herbs prevail as annuals, biennials and perennials, and this should be kept in mind when sectioning the garden. For instance, it is helpful to plant tough perennials e.g. Oregano, around the outer border of the plot. When your herb garden is in full bloom it will hum with the buzz of wings from honey bees, bumblebees, butterflies and hummingbirds. Bright and pastel colours of the flowering stalks will sway in the breeze. And this botanical symphony will ascend with an olfactory cascade of brilliance.

Here, I will provide an incomplete list of herbs that have potential for bee health. From experience I will outline the types that grow easily here (Atlantic Canada), and that I have used with positive results.

Most of the herbs that have medicinal properties benefiting bee health are in the botanical Family *Lamiaceae*. Other herbs may also contribute to the optimal well being of the Family *Apidae*. The majority of herbs in our discussion range in height from 30 centimetres (one foot) to 120 centimetres (four and a half feet) with the average at about 60 centimetres or two feet.

[1]APPLE MINT, *Mentha suaveolens,* is a hardy, herbaceous perennial plant originating from the Mediterranean region. From its base it puts up multiple stalks up to 100 centimetres tall. The foliage is light green, with opposite, wrinkled, oblong leaves, 3 to 5 cm (1.2 to 2.0 in) long and 2 to 4 cm (0.8 to 1.6 in) wide. The florescence develops on terminal spikes 4 to 9 cm (1.6 to 3.5 in) long and consist of a number of whorls of white or pinkish flowers which is very attractive to honey bees. Its bloom period is from mid to late Summer. It has a noticeably minty aroma and taste giving the honey from this plant a pleasant characteristic. The menthol aroma has a respiratory clearing action in people and may have a similar effect in the tracheal of bees.

[2]BASIL, *Ocimum basilicum,* is a common annual garden herb that is best grown from transplants. As a popular culinary herb this plant has a large number of known cultivars, such as blue, lemon, spice and purple basil. It has a distinctive aroma and flavour and produces tiny, white flowers at the terminal point of a stalk. It is sensitive to cold and primarily a Summer plant. The antioxidant, antiviral and antimicrobial properties are predominately in the essential oils of the leaves and bracts. Bees will harvest this oil, as well as nectar and pollen, to furnish their hives with propolis.

[3]BERGAMOT, *Monarda didyma,* et al, also known as Bee Balm is a large, vigorous perennial that is best grown from potted transplants and/or root division. Many people believe this plant is extremely attractive to honey bees. However, because of the size and shape of its flowers, the nectaries are not accessible to the short-tongued bees. The name Bee Balm is actually derived from the medicinal application of the crushed leaves on bee stings to relieve the pain and swelling. The large, red flowers of this plant are immensely attractive to hummingbirds. A native plant of temperate North America it is fragrant and also known as Oswego Tea. It has strong antibiotic properties and it is medicinal to people and bees when taken as a tea. There are a large number of cultivars and this one of my favourite garden herbs.

[4]BORAGE, *Borago officinalis,* is an annual herb of Mediterranean decent. It is a particularly hairy plant covering stems and leaves in fine bristles. Flowers are singular on many stalks and the bracts and petals are star-shaped (five points). Predominate flower color is blue, although pink and white exist. The flowers are edible and it is grown primarily for its seed oil, which is high in *gamma-linolenic acid.* Borage is attractive to many species of bees and blooms for an extended period from Summer into Autumn. Borage honey is considered premium with medicinal properties.

Bee on borage.

[5]CHILI PEPPER, *Capsicum annuum, et al.,* is not considered a typical culinary herb as it produces fruits it is nonetheless an interesting addition to the herb garden for bees. The flower blossoms are plentiful and continuous throughout the growing season. The nectar and pollen are readily accepted by bees. The "active ingredients' in peppers are the phytochemicals known as capsaicinoids. Depending on the cultivar or species the heat factor varies from mild to extreme. The primary medicinal use of hot peppers in humans is for reduction of pain such as arthritis and headache.

[6]CHIVES, *Allium schoenoprasum,* is a common perennial herb related to the onion. From their shallow, small bulbs hollow, tubular stalks emerge to a height of 30 to 50 centimetres. A cluster of small, pale purple flowers forms at the tip of the stems (scapes) in mid Summer. The chives form dense clumps of onion-like aromatic stands that are very attractive to honey bees. These

Chives.

plants contain heightened levels of sulphur compounds, which are recognized as having antiseptic properties. Sulphur is a primary component of fungicides. Chives have a beautiful florescence and make excellent dried flower displays.

[7]GARDEN POPPY, *Papaver spp.,* is an annual flowering herb with many dozens of species. The flowers have four to six petals in a range of bright colours in red, white, violet, yellow, pink and variegated, with many stamens forming a conspicuous whorl in the center of the flower. Poppies average about 25 – 30 cm (2 feet) in height however some species can reach four feet (100 cm). Typically, the plant produces one flower at the crest of a single stalk with long, spade-shaped, sharply toothed leaves that are alternate along the stem. These colorful flowers produce large quantities of pollen that are very attractive to honey bees. Some species contain opiates that may be present in the nectar and/or pollen, however it would most likely be in minute quantities. These alkaloids could have a calming effect on the bees.

[8]HYSSOP, *Hyssopus officinalis,* is shrub-like, a growth habit that is typical of most members of the Lamiaceae family. The leaves are opposite, dark green, smooth and lanceolate. Preferring hot and dry conditions, hyssop produces clusters of small, fragrant flowers that are pink or blue and occasionally white. In Mediterranean regions where it is abundant it is known for its aromatic honey. The phytochemicals in this plant have antiseptic and nerve stimulating properties.

[9]LAVENDER, *Lavandula angustifolia et al.,* is a shrub like herb in the *Lamiaceae* Family having varied leaf size and shape between the 39 species and sub-cultivars. The simple or pinnate leaves form a globular cluster over the root and the florescence spikes rise through and above the leaves. Flowers are small, in a wide range of blue to white colouration, forming whorls around the tops of the flower spikes. Lavenders flourish best in dry, well-drained, sandy or gravelly soils in full sun. All species need little or no fertilizer, and good air circulation. Organic mulches can trap moisture around the plants' bases, encouraging root rot. The essential oil of Lavender has antiseptic, and anti-inflammatory properties, as well as fragrant highlights. The honey of Lavender is prized and premium. Highly

attractive to honey bees (who prefer small flowers) the oils, pollen and nectar enhance the hygienic conditions within the beehive.

[10]LEMON BALM, *Melissa officinalis,* is a perennial herb that attains a height of 150 centimeters (five feet). The lemon scented leaves are oval with serrated edges. A bloom of small, white flowers that are very attractive to bees occurs in mid-Summer. Of the many phytochemicals within this plant, citronellal (source of lemon taste and aroma) is measurably elevated. Sufficient nectar from this plant may impart a lemon flavour to honey. In human herbalogy, lemon balm has antioxidant properties and calming effects with enhanced mental acuity.

[11]MARJORAM, *Origanum majorana,* is a cold-sensitive perennial (effectively an annual plant in the north) herb characterized by sweet pine and citrus flavor and aroma. Marjoram is cultivated for its aromatic leaves, either green or dry, for culinary use and its essential oils for aromatic purposes. The leaves are opposite, oval, smooth and light green. Flower stalks form at the junction of the main stem and leaf petiole. The flowers are small, aromatic and attractive to honey bees. It has antibiotic qualities similar to the related *Origanum vulgare.*

[12]OREGANO, *Origanum vulgare,* a hardy perennial herb accepting a wide range of soils it forms a dense cluster of stalks up to a meter high. The leaves are opposite, spade-shaped and dark, olive green. Oregano produces purple, violet and white flowers that persist from mid-Summer to late Fall. It grows easily from seed and spreads itself well even in grassy areas. Honey bees are very attracted to the small, aromatic flowers. The weather (heat and/or dryness) will affect the flavor and aroma of the leaves for culinary use. Among its phytochemicals are potent levels of the antibiotic and antimicrobial carvacrol, thymol, limonene, pinene, ocimene, and caryophyllene. Antioxidant activity is also enhanced due to the presence of phenolic acids and flavonoids. Although I have not seen any measurements of these compounds taken from nectar and/or pollen of Oregano, I have observed that the honey bees foraging on these plants support robust and vigorous colonies.

[13]PEPPERMINT, *Mentha × piperita,* is a hybrid plant created from the cross of spearmint and watermint, and being essentially sterile (seeds) it is propagated by root cuttings. Spearmint is perennial reaching 90 cm (2.5 feet) in height with pointed, dark-green oblong leaves. Flower spikes emerge from the junction of the leaf petiole and the stem to crest with a cluster of small, violet, tubular flowers. It prefers moist soils, growing rapidly and is considered invasive. It is generally cultivated for its oil, which has a high menthol content. The mid Summer bloom is rich in fragrant nectar and very attractive to honey bees. Peppermint honey is characterized as mild, and pleasant. In human studies peppermint has been used to treat gastrointestinal dysfunctions such as irritable bowel syndrome. Honey bees have complicated digestive tracts (they restructure sucrose in their honey stomachs) that contain *lacto-bacillus* among other organisms (nosema protozoa), which suggests that bees may benefit from the phytochemicals found in peppermint nectar and its oils.

[14]ROSEMARY, *Rosmarinus officinalis,* is a woody, perennial herb with fragrant, evergreen, needle-like leaves producing tiny white, pink, purple, or blue flowers. A native of the Mediterranean region it achieves a height of 1.5 meters (five feet), branching to 80 cm (2.5 feet). The narrow leaves 2 to 4 cm (1.5 inches) long by 2 – 5 mm wide are oily and strongly aromatic. Extremely drought resistant, they are very sensitive to wet soil and cannot tolerate frost (or cool, damp weather). This plant does well in potted situations and is very attractive to honey bees. Italy specializes in premium Rosemary honey. This herb is rich in nutrients and essential oils. Among the beneficial phytochemicals are rosmarinic acid, rosmaridiphenol, and rosmanol. Rosemary is also considered a "love charm" and an aid to memory.

[15]SAGE, *Salvia officinalis,* is the common or garden sage. This herb is a perennial, evergreen sub-shrub with woody stems, typically greyish leaves that vary in color with variety, and large blue to purplish flowers. The leaves are oblong, 6 to 7 centimetres (2.5 inches) long by 2.5 cm. (1") wide and covered in fine hairs. It is a source of essential oils and is popular for culinary uses. In

medicinal terms sage contains many phytochemicals with antibiotic and antifungal properties. Relative strength varies with type and variety. The Genus Salvia contains a large number of related species that could be used in an Herb Garden. These include: *Salvia apiana* (white sage), *S. divinorum* (diviner's sage), *S. fruticosa* (Greek sage), *S. pratensis* (meadow sage), *S. splendens* (scarlet sage).

[16]THYME, *Thymus vulgaris,* is a low growing or creeping perennial shrub-like herb. Common Thyme has rather small leaves, less that 1 cm (1/2") long, while other species and varieties may have larger and wider leaves. It produces a strongly aromatic oil rich in many potent antibiotics. Thyme is best cultivated in a hot, sunny location with well-drained soil. It tolerates drought well. It is propagated by seeds, cuttings and root division. Bloom occurs in mid Summer with tiny, pale blue flowers spread along each branch and stem. Honey bees find this herb quite attractive and produce an especially delicious honey. Greece is famous for its Thyme honey.

[17]WINTER SAVORY, *Satureja montana,* is a semi-evergreen, semi-woody, perennial sub-shrub, which reaches a height of 40 cm (16 inches). The leaves are opposite, oval-lanceolate, 1–2 cm long and 5 mm wide. The small white flowers are profuse over most of the plant during its Summer bloom. The oils of Winter savory have antiseptic properties and have been used to treat gastrointestinal maladies. The nectar and honey of this herb is aromatic.

It should be noted by the astute reader that the Honey Bee Herb Garden should also function as a source of culinary and medicinal plants for the beekeeper as well. I am particularly fond of drinking hot, Oswego Tea (with honey!), which is made from the dried, crushed leaves of Bee Balm, *Monarda didyma.* BC

R. Michael Magnini has been a beekeeper on Cape Breton Island, Nova Scotia for 13 years.

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Got A Question?

Ask Phil

Phil **Craft**

He Knows!

Send your questions to Phil at
phil@philcrafthivecraft.com
www.philcrafthivecraft.com

A beekeeper in Texas writes

Novice beekeeper here. April 20 will be 1 year with hive and I'm anxious to harvest honey this year. I've been told a queen excluder is not necessary and in fact may damage the bee's wings. Do I need to put a queen excluder between my super and medium box that I plan to harvest the honey from later this year?

Phil replies

First, don't worry about harming the bees. In the many, animated discussions that take place every year about queen excluders – written and oral, pro and con – damage to bees' wings is a very minor concern (though I have heard it mentioned before.) At one time, it was common to find excluders made of zinc sheets, punched to create narrow slits. I can imagine that the rough edges so produced would pose some risk, however, I don't think they are even available in the United States now, unless in old, used equipment. The queen excluders currently in use are made of plastic or of thick metal wire. I prefer the metal, though they are more expensive. I find that the bees tend to stick the plastic excluders to the frames with propolis more readily than the metal ones, making them more difficult to remove from the brood box. I also have the bad habit of taking queen excluders off and leaving them in the bee yard; the plastic ones tend to blow away in the first gust of wind, whereas the metal ones are always where I left them, usually leaning up against a tree. But both kinds get the job done, so compare prices and, if economy is important, go with plastic.

Now, the BIG question: should you use queen excluders at all? Throw this question out at a beekeeping meeting and you're guaranteed to get somebody's blood pressure up. Many beekeepers use them all the time; some call them honey excluders and won't have anything to do with them. The short answer is that they are not necessary, but there are some advantages to using them. They are not part of your essential equipment, but they are tools which can be useful in certain circumstances. For newer beekeepers like yourself, I recommend using them until you have a little more experience.

The main purpose of queen excluders is to form a barrier between the brood boxes and honey supers through which workers can pass, but the larger queen cannot. They are designed to prevent the queen from entering and laying eggs in the honey supers, and so ensure that you don't end up with brood in the frames when you're ready to extract. They are pretty effective at doing this. Many beekeepers don't like to see any brood at all in their supers, since it darkens the comb where it is reared as well as any honey later placed in the same cells. Beekeepers producing comb honey will also always make use of them. They are the beekeepers who always put a queen excluder over the top brood box when placing honey supers on the hives. I'm not that picky. In hives where I do not use queen excluders, I usually find only small amounts of brood when I remove the supers to harvest honey. There may have been earlier in the nectar flow but, as that early brood emerged, the bees generally refilled those cells with nectar. If necessary, I cut out small patches of brood from honey frames before extracting them or, instead of extracting, I put frames with too much brood back on the hive – over a queen excluder.

A common complaint of beekeepers who never use queen excluders is that bees will not go through them to draw out comb on frames of new foundation in the supers. Hence the epithet honey excluder. The simple solution is to place your honey super(s) on the hive without the excluder, wait a few days, and check back. When you see a lot of bees drawing the foundation or placing nectar in drawn comb, install the queen excluder over the top brood box. Once the bees are accustomed to traveling into the supers, they will continue to do so – with or without an excluder. Also, keep in mind that brood boxes must be full of bees, with most frames utilized for either brood or honey storage, before bees will move into honey supers. With a new hive, I recommend waiting until seven or eight frames of foundation are drawn out in the first brood box

before adding another. Similarly, in an over wintered hive, the bees will not move up to a honey super until they have made full use of the brood box(es) below.

I belong to a third school of thought: beekeepers who don't automatically install queen excluders when placing honey supers, but do make use of them occasionally. Typically, I do not initially place queen excluders on hives when supering. I do, however, always have supers full of empty drawn comb, from which the honey was extracted the previous year. (You won't have any this time, since you didn't have a honey crop your first year.) I put two, or even three, supers of drawn honey comb on each hive. In a strong nectar flow, the bees will quickly fill the bottom super with nectar, leaving no empty cells in which the queen can lay eggs. The full honey super functions as a sort of excluder. The queen, entering the first super and finding no cells available for laying, typically returns to the brood box instead of continuing up into the other supers. (Of course, I never say "never" when it comes to bees; they don't read the beekeeping books. Even an excluder is not 100 percent effective in keeping queens out of honey supers. A young, small queen may slip through the gaps. I've had beekeepers report cases in which the queen stayed in the honey supers, and the bees in the brood box reared a new one – resulting in a true two queen hive.) Although I typically do not place queen excluders when first supering, if I continue to see eggs or larvae in the supers, I often come back and place one later on. As long as at least three to four weeks go by between installing the queen excluder and harvesting honey, any eggs will have had time to hatch and brood to emerge before I extract. Of course, when delaying placing excluders until after there is evidence of the queen's having moved up into the honey supers, it's necessary to make sure that she isn't trapped there. I either look for her in the supers when installing the excluder, or check them for eggs on a later visit. If she had not already returned below when the excluder brood chamber.

As you gain experience with queen excluders, you may eventually choose to use them routinely, not use them at all, or (like me) employ them when you think the situation calls for it. I do recommend that you experiment with them before making up your mind. It helps to have a variety of tools to manage and nurture these fascinating, frustrating, foreign creatures.

A beekeeper in Minnesota writes

I grew up in the 1940s and 50s learning to eat and love honey. But that was always real pure comb honey. It came from the grocery store in a cardboard container with a glassine window on the top so you could see the comb honey inside. The comb honey was just the way the bees had made it - untouched by human hands - in nice little wooden square frames about 15 cm (about 6"?) square. The wood was about one to three mm thick and the corners were all box joints.

That was a long time ago and I have not seen any of those types of comb honey available in grocery stores (or anywhere else) for many decades. I do get some in little round plastic containers, but I really don't like plastics except as bags or insulation.

I have thought about raising bees from time to time, but I have never been able to find any information on building the hives and furniture that would use those little square frames for comb honey - even after much internet searching. I am on a fixed (Declining?) retirement income, so don't want to buy a bunch of stuff that won't give me the information that I want/need.

Do you know of any books or pamphlets (perhaps some reprints of pamphlets from the 40s or 50s?) that might give a beginner information and plans on building this type of bee keeping equipment?

Phil replies

Thanks very much for this question! I grew up in the mountains of Kentucky where comb honey is still produced and much appreciated. My sister always tells me, "Don't send me any squeezed out honey. I want some comb in it!" Richard Taylor, a name that may be familiar to some readers, is another who knew how to appreciate honey as it comes from the hive. He was a beekeeper and philosopher who produced a monthly column for Bee Culture more than a few years ago, and also authored multiple revisions of a book about comb honey. Mr. Taylor wrote, "Comb honey is what honey truly is – good comb honey represents a kind of perfection never found outside of nature and rarely equaled by nature itself."

Years ago, beekeeping books used to advise new beekeepers to consider producing comb honey exclusively – as a way of reducing startup costs. No extraction or bottling equipment needed. Unfortunately, these days, people are not as familiar with honey in its natural form, and there is not as ready a market for it as there used to be. I once knew a beekeeper, and a rural beekeeper at that, who told me that he had to work hard at convincing customers to try his comb honey. However, eventually, he was able to sell all that he produced. On the other hand, I have a friend in Kentucky who has sold nothing but comb honey during the fifteen years that I have known him.

Comb honey is produced in two basic forms: cut comb and sections. Of the two, cut comb is the simplest to produce, requiring only a regular honey super frame with thin comb foundation and no reinforcing wires. It isn't even necessary to fill an entire super with the frames; they can be interspersed among others intended for extraction. I would suggest marking the tops of the frames to identify them as being for comb honey. They need to be placed in the supers at the onset of a good nectar flow, and on a strong hive (lots of bees), to encourage the rapid construction of comb. Once the comb is drawn, filled with honey, and capped, the frame can be removed and

placed on a metal tray to be cut into the desired shape. Plastic containers are available from beekeeping supply companies, and even shallow, Styrofoam trays from grocery stores will work, sealed with plastic wrap. Some beekeepers like to put a piece of comb honey in a jar, then fill the jar with extracted honey, but that is usually referred to as chunk honey.

When I make cut comb honey, I do something a little different. I cut the foundation into strips about ¾ of an inch in height, and place them in the frames. This forces the bees to draw out the comb with only a small piece of imprinted wax as a pattern. I find that I need to check on the frames every few days as the comb is being drawn. If the bees start to connect it to adjoining frames or fail to draw it out straight, I redirect them by trimming or manipulating the new comb. When I harvest the capped comb, I leave a small amount at the top of the frame for reuse next year. The frames are stored with the rest of my extracted honey frames. I was told by an uncle that my grandfather always used foundation in this way, which is where I got the idea. For him it was a matter of economy. He was using a virtually foundationless beekeeping system in the 1920s and 1930s.

Section honey differs from cut comb, in that it involves using special frame and insert sections The bees build new comb within the inserts, fill it with honey, and cap it when ripe, as usual. After the beekeeper removes the frames from the hive, she separates the filled sections and inserts them into matching containers ready for sale. No cutting is needed, so there are no cut edges to drip honey. Most sections are square, but round ones, often called Ross Rounds, are also available. If you are interested in producing non-cut comb sections, you will have to purchase a section system. Each is a little different and, therefore, they are not interchangeable. They are also plastic for the most part, and I agree with you in feeling that wood, and not plastic, makes a more attractive frame for comb honey. However, there is one comb honey system with sections made of thin strips of wood - traditionally basswood. When the bees have finished capping the comb, it is attached to the inside perimeter of each square wooden section frame. To me this combination of pure comb honey and the thin wooden sections is an art form from nature and almost too beautiful to eat. The sections are sold, as you recall, in cardboard boxes with clear plastic covers, through which the comb honey can be seen. They are still available for sale by at least one beekeeping supplier that I know of: the Walter T. Kelley Company in Kentucky.

There are a number of books about comb honey. The one by Richard Taylor, which I mentioned, is titled The Comb Honey Book. It is still available; I purchased one in recent years. An even older book, Honey in the Comb by Eugene Killion, was originally written by Eugene's father, Carl E. Killion, in 1951. Eugene produced a revision of his father's book in 1981 and it is also still in print. I think most beekeepers consider the Killion books as the manuals on comb honey.

I hope that you get a hive or two and produce some comb honey. Your neighbors will be richer for it! BC

All The Buzzz in...

Hello Friends,

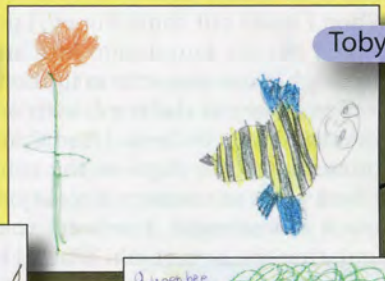
Enjoy taking the time to really look at the plants and pollinators around you.

Bee B.Queen

Bee B. Queen Challenge

Send me some of your nature observations.

Keiana Bliss, 9, MI



Toby Lee, 5, WA

Gary Weaver, IN

Mataya Davis,10, WI

Pollination Observation

This summer make a pollination journal. Observe nature and record your discoveries.

You will need:

* notebook - Make your own or buy one at the store.
* pencil, colored pencils, crayons
* a quiet outdoor location
* all of your senses

How to Begin

The most important thing about creating a pollination journal is observation. Find a spot to explore. This could be your yard, a garden, or park. Remember to always let an adult know where you are going to be.

Record the date, time, location and weather in your journal every time you go out.

Observation Ideas

Take a walk and record how many pollinators you see in a certain period of time. Describe the pollinators, flowers and plants around you. Use as many descriptive words as possible. Maybe even write a poem.

Come back to the same spot at different times of the day like early morning or late afternoon. Write down your observations. What is different? What is the same? Try making observations when it is rainy, sunny, cloudy, windy, cool, or hot.

Take photos or draw pictures of plants. Ask someone to help you identify the plants or use a flower identification book.

Write down the dates when you see the first blooms. Over time, you can compare your blooming observations from one year to the next. When did you begin to see bees working a specific flower?

Enjoy recording your discoveries and seeing the world with focused attention.

... Bee kid's corner

Produced by Kim Lehman -www.kim.lehman.com
www.beeculture.com
June 2014

Citizen Scientist

Now is your chance to help gather data on pollinators in your area. It's easy!

1. Read all about this project at www.greatsunflower.org
2. Count the pollinators in your yard, garden or community.
3. Report your numbers on the website. Remember if you see no pollinators enter 0. This is very valuable information.

Henry and Marshall, IN

Nature Word Search

Find these things you may see outside.

Ant
Beetle
Bird
Bumblebee
Butterfly
Flower
Fly
Honeybee
Leaves
Rabbit
Squirrel
Tree
Wasp
Worm

B	H	O	N	E	Y	B	E	E	L
N	U	D	R	E	W	O	L	F	Y
C	L	T	X	E	L	T	E	C	G
K	W	I	T	B	E	A	A	J	U
D	I	B	E	E	R	T	V	J	W
C	L	B	B	L	R	W	E	A	O
R	D	A	S	B	I	F	S	N	R
B	X	R	D	M	U	P	L	T	M
U	V	Y	I	U	Q	F	K	Y	R
I	N	F	D	B	S	M	S	Y	I

Make a Nature Journal

You will need:

* 5 sheets of typing paper
* string or yarn
* card stock or heavy paper
* hole punch

Stack the paper. Fold the paper in half short ways to make a booklet. Make a cover using recycled paper like the colorful pages of an old calendar. Cut the cover slightly larger than the paper. Slip the pages inside. Punch two holes in the fold. Insert the string so the ends are on the outside of the book. Tie.

What did Buzzy Bee say to the flower?

Hi, Bud!
What time do you open?

Bee Buddy

Reuben Hershberger, age 13 from Ohio, is the oldest of eight children in his family. One day as his dad was working the bees, Reuben began asking questions about the hive. He learned all about the life cycle of the bees and has been learning about bees ever since. Rueben finds looking for swarms and extracting honey very interesting. He likes building sheds and barns and enjoys swimming on hot summer days.

A monarch butterfly collecting nectar from a purple coneflower.

Beecome a Bee Buddy

Send two self addressed stamped envelopes and the following information to: Bee Buddies, PO Box 2743, Austin, TX 78768.

Name
Address
Age
Birthday Month
E-mail (optional)

We will send you a membership card, a prize and a birthday surprise!

Send all questions, photos and artwork to: beebuddies@hotmail.com or mail to the above address.

Bee Culture Visits Mother Earth News & Asheville, NC

Kathy **Summers**

Most of the time when we go to meetings or shows we spend most of our time behind a table selling books and talking to people about beekeeping. That's what we do and we love it. Once in awhile – if we have a third person with us and we're there longer than a day – we get to actually take part in some of the activities. We had that at Mother Earth News in Asheville. At times it was so busy that we all three needed to be at the table selling, collecting money and Kim signing books. It was a good two days and we did well.

We've gone to The Mother Earth News Fair four years in a row now – the first three to Seven Springs in PA in the Fall. The first year Kim and I went as attendees, the next two years he was asked to speak. This is the first year a fair has been held in Asheville and Kim gave two talks there.

The event was held at a huge fairground and they initially anticipated 6,000 people attending. Before the date even arrived 12,000 had bought their tickets. It was a huge success with only minor hiccups considering the amount of people. Food was really the only issue I saw – they had half as many food stands as they needed. But the folks running them did their best to keep up and all seemed to do it with a smile.

It was 75° and sunny the whole time. I don't think it rained a drop. There were over 150 workshops and about 200 vendors – inside and out. Kim spoke in the Mother Earth News tent which is the biggest one and it held over 1,000 people – it was full when he gave his talk. His second talk was in a tent that held over 200 and it was full. Shane Gebauer of Brushy Mountain gave two talks on Beginning Beekeeping that were also very well attended.

We handed out around 350 magazines and talked to hundreds of people between the three of us – some have bees, some used to have bees, some want to have bees and some are just intrigued by what we as beekeepers do. We had several people that just kept wandering back to our table with more questions. There is a huge interest in beekeeping out there. I'm thinking NC State Beekeepers Association should consider having a booth next year. Over 1,000 people listened to the talks on beekeeping. Lots of potential for new members there. PA State Beekeepers, there is still time for you to sign up for the Fair at Seven Springs in September.

There is an area inside one of the buildings that they call the book store. We did a rough count and there were an estimated – 5,000 books in that room. And there were several others, like *Bee Culture*, selling books. I am a

book person so I had to really watch and not go too crazy.

There are books on every topic you can imagine and some you would never have imagined – gardening, chickens, bees, pigs, goats, cows, composting, everything food and so much more. It was amazing to a book person like me.

Vendors were in three different buildings – a little spread out because it is a fairground. And it was NC so there were a couple of small hills to walk up. Outside there were tents everywhere with more vendors. And animals – cows, horses, alpacas (boy are those cool), turkeys, chickens, ducks. And tractors, t-shirts, plants, seeds (lots of seeds for sale), tools, gadgets of all kind.

Brushy Mountain had a constant flow of people buying suits, gloves and bee supplies. Our booths were

right next to each other which made it really convenient for both of us. We'd answer people's questions and then send them over to the Brushy Mountain booth. Shane sent folks our way to purchase the books they needed to get started. It was great.

By the time Sunday afternoon rolled around folks were looking pretty tired, but still had smiles on their faces.

I'd really like to go back to Asheville when we don't have a show to do. This was my first trip there and what little we did get to see made me sure I need to go back and visit. BC

Dandelion & Elderflower Mead

Spring Flowers Make Wonderful Winter Meads

Berry pickers make picking dandelions quick and easy especially if you find a big patch of flowers and want to get them before the bees. Wait until the dew is off of the flowers in the morning to pick the best blooms.

Jack **Blackford**

There is nothing so nice as to see a yard full of dandelions in the Spring being worked by the bees. Today the bees are going to have to share some of their flowers with us to make dandelion mead now to bring back that springtime feeling deep into the heart of Winter. As a bonus, the early light Spring honey, with its light floral bouquet, is the perfect honey to use to make both dandelion and elderflower meads. So take a few minutes away from chasing swarms and start picking as many dandelions as you can now! The elderflowers will come on a little bit later in the springtime.

Picking Dandelions

Making dandelion mead is very simple with a few important steps to make quality mead. The first quality step is to find a nice place to pick dandelions, a yard that has not been sprayed with herbicides or insecticides is a good place to start. Maybe consider an area not favored by your dog for his morning business. We have found our best dandelions, large heads and plentiful, at the edges of our pasture that is not mowed. Our yard, even with the dog, produces many nice dandelions as does our fallow garden plots. We like to wait until the morning dew has dried up on a nice sunny day and go out and start to pick the dandelions. We pick either by hand or use a berry picker, one that has little prongs on the front like are used to pick blueberries. The berry picker picks everything, good open heads can be selectively picked or a whole swatch of flowers can be picked at once and sorted later. The flowers are put directly into a paper bag that keeps them dry, never pick into a plastic bag as the flowers can sweat as you are picking. Once the bag is full or we have picked all the flowers in an area the bag goes into a cool area while we go back out and pick more flowers.

Only remove the yellow petals and leave out all green parts of the base of the flower which can make the mead bitter.

Plucking Dandelion Petals

The second quality step is to separate the green from the bottom of the flower from the pretty golden yellow petals. Our fastest method has been to hold the green base of the flower in our left hand and with a big pinch with our right index finger and thumb scoop out the base of the petals. This is much faster than other methods which peel away the green petals at the base but leave the petals attached to the base which we think might contribute to a bitterness some people get when they make dandelion wine. If there are no green bits on the bottom of the base then there is no bitterness in the finished mead. We like to have a good strong taste of the flowers as well as a good taste from the honey so that they are both in balance. Having tasted weak dandelion wines before we decided to add a lot of petals to our dandelion mead and to boost the vinous flavors to support the dandelions by adding Niagara grape concentrate as well as honey.

Preparing the Dandelion Mead Must

To prepare the petals we pour three quarts of boiling water over them and let them steep overnight. We added four strands of saffron to boost the color a little during the boil. The next morning they are gently simmered for 10 minutes then removed from the heat and cooled. After the petals are cooled they are strained out of the water, any honey strainer will do this just fine. The honey and Niagara grape juice are added. Depending on how strong your want your finished mead to be, we wanted ours to be strong so that we could backsweeten it and maintain a good overall balance, you can add more or less honey. We started this batch at a specific gravity of 1.100.

Modernizing Dandelion Meadmaking

We like to play with the modern winemaking additives like tannins. Scott Labs makes FT Blanc fermentation tannin, available at many online homebrew shops. This fermentation tannin helps protect the delicate dandelion mead from oxidation and improves the mouthfeel of the finished mead. No acid was added as the Niagara grape juice provides a balanced level of acidity. We rehydrated our yeast at 104°F with GoFerm, this rehydration nutrient gives the yeast a good head start and is specifically made for yeast rehydration, standard yeast nutrients would be harmful to add during rehydration as the yeasts are not ready to absorb them. Once our yeast was proofed it was stirred into

the must which was in a two gallon food grade plastic container and a fine flower sack towel was used to cover it and keep bugs out. It was stirred twice a day to keep the yeast up in solution and also because it's fun to smell it everyday.

Fermenting Dandelion Mead

After about five days our yeast took the must down from a specific gravity of 1.100 to 1.000 so we transferred it with a racking tube into a gallon jug and put on an airlock filled with water and a little sulfite to keep it clean. We left it to ferment in a cool spot in the basement for five more months, no tasting, no stirring, just let it finish out on its own. It was then racked again into a clean gallon jug at a specific gravity of 0.994. Here we added potassium metabisulfite to protect against oxidation and spoilage and potassium sorbate to keep the yeast from refermenting after we added more honey. We added more of our light Spring floral honey, probably made from a combination of apple blossoms, dandelions and locust flowers, to raise the specific gravity up to 1.006. This made the dandelion mead just slightly sweet and in perfect balance with the level of alcohol and the acids from the grape juice. Light Spring honey perfectly matches up with flower meads, complimenting the floral notes from the dandelions instead of covering them up as would happen if we used a stronger darker honey.

Finishing and Bottling Dandelion Mead

We got busy with the apple harvest and left this mead set in the cool basement for three more months, this is not a problem as it was already stabilized and remained clear during this time. We finally bottled this in January, nine months after starting it. It was a beautiful golden yellow, it surpassed our previous dandelion wine batches with the richness from the honey adding so much body and flavor. The additions of the grape juice, saffron and fermenting tannins all did their job of rounding out the final flavors and mouthfeel. This was only a gallon experimental batch this year, next we will move up to a three gallon batch, freezing the petals between pickings until we have enough to start, with a little lemon juice to protect their freshness in the freezer. If you have only had thin watery dandelion wine before try making this yourself, making it as a mead adds so much more body and flavor from the honey it really takes dandelion to a much higher level than just a normal dandelion wine.

Elderflower Mead

In the early Summer the elderberry bushes bloom. You don't notice the big green shrubs hiding among the trees until they break out into big white blooms. At this time you need to note where they are and come back soon with a big bucket and start harvesting flowerheads. First please make sure you can identify what elderberry flowers really are, we have some guidelines to identifying common cultivated elderberry bushes on our webpage at **www.wvmjack.com**. I don't say this lightly as I have read some city folks thinking pokeberry was elderberry, that's not good eats. The elderflower grows as a compound umbrel, the main flower branches several times to make different umbrels. The whole collection of umbrels can grow as a rounded head or flat. There are also poisonous elderberries especially out west like the scarlet elderberry, so make sure you know what kind you are picking.

Dandelion Mead Guidelines 1 Gallon

Yeast Pasteur Champagne – a strong fermenter, but K1V-1116, D47 and many other white wine yeasts can be used in this recipe.

7.5 ounces (214 grams) Petals picked from flowerheads

3 cans 11.5 ounces Welches Niagra Grape Concentrate

4 strands of Saffron

Spring Honey start with 1.5 cups, can add more

Yeast Nutrient – as per instructions with your nutrients
(we used Superfood 1.5 tsp, Fermocel P 1 tsp)

7 grams Scott Labs FT Blanc or FT Blanc Soft Fermentation Tannins

½ tsp GoFerm during Rehydration of Yeast

This is a guide for making Dandelion mead instead of a recipe as I want people to think about how they want their meads to come out in the end. Maybe you want to use all honey and no grape juice, go ahead and do it that way. Maybe you don't like saffron or think adding it to boost color is cheating, so go ahead and drop it out. Maybe you only have a regular yeast nutrient from your local homebrew shop, nothing wrong with using that as long as you follow the instructions for its dosage. Maybe you like it dry, don't backsweeten, or you want it much sweeter so add a bunch more honey at the end. This really if fun to make any way you want to make it.

Author's wife, Toni, dreaming about elderflower mead holding up a flower head from our irrigated cultivated elderberries. Very easy to grow, like moist soil and sunshine.

Picking Elderflowers

Elderflowers are very delicate with a unique strong flowery smell. As like in picking dandelions, quality counts both in finding good flowers and in taking care of them once they are picked. On a nice sunny dry morning first smell your elderfowers, they should smell very perfumey and strong. We actually grow cultivated elderberries in a big patch, when they are in flower you can smell them from a hundred feet away. The petals should be bright white with no yellow or brown petals, if there is these are past prime and shouldn't be used. Also if there is any hint of ammonia or cat pee smell these are also past prime and shouldn't be used. Some unopened flowers in the cluster are ok to use as it's very rare to find a complete flowerhead where all the flowers are opened at once in prime shape. Cut the whole flower head off at the stem and drop it into a big bucket or paper bag, don't compress them. Keep the flowers cool, don't let them set in the sun while you are picking them. For our three gallon batch we picked two eight-gallon buckets overflowing full of elderberry brackets, not pressed down. This gave about 3.5 quarts of sorted flowerlets.

Separating the Elderflowers

Once home put the flower directly into the freezer for at least three days to a week. This freezing causes the flowerlets to drop off the stems much easier. Remove your flowers from the freezer and crush them up quickly with your hands and then pass them thru a baking rack to remove

Big eight-gallon bucket filled with elderflower heads, not packed down, ready to be quickly cooled off. Check for bugs and put in freezer as soon as possible to preserve quality of the flowers for a better elderflower mead.

the larger stems, do this quickly so they don't all thaw out while you are sorting them. They can be refrozen quickly if you are doing big batches. Another method to separate the flowerlets is to use a backing cooling rack and scrape the flowerheads across the grate over a bucket. Maybe add a little water with some lemon juice to keep the flower petals from turning brown.

Preparing the Elderflowers

Boil a gallon of water and two tablespoons of acid blend and add the sorted flower. The acid keeps the flowers white, lemon juice would do the same thing. Simmer gently for 10 minutes, turn off the heat and allow to extract overnight. Strain out the flowers with a honey strainer.

Elderflower Must

Light Spring honey is the perfect match to an elderflower mead. We want a floral honey that won't overpower the flowers that is also sweet and has a nice floral bouquet of its own. We added about 11 pounds of light Spring honey to the elderflower extract in a total volume of three gallons of must for a specific gravity of 1.120, again we are going for a strong mead that we can backsweeten a bit later with more honey. We added yeast nutrient and a little bit of pectinase just in case we extracted some from the boiling process, probably not needed but we feel it's better to prevent a haze at the beginning then to try to cure it later. To modernize this elderflower must we added Scotlabs Optiwhite which helps make a white wine smoother sooner, helps prevent oxidation and improves mouthfeel.

Elderflower Fermentation

The D47 yeast was rehydrated with GoFerm nutrient at 104°F and added to the must. The must was fermented in a cool basement at about 67°F, D47 likes it cool, in a five-gallon carboy initially sealed with a nylon stocking swirled twice a day to keep it mixed up. After six days of fermentation, raw fresh florets from 10 more flowerheads were added to boost the fresh elderberry fragrance along with another ½ cup of honey and an airlock was added. Six weeks later the must was racked at 1.000 to a three-gallon carboy. This is longer than we typically wait to rack into the secondary carboy, but since we fermented in a carboy and already had an airlock attached we were not worried too much about oxidation. Plus, we wanted the must to absorb some of the yeast autolysis products in a method called *Sur-Lie*. This adds even more mouthfeel from certain yeasts, including D47. Three months later the mead was again racked at 1.000 and honey was added to a specific gravity of 1.020 along with potassium metabisulfite to prevent oxidation and spoilage. After three more months of patience the mead was still at 1.020, so it was racked again and degassed. It was a little cloudy from the proteins in the honey we used to sweeten it with so we added 4.5 gm of Sparkaloid. We prepare the sparkaloid in a coffee cup with about a half cup of water, stir in the sparkaloid and microwave until it boils, stir, and repeat two more times and then using a funnel add it directly to the mead and stir it in very well. A week later the mead was filtered through a medium grade filter in a Buon Vino Mini Jet filter, this removes any sparkaloid that we may have stirred up before bottling. This elderflower mead was perfectly smooth with a wonderful scent of elderflowers and honey.

This Spring found us competing with our own bees for dandelion flowers, though we will have to balance how many flowers we pick to how much honey we are going to lose taking them away from the bees. The bees scout the elderflowers but don't seem very interested in them so we can pick all of those we want leaving enough for berries later in the Summer. If you have had weak flower wines in the past they just don't compare to the quality and smoothness of making them into meads. So take a few minutes between splits and pick some dandelions, scout out elderberry bushes. Driving back and forth from your outyards, always carry some snips and paperbags to be ready. A little work in the Spring pays off very big in the Winter. BC

Elderflower Mead Guidelines 3 Gallon
Yeast D47 – likes to ferment cool, but K1V-1116, QA23 and many other white wine yeasts can be used in this recipe.
8 gallons of flowerheads yielding about 3.5 quarts of petals
Spring Honey start with 1.5 cups, can add more
Yeast Nutrient – as per instructions with your nutrients
(we used Fermaid 4.5 tsp)
0.6 gm OptiWhite
2 TBSP Acid Blend during boiling of petals
Pectinase enzyme as per manufactures instructions
½ tsp GoFerm during Rehydration of Yeast
10 flowerheads raw added to primary
4.5 gm Sparkaloid before bottling to clear

Jack and his wife Toni live on a small farm in WV growing bees and berries and apples. Their webpage is at ***www.wvmjack.com*** *for more mead recipes.*

BIGGER PICTURE

Jessica **Louque**

Pretty And Practical

If you've ever lived in a small town, suburb, or rural area, you know that people *talk*. Neighbors will question your every landscape, gardening, and sometimes beekeeping, move. We have an unsightly refrigerator on the front porch from a recent (or not so recent) appliance swap and haven't had time to move it. I had a neighbor call and offer to buy it just to get it out of their sight. Keep in mind here, we live about a quarter mile off the highway and there are only three houses on this dirt road. Sometimes, it's worth it to pick a fight with your neighbors, and sometimes a little appeasement goes a long way.

Assuming you are keeping bees and have neighbors nearby, chances are you've already upset someone. I have at least one neighbor that swears he will go into anaphylactic shock if he is stung by even one bee. I will give him the benefit of a doubt because he does carry an epipen, but having him calling me before 8:00 a.m. on a Saturday because there are "swarms" of bees on his hummingbird feeders is not the way to start a weekend. Some of your locals prefer to not even know you have bees, and a few will either not mind or even be happy about the extra garden pollination – but there's always THAT neighbor. In this case, the best scenario is to figure out how to do what you want while causing the least amount of confrontations.

I like to plant things everywhere. It's probably a good thing that the soil is atrocious here or there might be a jungle outside. I used to tediously attend to the needs of all the plants, prior to the acquisition of stepchildren. Now I have a lot less strict idea of what's "absolutely necessary" for yard maintenance, while the need for growing food has risen. Personally, I've never met an ugly garden, but we all know that beauty is in the eye of the beholder. I like the addition of color to the front of the house from the chalk murals, and I think the broken picnic table with bullet holes and paintball splatters adds character to the yard, much like a statue or fountain. Some people may call this unsightly. Sometimes I think both my neighbors and I are waiting impatiently for the orchard trees or crepe myrtles to grow high enough to block out the yard. Not everyone is going to upset their neighbors quite like I do (wait until your neighbors think you're keeping a bobcat because they hear your peacock) but everyone can benefit from pre-planning your plantings.

I'm going to focus on the front yard, because that's normally the main area of scrutiny from surrounding people. A lot of you have a grassy spot in the front yard. I think grass is a waste of gardening space and of lawnmower gas, and a breeding ground for grubs. Slowly the grass is disappearing. More attention to detail will have to be applied to this gardening endeavor to keep it visually appealing as well as beneficial to you and your family (don't we all count bees as family?). If you can make an attractive garden that has various points of interest and usefulness, it's much easier to strike up a positive conversation that can also add a good spin to the beekeeper's heinous hives.

Trellised roses and peonies.

When you are looking to plant up your yard, there are several things to consider. It's nice to have pretty flowers, but why have something that's only pretty? You should pick plants that can offer at least two benefits from being in your yard. Make them pay you for your hard work with something other than visual appeal. For example, Bachelor's Button is pretty, bees like it, and it's edible. Depending on your level of expertise, you might also want to keep up with what will be pretty the longest, unless you want to do some sort of succession planting. You can also do a mix of annuals and perennials so that part of the work is already done for the upcoming years.

If you are past the novice stage of gardening, you may want to try your hand at espaliered fruit trees. I took a class in permaculture in grad school where the professor used his house as an example of small things that make a big difference. His front "picket fence" was criss-crossed apple trees that had grown together in a lattice design. One of our field trips uncovered an entire backyard fenced in by espaliered apple trees. Not only is it unusual and eye-catching, but it's also a fruit producer. Who doesn't want a blooming fence?

Vining plants should also be taken into consideration. Pole beans are pretty, especially if you plant an unusual variety, like Yard Long Red Noodles, or Tongue of Fire. In this case, the trellis can be just as important as the plant. Since it will take a large part of the season to

Young spinach coming out of the raised beds.

cover the trellis, you want it to be attractive in its color and pattern. If you're looking for something with more prominent blooming features, you could try passion flowers, so named for the Passion of the Christ – check out the history sometime. The flowers are gorgeous and you can eat the fruit. I don't know if it's relevant in all parts of the country, but we call them maypops.

If properly managed, herbs are pretty and useful and bee-attractive. Rosemary is a neat perennial that thrives in the right areas and is sought after by the bees because it blooms off-season. Of course, it will take some pruning, but you can easily manage that from taking some for cooking. Basil is also a bee-frequented plant when it's flowering, and can be really interesting if you plant an unlikely variety, like bush basil or holy basil. Oregano attracts bees and can be a low-lying addition, but if the bees have too much at hand, the honey will taste weird. Mint is a hardy herb that will take over a landscape if you aren't careful, but it can come in handy in spots that won't grow anything else. Ginger is absolutely amazing. I know not everyone likes the taste (I am not a fan except ginger ale) but the foliage lasts all year, it's taller than average, the flowers smell fantastic, it's low maintenance, and it's a perennial. It should be regarded with the same growing abilities as a Cana Lily, but attracting honey bees instead of bumble bees. Bee Balm is an unusual plant that grows fairly tall as well, with bright red flowers (sometimes other colors) and seems to do okay even in poor soil. Although it is an annual, mine doubles in consumed area each year and the bees are always happy about it. I've never made tea out of it, but I've given it to friends for that purpose. Borage seems to attract bees, and it tastes like cucumber. I've heard the blossoms are good in salads and frozen in ice to put in drinks, but I have only sampled a bit to see if I liked the taste (I didn't but you might).

If you're looking for edible border plants, leafy greens are the way to go. Lettuce, spinach, pac choi, kale, sorrel, and Swiss chard are good options. The Bright Lights Swiss chard is one of my favorites because it's pretty from start to finish. The only problem with all of these is that they will need to be succession planted, so a schedule will have to be kept to make this area continuously appealing. Corn can also be used as a border if it's planted behind shorter plants. It will quickly outgrow any neighboring plants. Part of the garden planning will be to remember that not all of these plants will stay short or tiny and some will grow much faster than others.

Permanent fruiting plants can be a high-reward job if maintained properly in the initial phases. Blueberries, blackberries, grapes, and arbor kiwis are all examples of perennial plants that can give long-lasting benefits. Grapes, blackberries, and kiwis can all hide an ugly fence, or make a nice fence better. They can also be used to partition off an area, to climb a pergola, or to border another area. Blueberries can be used to line a walkway, giving easy access to anyone nearby. Strawberries are another eye-catching fruit that can be considered permanent if they are grown in the right conditions. They are excellent for producing bursts of red throughout the season if you plant everbearing strawberry varieties.

As I have repeatedly written about my penchant for tomatoes, I am not suggesting them for front yard

Cabbage growing in the raised beds.

Evening primrose makes a nice addition of pink to the green.

Potted herbs on the front porch.

Flowers planted in the walkway space next to the honey house attract multiple species of bees.

planting. I grow them in the front yard, side yard, and backyard – I would grow them in the kitchen sink if I didn't need it to hold dirty dishes. However, they are sometimes a mess and are not going to make your nice front garden look organized and well managed. They need a lot of care to keep them in check and are going to have to be pulled up early if you have only determinates. I wouldn't suggest anything in the cucurbit family either (cucumbers, squash, pumpkins, etc) because the runners can make these difficult to control, and the multitude of pests and diseases can make these look more like a science project than an ingredient for supper. Pests and diseases should be considered, because the front yard is not where a beekeeper wants to be seen spraying pesticides while touting the use of IPM or biocontrol methods.

The most important part of the entire effort is the planning. Not all plans work out, but it can at least be a baseline for beginning your project. There are several plants that I didn't mention that can work just fine, and anything can be tailored to your own tastes. In the end, it's really about making yourself happy. Having an attractive yard that has a high production value is no easy task; it is certainly something to hold in high regard. BC

Spinach and cabbage taking up space in the raised beds.

Jessica Louque and her family are living off the land in North Carolina.

Plan For A Honey Party

Ann **Harman**

Your Hives Did Well This Year – What To Do With All That Honey

Your three colonies did very well this year and produced quite a few full honey supers. Last year you had such a small amount that it was easier just to crush the comb and strain the honey. But this year you will have to take advantage of your local club's rental extractor and uncapping knife. Now is the time to reserve it! Others in your club also had a good year so get your name down early to have a good choice of dates.

What? Your club does not have an extractor for rent? Perhaps you can stir up interest in having a club extractor. For someone with two or three hives, buying an extractor may seem an expensive purchase. However, if your future plans are for six or more hives, then perhaps this is the year to buy one. You will need an uncapping knife, uncapping tank and strainers also even if you have rented just the extractor.

When is the best time to remove the honey supers? That depends on several factors. One is the time of your honey flow – early? late? May? June? Summer month? Another is the best timing for your varroa testing and control. *Varroa* populations tend to peak during the summer. You should know when to test for *Varroa* levels and when controls are most effective in your area. Not sure? What does you local club recommend? If your state has a state apiarist, what is the recommendation? You know what controls you wish to use, so now is the time to plan for *Varroa* control and your honey harvest.

These days we need to keep the small hive beetle in mind. Are they in your area? Those with shb need to make honey harvest plans carefully or the whole crop could be lost. If you are not certain about shb in your area, again check with your local club or state apiarist. Making plans for your honey party may have to include preventive measures against shb. More on that later.

Honey extracting is messy – full of bits of wax and sticky honey. Places to consider include your kitchen, your garage, carport, basement, equipment shed, storage shed, barn. Stop for a minute! Think! If you plan to extract during the day the place must be bee proof. Remember, bees have a much better sense of smell then you do. It takes only a few minutes for one bee to find a bit of honey, return to her hive and recruit many others to a fantastic source – your supers of honey ready for extracting. Within minutes you would be battling thousands of eager bees, to say nothing about the loss of your honey crop.

It is possible to use an open area – garage with door open, carport, shed or barn if it is done after dark. This means that you may have to remove supers during the day and protect them from bees and shb until late. You may be cleaning up at 2 a.m.

Give some thought to the weather at the time you plan to extract. If it will be horribly hot you may think of using a fan. Not a good idea. A fan will blow dust and dirt around. You may be more comfortable but your honey will end up full of dust particles, excellent nuclei for crystals to form. Will your summer humidity be high? Honey picks up moisture from the air and the honey will be exposed during uncapping, extraction and straining.

If you are extracting in a closed area a dehumidifier could help, but turn it on hours before you start to work to have the humidity lower at time of extraction.

Your friends have pestered you for several months now. They are eagerly awaiting a jar of honey. Well, how about a Honey Extracting Party? You could use the help. Tell them they will get sticky but will go home with a jar of honey. Yes, their honey should settle in buckets or tank to get rid of air bubbles but just explain that part of honey harvest to them. After all, those air bubbles don't affect the taste. Serve pizza or sandwiches, some fresh fruits in season, and something to drink. If all goes well it can become an annual event.

Many things need consideration when selecting your extraction site. Full supers need to be brought in and stacked. Then frames need to be removed and uncapped. So that area should be near the supers. From uncapping the frames get put into the extractor. Remember they will be dripping honey so the nearer the extractor the less honey on the floor. What is the size of the extractor you will be using? Now the extracted frames need to be put back into the supers. These need to be stacked away from the working area until they will be moved back to the bees for cleanup. A table is handy for refreshments. And remember how many helpers you invited. They will need room to be helpful!

Now you can make some estimate of the size area you will need. Your kitchen may have worked for two or three supers but beyond that number the kitchen may be too small. Make yourself a diagram of the steps of uncapping and extracting. Estimate working area spaces. Make a plan going from full supers in to empty supers out. Now you can better decide where your temporary honey house will fit.

Let's give some thought to uncapping. The electric uncapping knives make the job easier but you

need a source of electricity. You can use a non-electric knife, even two kitchen knives, but these are easier and faster if the blade is heated. So how can you keep a deep pot of water reasonably hot? If working in an open area at night you need a source of good light. Since this is a sticky project everyone will need a convenient way to clean off hands from time to time. A sink is nice but some buckets with water will work. Just plan for their space.

Throughout all the planning and the extracting itself remember that the bees have made a very clean product and that you are working with a food product. Wherever you do your extracting it needs to be in a clean area.

If you chose your basement, is it finished with ceiling and a nice floor, well lit with source of electricity and a source of water? Or is it just first-floor beams and spider webs with a concrete floor and piles of boxes for storage? If the basement is the latter, see and use the suggestions for using a garage. You may already have crossed off a shed or barn.

Many garages can have plenty of space to work (move the bicycles, garden tractor, and rubbish bins outside) but it should be made into a clean area. In getting it ready for use as a honey house you will probably find the screwdriver you lost last summer. Does it have a ceiling or open rafters holding assorted junk? Are there some shelves on the wall holding half-empty paint cans, bug spray cans, tools, birdseed and dust? Is there a jumble of garden tools over in a corner?

I thought so. A trip to a hardware store is necessary. You need a stapler (and staples) suitable for attaching the plastic sheeting – you are going to buy that now – to the rafters, over the shelves around the garden tool area and anything else that needs to be covered. Don't fuss—remember you are producing a food product. Afterwards you can pull off the plastic and save for next year.

Now for the floor. Sweep up the debris. If you have a shopvac use that after sweeping. The floor will have to be covered for a couple of reasons. First, if there are heavy oil stains from vehicles they need to be covered. Second, you will be dripping honey between the various pieces of equipment. Newspaper will work and it still can be recycled after you are done. The nice thing about newspaper is that you can keep adding clean sheets of it over the sticky places so you are walking on clean newspaper instead of it sticking to your feet and flopping about. One of your helpers can be in charge of putting down clean newspaper sheets. If you thought about using sheets of plastic to cover the floor what will you do with the places honey gets dribbled? You cannot cover those with more plastic. A sheet of plastic on top of a sheet of plastic becomes a skating rink – dangerously slippery.

In areas with small hive beetles you need to plan when to remove honey-filled supers and when to start extracting. With shb in your area you cannot spend more than a few hours before removing supers and extracting. Shb can fly and they have a good sense of smell. Furthermore when the supers come off the hives, the honey and wax are warm, making uncapping and extracting quicker and easier. If you are extracting after dark, the empty supers can go back on hives, over the inner cover, the next morning. In some ways the shb has made us better honey harvesters.

Extractors tend to dance around the floor unless the load is balanced. It is possible to learn to balance the load and it only takes a little practice. Since your honey house is not permanent, the extractor cannot be fastened permanently to the floor. Even if it were fastened it is better on the moving parts if balanced.

Since this is now just the beginning of June you have time to look through the beekeeping supply catalogs for items that will make your extracting and processing of honey easier. Even if you are renting the extractor and uncapping knife buying some additional pieces of equipment will make honey harvesting easier.

You probably already own a capping scratcher that you used for varroa inspection. If you are considering buying a heated uncapping knife be sure it has a thermostat control. A heated knife that becomes too hot will scorch honey giving an unpleasant burned taste to your honey.

The plastic uncapping tub is a great addition to harvesting equipment. It is big enough to catch the cappings and the honey from them will drain through a coarse strainer into the lower part of the tub. The plastic pail strainers that fit five-gallon buckets come in three sizes of strainers and do an excellent job of removing wax and bee parts. They are inexpensive and easy to clean. Five-gallon buckets with gate can be used as settling and bottling tanks. If and when you expand your apiary you may need a large settling tank. You can also buy various extractor and settling tank stands that save you from making unstable ones from an assortment of cement blocks.

Now that you have assembled the equipment that you need and planned your temporary honey house it is time to set the date and invite your honey harvest friends. Be certain that you have honey jars and lids ready for their reward. By the way, those jars need to have your label on so their friends will know where to buy good honey from local bees. BC

Ann Harman keeps her bees and harvests her honey at home in Flint Hill, Virginia.

DOWNTOWN

Are Apicultural Decisions Community Decisions?

Tales of beekeeping in the city published in this column have often revolved around all of the people and human organizations which beekeepers must deal with in densely populated urban environments. But the closeness of our bees to one another raises questions all its own, and it's not at all clear that the jury is in!

A couple of years ago, a nearby state beekeeping organization had the fantastic privilege of welcoming Jennifer Berry to speak to a general meeting. Every word which comes out of that woman is food for thought, but part of her discussion of *Varroa* gave me huge pause. She asked (to paraphrase), when we look at Varroa mite infestations, are we always looking at the same mites, with the same virulence or impact on honey bee health? Or are some worse than others? Are practices like loading the majority of North American bees on trailers and packing them into the almond growing areas of California creating an opportunity for an even less balanced parasitic relationship? In the almond groves, it may be possible for an impossibly malevolent strain of mites, which would become extinct in normal circumstances by killing off its hosts, to have such an artificial abundance of potential host colonies that it just skips from one to one in an endless trail of devastation (please pardon the drama, but it's fearful stuff for me).

And then last year, at the same state meeting, Our Illustrious Editor contributed something similar: when we talk about *Varroa*, there is no point in separating them from the viral payload they bring along. The lucky beekeeper who thinks she has survivor stock may just have the mites that carry less Deformed Wing Virus (DWV) or Acute-Kashmir-Israeli complex (AKI). The unlucky one who got wiped out may have fantastic stock but the ill fortune of having hives close enough to rob an apiary that collapsed under *Varroa*/virus pressure.

You see, colonies in cities are not that far apart, either. By my math, my colonies can reach 60+% of downtown Washington, DC in the course of normal foraging, and there are a couple hundred beekeepers (that I know about) in that area. And they represent a lot of different choices and approaches to honey bee management.

Since those talks, a couple of studies have also come along to put some steel in those warnings: Frey & Rosenkranz write about *Varroa* invasion rates in the April 2014 Journal of Economic Entomology. "Varroa invasion" is the phenomenon of mites coming into a hive via drifting or robbing, rather than being produced by the resident population. Colonies in dense neighborhoods had from five to seven times as many invasive mites as those with fewer neighbors. In the experiment, all the hives managed to Winter, but the most infested colonies lost three times as many bees. Looking at this horrible Winter in the MidAtlantic and the approximately 20 days the bees will get before whatever nectar flow we are going to have, I would prefer the colonies with lots of bees at Winter's end. Just saying.

No City Bee Is An Island

Are apicultural decisions community decisions?

Now, here in the city, I am sitting here thinking about my beekeeping neighbors' treatment decisions, wondering what impact their increasingly wobbly colonies might have on my hives' health. There's also the idea that, when I don't stay on top of mite loads or get treatments into place in a timely manner, that the lovely new hives my newbees are trying to start face a pre-built threat from me. I've already heard numerous lectures about how, if I am not part of the survivor stock solution, I am part of the weak-bee problem. Here's a surprise: to my mind it's just not that simple.

I'll put my unshakable faith in survivor stock on the day that we figure out how to select for climate and hygiene and temperament and pesticides and viruses in a single breeding program. Until then, we'll choose the best bees we can, ones which we can manage at the level we are able to manage them, and try to make as many of them locally as we

possibly can. Most of our newbees still get started with packages from hundreds of miles away, bringing that biological payload in and receiving ours. I've seen too many new beekeepers start with a package and a lecture about the evils of *Varroa* treatments, and give away all their stuff the following Spring. That's not my chosen solution for increased urban hive density.

Are alternative approaches a vulnerability?

Then there is the question of other alternatives to typical Langstroth beekeeping that seem to have a hard time surviving here: many of our most devoted, most committed green beekeepers are only interested in Top Bar Hives, though as of yet in this city, successful wintering of a TBH is the exception rather than the rule. That is almost certainly due to a lack of TBH expertise, mentoring and experience as well as the inherent vulnerabilities of any type of honey bee management system (hey, the bees don't build movable frames on their own!) I know, however, in my neighborhood that there are three Top Bar Hives in the hands of relative newbees, and here's hoping that they do not encounter any drastic parasites or diseases on their first trip around the sun. I'm also hoping that one of my Lang monsters does not discover them in late August in a moment of decreased brood rearing and late-season honey stores.

What about impact on other pollinators?

None of which even addresses The Bumblebee Question. During the waning days of Winter, a handful of us discussed hive losses and (non-) treatment decisions in light of yet another study, this one out of the United Kingdom. The February 20, 2014 issue of *Nature* included research by Fürst, McMahon, Osborne, Paxton & Brown which demonstrated that honey bee pathogens including DWV and *Nosema ceranae* are being transmitted from managed colonies to increasingly threatened wild pollinator populations. If we city beekeepers took up apiculture to make an environmental contribution, and we are not only infecting each other but damaging native pollinators, doesn't that provoke a whole new discussion of what risks we are entitled to take in our management decisions?

Throughout these ideas runs a single thread, really, and an obvious one. When we learn beekeeping, we usually memorize rules like "a worker lives about 41 days" and "there is one queen in a colony" and then we learn all the exceptions. It's not all simple rules, it's a complex equilibrium of connections. If you wiggle one strand of the spider web, you get jiggles all over. So it goes with management decisions.

Introducing honey bees into any habitat is a powerful decision, so introducing lots of them into a small area has lots more impact. It's naïve to think that there isn't any downside, though when I drink my coffee and watch those multi-colored Spring pollen packs come in, it is hard to *imagine*.

For my part, keeping honey bees has made me far less a believer in single-strand, big impact solutions, even ideas with obvious power like survivor stock or chemical-free management. Thinking about what the presence of my bees does to both the managed and the wild pollinators around me opens up another complicated but kinda thrilling dimension of trying to contribute to urban habitats, where self-doubt can be a powerful teacher. The best thing may be, however, to keep watching, to keep learning, and to keep evolving, like we ask the bees themselves to do. BC

Toni Burnham keeps bees on rooftops in the Washington, DC area where she lives.

A Honey Bee Tongue & The Licking Cycle

Ian **Stell**

The tongue is vital for food collection for the bee. Plants usually produce their nectar deep in the heart of flowers in spaces which are too narrow for the bees' head to reach. So the bee needs a long thin tongue which it can extend to reach nectar, but which it can also put away again. The tongue is shown in figure 1, it is about 4 mm in length 'at rest'. The hairiness of the tongue gives it a large surface area for nectar to stick to (figure 2).

The tongue (or glossa) is made up of a large number of rings of harder cuticle connected together by membranes. This gives it a great deal of flexibility. Down the centre of the tongue runs an elastic rod known as the glossal rod. This holds the rings together and maintains the tongue's basic shape (figures 3 and 4). A canal down the back of the glossal rod allows saliva to run to the tip of the tongue, for example when liquid is needed to dissolve granulated honey. The rings of the tongue are incomplete at the back. The glossal rod is connected to the back of the rings on either side of this opening by flexible elastic membranes. The space within the tongue is filled with a liquid, haemolymph. The bee is able to vary the pressure within this liquid, using muscles in the base of the mouthparts. This variation in pressure is important in controlling the shape of the tongue. Muscles attached to the base of the glossal rod also have some ability to bend the tongue from side to side.

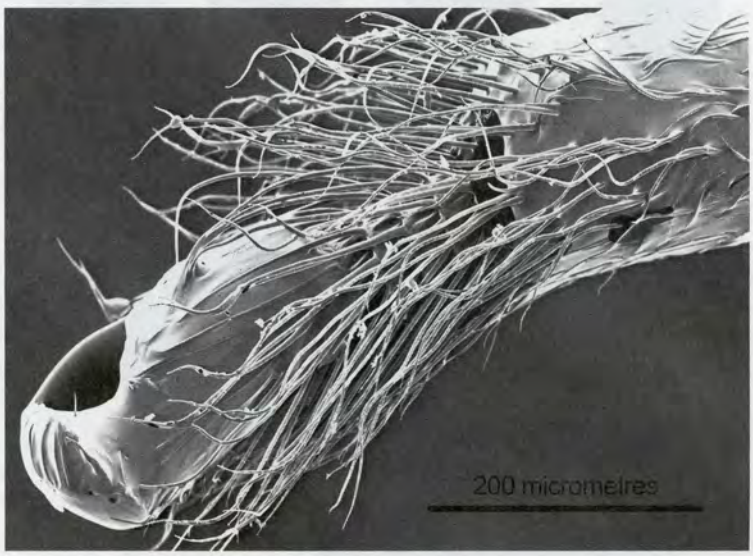
The first action when the bee wants to use the tongue is to un-bend the mouthparts from the fossa behind the mouth and swing them forward, bringing the four components of the feeding tube together over the mouth and supporting them with the mandibles. The tongue lies within the feeding tube (figure 5).

If the bee then raises the pressure of the liquid within the tongue, it starts to stretch, but as it is restricted within the feeding tube the main effect of this stretching is for the tongue to get longer. The resting length of the tongue is about 4 mm, but it can be extended to about 6 mm. If the pressure is reduced, and muscles pull on the glossal rod the tongue can be reduced to about 3 mm so that it shrinks entirely within the feeding tube.

These actions occur repeatedly in what is known as the 'licking cycle' (figure 6). In the first phase of the

Figure 1.

Figure 2.



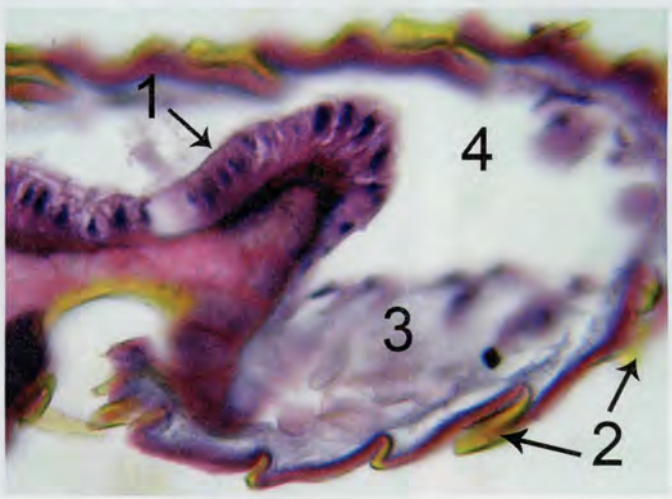


Figure 3.

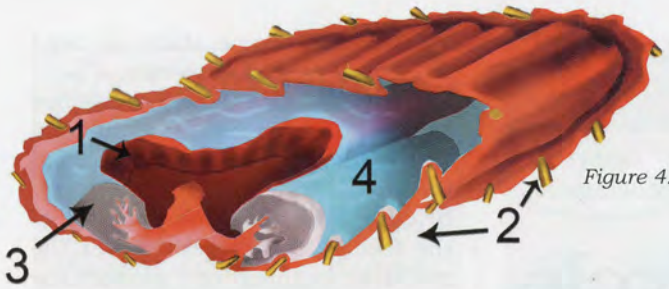


Figure 4.

cycle the tongue is extended to pick up nectar. It is then withdrawn to bring the nectar up within the feeding tube. At this point the dilator muscles around the pharynx in the head expand the pharynx which creates suction. This suction is transmitted down the feeding tube so that nectar on the tongue is drawn up into the pharynx in the second phase of the cycle. The circular muscles around the pharynx then come into operation, squeezing the contents and so pushing the nectar up into the oesophagus and towards the crop. This is the third phase of the cycle, after which the cycle is repeated. Bees typically lick around four times per second.

At times the bee needs to clear the tongue of particles stuck to it, such as pollen. To do this it allows the walls of the feeding tube to relax and move apart so that when the pressure in the haemolymph of the tongue is increased the whole tongue becomes 'fatter' rather than longer. As the tongue gets fatter, the opening in the rings at the back gets wider, the glossal rod moves back towards the gap, and the membranes attaching the rod to the sides of the opening start to stretch. As the haemolymph pressure continues to rise the glossal rod is pushed out of the widened opening and its membranes get stretched out so that the whole tongue gets fatter and fatter until the stretching limit of the membranes is suddenly reached, like a 'snap'. The speed of this sudden enlargement, and its abrupt halt, is so rapid that adhering particles are thrown off briskly.

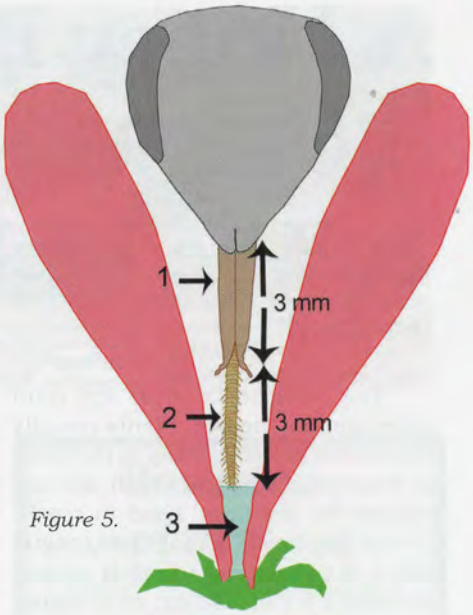


Figure 5.

When not needed the tongue is folded within the other mouthparts, and tucked away in the fossa behind the mouth, where its delicate structure is protected (figure 8). BC

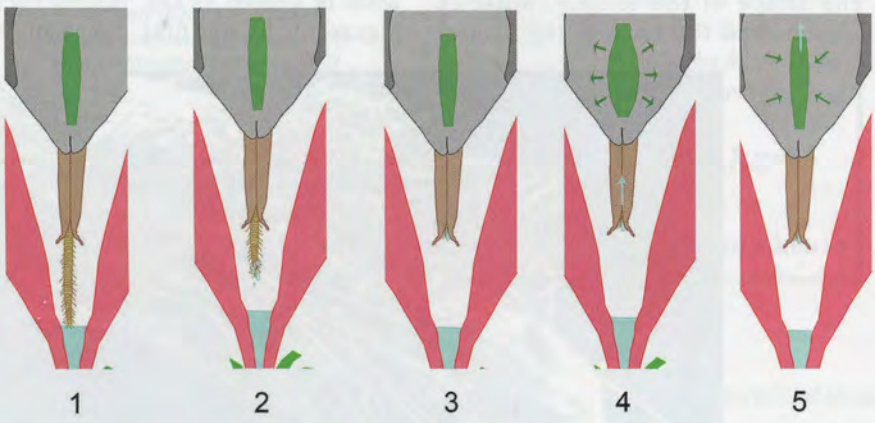


Figure 6.

Figure 7.

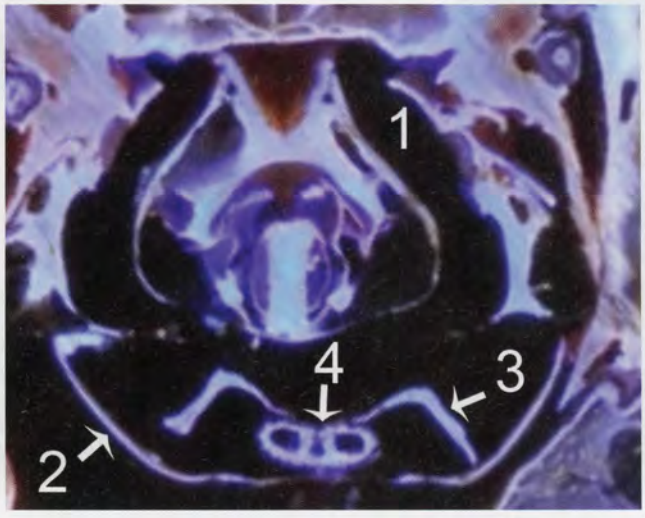


Figure 8.

Ian Stell is the author of Understanding Bee Anatomy, A Full Color Guide.

GLEANINGS

JUNE 2014 • ALL THE NEWS THAT FITS

LOSING PUBLIC LAND

The loss of access to public lands, used by Australian beekeepers for more than a century, is a threat to the future of the country's beekeeping and pollination service industries, a Senate inquiry has been told.

The Australian Honey Bee Industry Council tells the Senate Rural and Regional Affairs and Transport References Committee inquiry into the future of the beekeeping and pollination service industries that beekeeping in Australia relies heavily on access to public lands.

Also known as Crown land, they cover 23% of Australia and include areas set aside for nature conservation. The land is held by the states who set policies on its use.

Pressured by environmental extremists there have been instances where state governments, needing the support of small political parties to stay in power, have barred managed European bees from the areas as a threat to native bees.

The extremists base their argument on the fact the European honey bee (*A. mellifera*) is not native to Australia and was only introduced in the early 19th century.

But the species has spread widely throughout the continent in both managed and feral colonies and the council's submission to the inquiry says the majority of honey produced in Australia comes off public lands.

The council says the public lands also provide an important role in either building up hives for pollination or rejuvenating hives after pollination.

"Many of these areas of public land that are under threat have been used by beekeepers for over 100 years," the council says. "If access was denied to these public lands, the number of bee hives that could be managed in Australia would drop dramatically. This would have a flow on effect to the number of bee hives available for pollination in Australia."

The result would be fewer crops that rely on honey bees for pollination being able to be grown, creating a threat to Australia's food security.

"So while there is currently access in most states to public lands, there needs to be surety given to the beekeeping industry that this will continue otherwise the viability of the beekeeping in Australia is threatened," the council submission says.

The threat of loss of access is also one reason for declining beekeeper numbers in an industry with an aging population. – *Alan Harman*

AFRICAN BEES CONFERENCE

A major international conference focusing on bees and beekeeping is scheduled for Tanzania towards the end of this year.

The 1st Apimondia Symposium on African Bees and Beekeeping will take place Nov. 11 - 16 in the International Conference Centre in Arusha with the theme African bees for a green and golden economy.

Organized by the Tanzanian Ministry of Natural Resource and Tourism with the support of Apimondia, the symposium will seek to present fresh and evidence-based research findings; collect and document stories from beekeeper-based beekeeping practices, conservation and livelihoods; create networks among beekeepers, buyers and service providers through trade exhibitions, and incorporate issues raised by beekeepers into discussions.

It is aimed at everybody in the industry from indigenous people, rural beekeepers, decision makers, traders, researchers, students and representatives from NGOs and the private sector.

The symposium will address seven main topics – issues being raised by African beekeepers; critical view of beekeeping projects; beekeeping and climate change; beekeeping and conservation; policy and organisation concerning apiculture in Africa; quality assurance schemes; and bees and livelihoods.

Organizers say it will provide a forum to small-scale beekeepers to air their views in various ways through scientific presentations, a commercial exhibition and excursions to integrate beekeeping in support of rural livelihoods.

Alan Harman

Display Advertisers

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Executive Publisher – John Root
Associate Publisher, Senior Editor – Kim Flottum, Kim@BeeCulture.com, Ext. 3214
Assistant Editor, Design & Layout – Kathy Summers, Kathy@BeeCulture.com, Ext. 3215
Circulation – Dawn Feagan, Dawn@BeeCulture.com, Ext. 3220
Advertising Manager – Peggy Garnes, Peggy@Beeculture.com, Ext. 3216
Publications Assistant – Amanda DeSimone, Ashaffer@RootCandles.com, Ext. 3255

Contributors

Clarence Collison • James E. Tew • Ann Harman • Kim Lehman • Phil Craft • Larry Connor • Connie Krochmal • Jessica Louque • Jeff Harris • Toni Burnham • Ross Conrad • Jennifer Berry

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BEE CULTURE, The A.I. Root Co.,
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Subscriptions, Book Orders
V800.289.7668, Ext. 3220 • F330.725.5624
www.BeeCulture.com • info@BeeCulture.com

Advertising
800.289.7668, Ext. 3216; Peggy@BeeCulture.com

Cover photo by Elizabeth Donley of Duluth, MN, whose family has grown peonies for five generations and now keeps bees too. They love each other – this is Guardian of the Monastery with an Italian escort.

"Every day's a great day to be alive!" That's what Dave told me when I dropped off bees to pollinate his sweet cherry orchard last March in Grand Junction. I appreciated his optimism. In the Colorado fruit business, you need optimism, or a psychiatrist. Last year Jack Frost came calling at Dave's place. "I got just enough cherries to make a couple of cherry biscuits," Dave quipped.

Driving back into town from the orchard, I got pulled over by the state patrol. I wasn't even on the highway. This was a country road. The good-natured cop said, "Good morning! I noticed you crossed the center line a couple of times, and I was wondering if maybe your dog was distracting you."

Crossed the centerline? What was he talking about? I was just driving down the road, dreaming about honey bees!

My gal Marilyn's blue heeler dog bouncing around in the cab should have made a perfect setup to tell a harmless white lie, but I'm not a good liar, as Marilyn will attest.

"I guess I don't have a reason," I blurted.

"Well, be careful. I'm going to give you a warning," he said. He glanced back at the hand truck, ramp, smokers and hive net in my truck bed. "What do you got in the back of your truck?"

"Bee stuff," I replied. "I just dropped off some hives at an orchard in the Redlands."

The officer's eyes lit up. "My wife wants bees," he said. "But she doesn't really know anything about them."

"Beekeeping can be a little overwhelming at first," I said. I gave him my beekeeper card. "Tell her to call me anytime," I said.

Now I wonder if he pulled me over just to strike up a bee conversation. Because I'm a good driver. I always stay in my lane.

At breakfast at the Slice o' Life Bakery in Palisade, a dozen women chatted at the next table. When I got up to leave, my plate inexplicably jumped out of my hand and flew across the room. It bounced a couple of times before it wobbled noisily to a stop on the floor, unbroken. For an instant, you could have heard a pin drop. One of the women broke the silence. "Oh, my," she said.

I said, "This morning I got pulled over by the highway patrol and didn't get a ticket. I just threw my plate across the floor, and it didn't break. This is shaping up to be a good day."

"You should buy a lottery ticket," another woman said.

I do like the Slice o' Life Bakery. You walk past a native-bee poster on the way in. It reads, "Our Future Flies on the Wings of Pollinators". How could you not love this place!? The diminutive long-time proprietress, Mary, hops around the kitchen on sneakers with exposed three-inch coiled springs in the heels. Seriously! She says they take the stress off her knees.

The cheerful employees apparently spend most of their paycheck at the tattoo parlor. I notice these things, but then I'm a man from another century. If you have a sweet tooth, you could get into trouble at the Slice o' Life. Might I recommend the cherry cheesecake, and a rhubarb pie to go? Or maybe you'll chow down on the sugar cookies cut out like little honey bees.

It's early April as I write this, and my bees are just back from California. This was the first time I ever shipped them to the almonds. They're bustin' out of their boxes! I sent 40, got back 38, all but two full of bees and honey. My concerns about the little darlings coming home riddled with mites proved unfounded. I sugar-shake tested all of the returnees. Over half tested zero or only one mite per 300-bee sample. The high count was seven. I used Mite Away (formic acid) Quick Strips between the supers to

treat all the colonies with two or more mites per sample. I offset the top super forward an inch to give the treated hives extra ventilation, as this stuff can be hard on queens.

Speaking of queens, next week I expect a shipment from California, followed two weeks later by more queens from a different California breeder. I had pretty good luck with these queens last year. I'm using them primarily to make splits and nucs. So I'm using these queens to start new colonies. I'm not replacing perfectly good old queens with untested new ones, even though the experts say you should. But experience taught me that queen replacement can be risky. Lots of things can go wrong. Far too often, the new queens get superseded. This is a big waste of time and hive energy when you're trying to build up colonies strong enough to fill honey supers.

Maybe someday when I'm a better beekeeper, and my success with new queens improves, I'll try re-queening every year . . . maybe.

Ed **Colby**

Cherry Biscuits