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Feb 2014

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Features . . . . . The Rest

Go Gators

Down here in Gatornation everyone loves the University of Florida football team. This mascot loves reading about honey bees ever since the teams started using honey for an energy boost during the games.

Have a great day,

Chappie McChesney
Florida

More About Monsanto

A very enlightening article on Monsanto. I became a stockholder as a result of a spinoff and the company was a good investment. I did not feel the company's products were beneficial to the environment and therefore sold the stock. They play their cards close to the vest and revealed very little in their interviews. It should have been pointed out that their genetically modified corn has been banned in Europe, and in my opinion should be banned in the United States until it is proven safe. As we all know it is difficult to kill a bad insect without killing a good one. This has been true with bug zappers, spraying for mosquitoes or producing a seed with ingredients that are detrimental to insects. Our EPA is not functioning in our best interests although increasing food production cannot be overlooked. Testing of a product cannot be left to the company but must be done by an independent unbiased source.

Bob Ricci

Burning In California

On September 15 of this year, my family and I had gone on a whitewater rafting trip on our 'most local' river, the South Fork of the American River. When I got back to the car that afternoon, I had a voice mail message from one of my bee yard land owners, to call her immediately. Apparently there had been a fire. Betty sounded pretty distraught.

I currently have about 160 colonies in the foothills of the Sierra Nevada. I have 11 yards in the mostly rural environs of the Nevada City/Grass Valley Area. I hope to bring this number up to about 350 next year. The particular yard in question was only started in June of this year, as the result of a phone call from the landowners that 'there aren't any bees around this year'. I only had about six colonies at the time that were looking for a home, so that is all that I brought them.

Of course I called the landowner back as soon as possible. Betty and Chuck are in their 70s, and have about a two acre parcel, surrounded by rolling grass land and oak/pine environs. We had had a very dry Summer up to this point. Apparently her husband Chuck had been mowing on their John Deere ride-on mower, when the blades hit a rock, and the resulting spark caused the start of the fire. Within seven minutes the first fire truck had responded. A bit later two bombers from Cal-Fire were doing their modern miracle. Somehow they kept the fire under control. It could have been very bad, as there are many houses in the area surrounded by bone dry grey pine and live oak. The wooden fence between their property and the neighbors was partially destroyed, and an outbuilding burned, but no other serious losses occurred.

I wasn't able to make it out to the scene until the next day. Upon first inspection I thought I'd lose most of the colonies in the yard. Each one had dozens to hundreds

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of dead bees in front of the hives, and fairly scorched boxes. I looked inside all six boxes. In the worst one was maybe an inch or so of dead bees on the bottom board. The bees seemed a bit more defensive than usual but not excessively so. I was somewhat concerned that all the smoke and excitement would have caused an exodus of bees. Six weeks after the incident, it looks like all colonies will survive. I had trimmed the grass when I first brought the bees out in June, and it hadn't grown much since then.

I believe that because the grass in the yard was fairly short, and there weren't any real fuel sources nearby, that the fire went through the yard very quickly, but without a huge amount of heat (relatively).

When I brought the rental fee honey quarts to Chuck and Betty a few weeks later, we joked about the incident, and wondered if this batch of honey should be declared 'BBQ flavored'.

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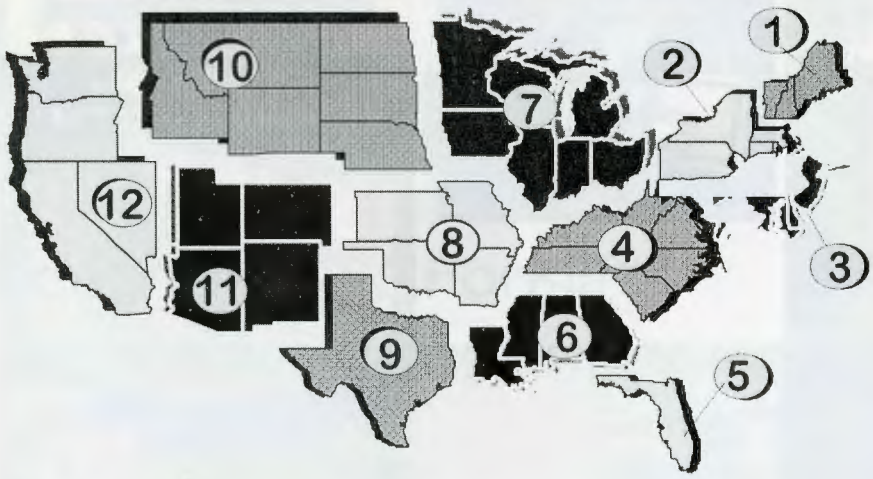
FEBRUARY – REGIONAL HONEY PRICE REPORT



NEW THIS MONTH!

On the right hand side of our Summary Report we've added a new column, labeled simply as $/LB. It is the price per pound of what ever it is in that row. For instance, this month the $/LB for a 60 pound pail of light honey, retail is $3.04, not quite double what it is in a drum. The per pound price of a case of half pounders comes to $6.06. You should be selling more of that, and fewer pails, it seems.

Everything but the Buzz, and even that if we could figure out how to harvest, process and sell it.... that's the feeling of a lot of beekeepers who keep bees for both fun and profit. But how to make money keeping bees when it seems that all you do is put money into that box, and don't seem to get nearly as much out?

Our reporters seem to be making it work, and they're doing it by making and selling everything and anything they can glean from the bees, and the beehive. Our chart lists most of the harvestable products from bees that beekeepers can make, use and sell. And the numbers show the percent of our reporters who are doing just that. We now have four years worth of data and you can see already the slight changes our reporters are making. (We missed this in 2013.)

There's no doubt that producing and selling value added products is one way to go, and for a small scale producer it's probably the best way to go. Using beeswax for candles, ornaments, lotions, potions and creams takes a commodity product and doubles or triples its value. Specialty honeys...cremed, comb and the like sell for more than honey in a jar, so consider those, too when producing your product.

The sideline jobs...producing queens, packages, nucs, pollination, selling supplies of all kinds, and even buying product from other beekeepers and reselling, something like honey stix, isn't a bad idea.

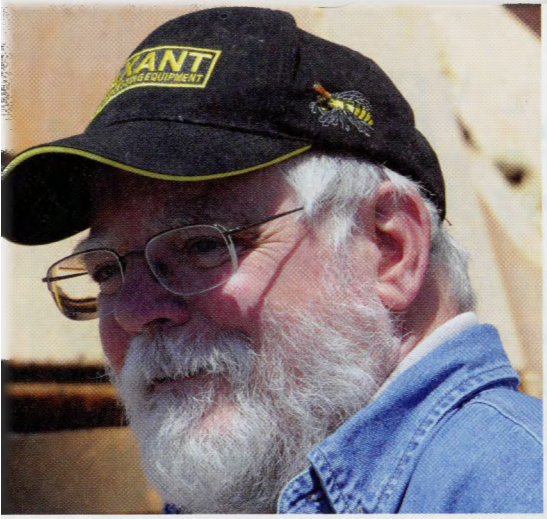
There's more than one way to get the buzz out of your bees, and you don't have to squeeze so hard it hurts the bees in the process.

There are other products, of course. Our reporters were asked – what else? Royal jelly, honeyed popcorn, honey sweetened apple butter, honey candy, candle supplies, bee removal, flavored creamed honey, honey butter, honey mustard and flavored honey.

	Candles	Ornaments	Wax Blocks	Honey Stix	Pollen	Propolis	Bee Supplies	Packages	Queens	Bulk Wax	Lotions	Soap	Creme Honey	Liquid Honey	Comb Honey	Chunk Honey	Nucs	Pollination	Bee Feed	Other
% Reporters Selling																				
2010	28	17	54	28	28	13	20	9	15	48	20	10	35	90	66	38	28	-	-	-
2011	39	20	53	39	35	21	21	10	15	42	19	11	35	90	67	40	26	37	10	18
2012	35	21	53	37	32	15	53	10	22	44	18	13	21	94	62	34	23	32	7	48
2014	32	12	51	30	31	21	55	17	27	42	25	10	29	93	54	42	29	34	8	11

REPORTING REGIONS

	1	2	3	4	5	6	7	8	9	10	11	12	SUMMARY Range	Avg.	$/lb	History Last Month	History Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS																	
55 Gal. Drum, Light	2.19	2.45	2.19	2.00	2.20	2.22	2.30	2.25	1.80	2.25	2.10	2.36	1.74-2.65	2.19	2.19	2.13	1.95
55 Gal. Drum, Ambr	2.09	2.00	2.09	1.92	1.80	2.06	2.23	2.15	1.60	2.09	2.00	2.17	1.55-2.75	2.03	2.03	2.04	1.82
60# Light (retail)	207.50	183.33	170.00	181.60	96.00	188.33	174.67	173.33	150.00	171.00	177.50	225.00	84.00-270.00	182.59	3.04	175.88	165.22
60# Amber (retail)	203.75	172.50	170.00	179.20	96.00	183.33	168.25	162.50	157.50	176.51	166.50	203.75	96.00-255.00	177.52	2.96	175.52	161.11
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS																	
1/2# 24/case	77.62	72.42	52.20	71.13	73.23	60.00	63.38	73.23	73.23	51.84	86.40	98.80	45.60-102.00	72.67	6.06	67.46	67.22
1# 24/case	121.97	110.14	106.00	95.07	132.00	114.10	95.40	99.67	84.00	98.16	104.40	132.50	79.20-168.00	110.18	4.59	101.25	103.25
2# 12/case	110.86	91.75	102.60	85.85	90.00	92.28	85.18	105.00	69.00	97.44	90.00	108.33	69.00-144.00	95.68	3.98	96.81	89.74
12.oz. Plas. 24/cs	106.66	90.40	71.40	78.84	74.40	81.00	72.62	83.93	72.00	74.40	97.80	92.00	48.00-144.00	84.83	4.71	84.93	76.31
5# 6/case	139.26	95.05	100.50	91.50	114.00	120.00	99.65	101.15	84.00	102.30	97.20	122.50	83.10-175.00	106.42	3.55	103.40	98.62
Quarts 12/case	153.00	167.44	117.60	119.85	144.00	111.63	136.08	114.93	117.60	115.32	133.50	112.75	95.00-153.00	124.69	3.46	125.31	115.35
Pints 12/case	80.28	88.48	96.00	82.75	96.00	69.71	89.63	64.30	60.00	81.89	96.80	87.00	48.00-118.80	80.39	4.47	82.72	74.96
RETAIL SHELF PRICES																	
1/2#	4.55	4.33	3.44	4.05	4.22	3.50	3.40	2.19	4.22	3.89	3.99	5.75	2.19-6.75	3.97	7.94	3.78	3.72
12 oz. Plastic	6.25	5.48	4.00	4.48	4.50	5.10	4.28	4.67	4.99	4.34	5.51	6.86	3.39-8.99	4.98	7.53	4.77	4.50
1# Glass/Plastic	6.47	6.47	6.25	6.19	7.25	6.93	5.32	5.91	5.99	6.22	5.91	8.37	3.00-10.00	6.34	6.34	6.22	5.87
2# Glass/Plastic	11.67	10.29	11.96	10.04	11.00	9.96	9.62	8.92	8.50	10.23	9.35	13.00	5.99-16.00	10.44	5.22	10.40	9.85
Pint	8.00	9.98	10.25	7.82	6.95	7.36	8.98	6.55	6.00	8.00	8.19	10.30	4.00-14.50	8.23	5.49	8.50	7.65
Quart	17.40	15.98	16.08	13.57	12.00	12.44	13.45	14.91	16.66	14.24	11.42	17.90	8.00-30.00	14.32	4.77	13.84	12.89
5# Glass/Plastic	26.83	21.94	25.90	23.68	35.00	29.50	21.66	23.50	22.00	20.91	20.94	30.00	14.87-35.00	23.47	4.69	22.84	20.50
1# Cream	9.50	7.48	7.95	7.90	7.31	8.00	6.71	5.99	7.31	6.42	8.75	9.75	4.00-10.00	7.61	7.61	7.59	6.94
1# Cut Comb	9.38	7.00	10.75	8.50	9.64	6.92	9.75	8.00	9.64	10.33	10.75	13.50	4.50-15.00	9.54	9.54	8.85	8.55
Ross Round	12.00	9.95	8.25	6.00	8.18	7.00	9.00	10.00	8.18	4.00	9.25	8.18	4.00-12.00	8.36	6.29	7.59	8.04
Wholesale Wax (Lt)	6.30	4.90	5.67	4.69	3.20	5.34	5.10	6.67	7.00	6.00	3.80	6.19	2.50-10.00	5.39	5.09	5.22	4.64
Wholesale Wax (Dk)	5.17	4.98	5.50	4.44	3.15	4.58	5.14	7.50	5.37	5.37	2.67	4.25	2.00-10.00	4.75	4.75	4.49	4.17
Pollination Fee/Col.	99.00	76.33	97.50	58.60	80.00	65.33	61.33	85.00	91.35	80.00	90.00	107.10	35.00-170.00	80.19	-	77.51	75.28



INNER COVER

Last year's honey crop is predicted to be the worst ever – with reports ranging from 95 to 120 million pounds, even though colony counts are basically steady. That amount of honey is less than a third of what we consume here in a year. The import business should do well, though let's hope at least some of what comes in is legal and paying their fair share duty.

Why the dismal crop last year? First and foremost you can blame the weather. Dry, dry, dry in the west, cool and rainy in the northern Midwest and not very productive in the very southeast – reduce California, the Dakotas and Florida to worse than average and you have a disaster in the making. Throw in Texas, Minnesota, Montana, Georgia crop reductions for the most part and add in some of the Gulf states like last year and there's a national crop failure of epic proportions. That was what was last year.

But that's history. What's next?

I invite you to look at NOAA's temperature prediction maps for the next twelve months here **http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/t.giff** and the drought map for the next three months here **http://www.cpc.ncep.noaa.gov/products/expert_assessment/season_drought.png** it's going to be hot and dry in most of the south this year. Again. In fact, by June it'll be extremely hot from Nevada extending southeast to northern Oklahoma then heading northeast all the way to Maine. Imagine that line, and everyplace south – and that's the whole south, is going to be hotter than usual. The semi-circle from the far northwest down to central Nebraska and up to Michigan will be cool, and wet. Cool and wet or hot and dry everywhere honey gets made in any quantity again this year – it's 2013 all over again.

Look at the NOAA Drought map. That's telling right now is how dry California is and has been. They're something like 12"–15" below normal rainfall, south to north over the past three years. And right now Florida is 6"–9" below normal. That is not good news for colonies already in California for almond pollination, or still trying to build up in Florida. All the good intentions in the world to plant forage for bees out there is going to be stressed to the nth degree when it's water for trees, or water for honey bee forage. Guess who gets a drink and who doesn't.

And now you've been warned. But providing enough good food should not go unheeded I think. It is the third leg in the honey bee health system that always needs attention. (the other two of course are *Varroa* and ag chemicals). Still, there's an element that continues to advocate that feeding bees isn't the natural way to keep bees. That if they can't maintain themselves wherever it is they get put, then they are not worthy of continuing to remain in the local gene pool. The bottom line is – it's not natural for honey bees to have to eat sugar and protein supplements.

Perhaps there is some truth in that. Constantly supporting a lazy, prima-donna bunch of bees that can't take care of themselves – can't feed themselves, can't handle *Varroa*, can't overwinter in a manmade box – wait a minute – is overwintering in a manmade box natural? And is putting bees in the place you live, no matter where that place is if it isn't Africa, natural?

Of course not. Nothing we do with bees is natural. Bees live in cavities in the wild. They don't live in congregations of several to hundreds of colonies all within a stone's throw of each other, over populating a location and starving themselves out of existence. They don't produce hundreds of pounds of honey each season in an artificially huge nest, they need to swarm on a whim because life is a fleeting luxury and reproduction is absolutely required for existence of the species, they are fierce in defense of their nest, they are quick to abscond when the environment turns on them, and they are not a domestic animal. Nothing we do with bees is natural. For them.

So why would we choose to be 'natural' with bees for some things but not other things? Putting them in a box right off screws things up. Shaking packages is way not normal. Moving bees to a monoculture by the millions is not natural. Medicating them to keep them alive is not natural. But not feeding them is?

I contend that there is nothing at all natural about keeping bees. The minute we do anything at all in the form of management means all bets are off and to argue otherwise is not in the best interests of the bees we keep in boxes, no matter the size or shape of the box. We changed their world. We moved them. We introduced them to pests and diseases not previously in their world. We put them in environments not designed to support honey bees, and then to make things worse we put them on a truck and change their environment and expect them to adapt – this week.

No, we changed the rules when we put bees in boxes and we didn't ask them, or anybody, if that was OK. You can leave it at that – live or die girls. I don't care. Or, you can, wisely, support them so they remain healthy, fed and protected. We do it for dairy and beef cattle, swine, sheep, goldfish, caged birds, certainly our pets, chickens and fowl of all kinds. In fact, bees are the only life force in our lives we do not regulate care for.

Actually, the tomatoes in your garden this summer will get better care than the 'natural' lives of some bees. They get transplanted with care, protected from pests and diseases and weeds, fed, covered from frost, and displayed with pride. But feed a bee?

And is a three year drought 'natural'? Or is two years of lower than normal temperatures, or more than normal rainfall natural? No. So

All Natural.

what happens when things get back to normal?

I certainly urge you to carefully work to select and produce bees that are adapted to where you are so they can thrive in your location. But when it doesn't rain, or it rains too much, or you bake for a whole summer, or freeze beyond belief in the winter, and in the end there simply isn't enough food in the local environment to support the colonies under your care, you have a responsibility to maintain the health of those colonies. Just like your pets, your livestock and your other animals. Yes, strive for bees that do well when everything is normal, but don't abandon them when it isn't. In the end, because of our initial interference, without continuing interference, bees die and the saying quickly becomes, the only 'Natural' bee is a dead bee.

The FDA has pretty much said that putting "Natural" on a food label is basically meaningless. They're even considering allowing GMO foods to have the same label . . . Natural. I'm making no judgment on GMO's here – but if not feeding bees is as natural as a genetically modified soybean, corn, cotton or sugar beet plant – then you have put yourself in a place you might not want to be.

•

Do you ever use the information on our Regional Honey Price Report page? The numbers presented there are pretty good data about what things are selling for in the various regions. And there are regional differences. There's also seasonal differences within most regions, and there certainly are differences between some commodities between regions. And though not perfect, the National Honey Board is confident enough in our figures to use them as a measure of honey prices on their web page.

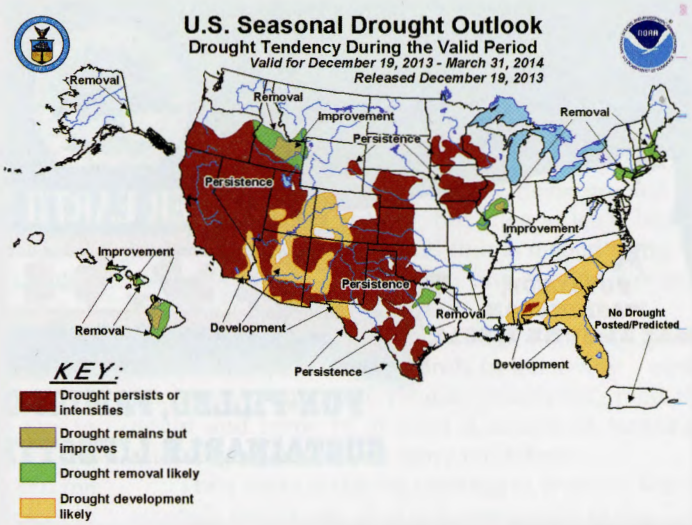
We have well over 100 reporters in the field who send us these numbers every month, and also fill out the survey information for each report. Some of those surveys are a lot of work so we hope you appreciate their efforts. They don't get paid very much.

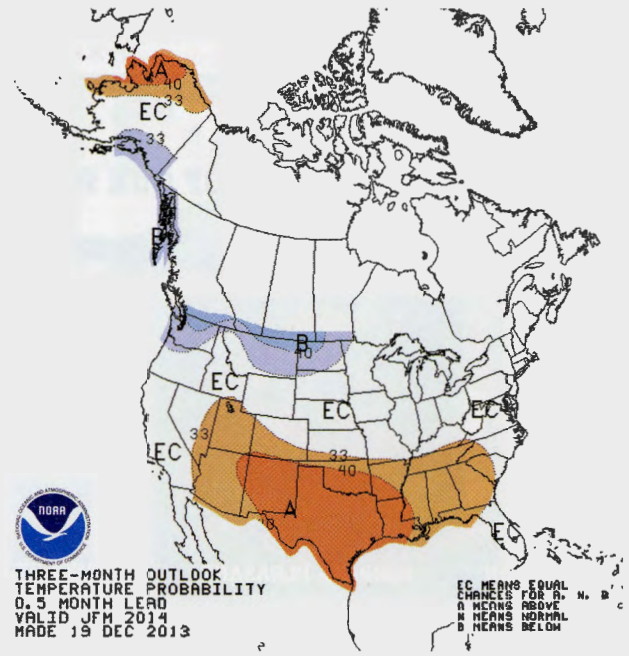
And, for the most part, most of those surveys have been going on for some time, so you have a window to what's changing over time. Too often you get a snapshot in time, but nothing historical to compare it to.This month is a good example. What do people sell that they make from their bees is the theme, and how many are selling that particular product. One good example of change over time is raising and selling queens. The number of people raising and selling queens has doubled in the past five years, obviously a good example of folks taking advantage of a need and filling it. Other products remain pretty steady though, like pollen...about a third sell pollen, and the same number, but not the same people sell candles every year. What do you sell, but more importantly, what could you be selling?

New this month, however, is the $/lb column. Take a look, close to the right hand side of the graph. It's easy to see how much a pound of honey in a barrel is selling for on the chart, but not so easy when you look at a case of 12 ounce bears at wholesale, or a quart at retail.

It you take an overview, wholesale honey is selling for about $3.75 a pound, and retail for $6.00, about a 38% markup. If honey was like other products, which, if made for $1, sold wholesale for $2, and then retail $4...well, I guess we're not like most other products.

So. How much are you selling a pound of honey for? Does that pay for the container, the label, the investment, your time, and what else you could be doing? Think about that. Do the math. We hope our new information will help you decide.





It's Summers Time

2014

As I write this it is just a few days into January, 2014 and it is 12°F outside, but the sun is shining and the snow we got yesterday is starting to melt. However, next week it is anticipated that Northeast Ohio will have temperatures colder than we have had since 1999 – Tuesday a high of -2°. Now there are some of you – those farther north – that are thinking just suck it up, it's -20° where I live. And then there are those that live out west that are thinking I would die in that kind of cold.

I am the youngest of four siblings and two live in California – one southern and one northern – and the third lives in Baton Rouge, Louisiana. They all called me yesterday to make sure we're OK and not going to freeze to death. They are all in that group that can't imagine 10°F or lower. They do this routinely, call to make sure we're OK. It's actually comforting to know that they are thinking about us. However, my brother that lives in southern California called Christmas Eve to tell me it was 85° and he was taking the dogs for a walk. He enjoys doing that – calling just to let us know how warm it is where he lives.

Did you get your 2014 *Bee Culture* calendar? Thank you to all who submitted photos for our contest. We had over 1,000 photos to choose from. It was tough. 'Bees on Flowers' are always a favorite with our readers, always a favorite for cover pictures – so pay attention to the upcoming covers if you didn't get in the calendar. One of your photos may end up on a future cover. Our newsstand broker tells us those covers are the best sellers. And John Root has always liked 'Bees on Flowers' for our covers.

The chickens are comfortable for now. We put a thermometer in the coop and last night when it was 12° outside, it was right about 30° in there. They were all cozied up next to each other and seemed quite happy. We have warming lights in there and bales of straw up against the walls to block those drafts. It's really not too bad in there. We have several friends who don't really do anything extra for their girls in the Winter – no warming lights, no heated water, no light at all – they're just on their own. And I guess they do OK. I am a little concerned about the -10° that it is supposed to plummet to next week. I'll be keeping a close eye on them.

We're still at 11 chickens and the egg laying is going OK, depending on which one of us you ask. We're getting an average of about five a day. Not bad for the middle of Winter and chickens that are approaching two years old.

The plan for 2014 is to incorporate some number of young chicks into our flock. We haven't decided how many more we think we can handle yet. But I'm hooked on chickens now. I think I will always want to have them. They really are loads of fun.

It's going to be the typical busy year for us here at *Bee Culture*. In January we start our Beginning Beekeeper classes. Folks are signing up now. The numbers seem a little down this year from the past couple of years, but there is still time, so we'll see how that goes. Kim has done this every Spring for more than 20 years now. We haven't kept very good records, but that's several hundred folks that have come through these doors and learned about beekeeping over the years. Some never go past the class – never actually get bees, but they at least have a bit of knowledge about them and that is a good thing. We have some long time members in our Medina County group that started in Kim's class.

The classes continue through February giving those new beekeepers all of March to get ready – order their packages or nucs, purchase equipment, read the book again and come to at least a couple of meetings. This should give them a bit more confidence.

Then there is the big meeting in Wooster March 1. We strongly encourage all of our new people to the Tri County one-day meeting. There will be close to 1,000 people there. Every known bee supply company will be a vendor there. They offer several workshops for beginners and talks for those of us with more experience. If you haven't been and you're within driving distance I urge you to come. This meeting sort of gets everything going here in Ohio for the Spring. It gets everybody fired up about the bees.

In April we're off to the Mother Earth News Fair in Asheville, NC. This is a new site for them this year. There will be four opportunities to experience this amazing event – Asheville, NC; Seven Springs, PA; Kansas City, KS; and Puyallup, WA. Check their website, check the ad in this issue. We'll also be at the one in Seven Springs in October. Hope to see some of you there. Please stop by our booth and say hello. Kim is also speaking at both events.

Then comes Summer and we all know what that's like. Between the Summer meetings, getting the magazine out on time each month, there's the garden and the mowing and oh yeah, the bees. Isn't it grand!

I hope you all have gotten your first few seed catalogs and had time to leaf through them. We've also gotten our list of trees and shrubs that the Water Conservation folks sell around here. Every year we over-estimate how much we can handle, but it's fun trying to make it all happen.

Each thing we do, each meeting we go to, each time we give a talk or teach a class, the hope is it helps us get better at our real job. That is getting you the most information we can each month. Our main goal is to help you be better beekeepers – keep those bees alive. But we also sometimes bring you controversial information to make you think, to get you talking to other beekeepers and reading and investigating what's going on in the world of bees and agriculture and science.

It's already month two of 2014, so here's hoping that you're making plans to increase your honey crop, get more bees, have a bigger garden, get some chickens and who knows, maybe a goat. Enjoy the year, it will go by fast.

Happy Summers

Winter Reading and What's New –

Wisdom For Beekeepers. 500 Tips For Successful Beekeeping. James E. Tew. 6.5" x 8.5". Published by Quid Publishing, UK, distributed in US by Taunton Publishing. 288 pgs. Hardcover. Decorative color art. ISBN 978-1-62113-761-0. $20.00 including domestic post from *Bee Culture's* Book Store, and other outlets.

Jim Tew found something to do when he retired from Ohio State a while ago. Actually, he's been pretty busy with his ongoing Extension work in Alabama, working his bees, keeping his grandchildren busy, and spending more time with his family. And writing this book.

You are going to love this book. I knew that Jim was writing this, the type of content and the style – the Tips approach, but I hadn't looked at or read even a small part of it until he handed me a published copy. There are 10 'chapters', and they kind of follow a typical beekeeping book route. Getting started and the equipment you'll need, but then it shifts into high gear with a chapter on pollination, moving bees at night, and dealing with pollination in your garden. Then, some biology, then management, getting bees, ailments, the beekeeping year, all about honey and then byproducts.

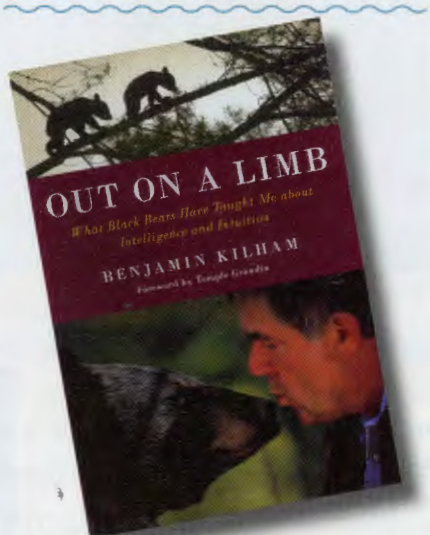
What isn't obvious is that each of these chapters has its own order, with some of the tips aimed at those who don't yet have a clue, to those who thought they knew it all, and now know they didn't. From beginner to advanced in each – an interesting way to present the information.

This makes for an interesting read however. You can pick it up and read a few tips, put it down and come back and start somewhere else. Each tip is a single line . . . Keep returning bees from drifting to the wrong colony, for instance, and then there's a 100 – 200 word explanation on just how to do that. Straight and to the point.

There's a little humor, but the publisher kept Jim on the straight and narrow mostly, and he spends enough time explaining why information in some of the older books was right, but now is wrong. That's a real strong point in my opinion. Another strength of this is that some points are repeated again and again...a similar tip with a similar explanation, but never the same, and always with additional information. Water for bees, for instance, is looked at five or six times, each a bit different, but each with emphasis on importance.

This is a good read, and I'm glad Jim is writing for us. And for you. I guess we'll keep him for a bit yet.

Kim Flottum



Out On A Limb. What Black Bears Taught Me About Intelligence and Intuition. Benjamin Kilham. Published by Chelsea Green Publishing. ISBN 978-1-60358-390-9. 6" x 9", 244 pgs. Center color section. Hard cover. $24.99.

For many people reading this review the only good bear is a dead bear because you have been on the receiving end when your bees had a nocturnal black bear visit. And, with black bear populations increasing everywhere, the chances of a bear and your beeyard encounter increase every year.

Others have a natural curiosity about this omnivore honey bee predator, not because they have had to clean up a beeyard, but because this is one interesting creature. No doubt about it. I fall into that category. Curious.

The author of this book came to write it in a decidedly unique way. He is dyslexic. As a result school was difficult, but he did get a bachelor's degree, but more, though worthy, seemed more difficult than necessary. But his disability made him learn to view the world in a very different way than you and I. It had to be based much more on observation and intuition and experience than referencing a book for background. This, as it turns out was extremely beneficial because black bears, it turns out, are pretty smart creatures, but they, too don't have the luxury of referring to a reference. They have to learn, and they have to know, and they have to use that information to survive.

But it turns out they have emotions, are altruistic, plan for the future, make child rearing decisions that are based on choices other than family, recognize themselves in a mirror, reward and punish members of their family and other bears, and easily develop relationships with other bears, and even humans.

Ben got started in this by raising abandoned cubs. And over the years he and his wife have raised a lot of them. A cub raised by a human considers that human its mother, for life. This opens a lot of doors for opportunity to learn about how a bear learns, lives, eats, matures, raises children, relates to other bears, and other humans and all the rest. And with many bears that consider Ben mom, much has been learned about them that otherwise probably never would have – certainly not in a zoo.

You want to know about bears, Ben will teach you. But still, use an electric fence. Your bees will appreciate the effort.

Kim Flottum

Herman Danenhower and Betterbee are proud to announce that the Hogg Halfcomb is available again in cassettes and supers for eight and 10 frame hives. This exciting product is a unique comb honey producing system that features clear styrene trays with the hexagon embossed bases coated with pure unbleached beeswax. The bees produce beautiful half-combs with much less wax than other forms of comb honey because there is no central wax midrib. Trays fit in modified comb honey supers and come in preassembled superpacks containing 40 trays for 10 frame equipment and 32 trays for eight frame hives. Fully assembled supers with cassettes are also available. Assembled supers and superpacks will be available from Betterbee. Large superpack orders can be placed directly from Herman's Honeycomb. More details are available at **betterbee.com**. Photos, video, and finished sections are available from **hermanshoney.com**.

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Honey bee field exposures -TANK MIXES - beyond EPA's scope

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Photo Bee Culture magazine

2013 bee kill in almond orchard from tank mix of fertilizer, herbicide, spray oil

A Closer Look

NATURAL QUEEN REPLACEMENT

Clarence **Collison**

Honey bee colonies are monogynous (having one functioning queen in a colony) for the vast majority of their life histories.

Honey bees raise queens under three circumstances: emergency queen replacement (when the queen is removed, accidently lost or dies suddenly), supersedure (when the queen is old, or otherwise unacceptable) and in preparation for swarming, when the colony produces queen cells before the old queen leaves with the primary swarm. In each of these situations there are typical characteristics in the number and location of queen cells reared. The highest quality queens are produced under the supersedure or swarming impulse and poorest queens during the emergency impulse. This basic difference in quality is believed to be related to the ages of larvae that are selected as emergency replacements and their nutrition during development.

Honey bee colonies are monogynous (having one functioning queen in a colony) for the vast majority of their life histories. However, colonies raise multiple queens to create a state of temporary polygyny during short-lived phases of their life cycle which ultimately result in queen replacement. Temporary polygyny almost always occurs during supersedure and emergency queen rearing, and frequently occurs at the conclusion of swarming. Nonetheless, the natural requeening process encompasses two discrete stages: 1) queen rearing, to create temporary polygyny, and 2) polygyny reduction, to reestablish monogyny through queen competition (Hatch et al.1999).

Nearly all colonies possess queen cell cups throughout the period of the year when queen rearing is likely to occur, but only a small proportion are ever used to rear queens (Free 1987). In fact the formation of queen cups appears to be a normal part of colony development and does not necessarily indicate that any occupied queen cells will be present subsequently (Simpson 1959, Allen 1965, Caron 1979).

The production of queen cells is normally the first noticeable step in preparation for queen supersedure and for swarming. Gary and Morse (1962) found that the pattern of queen replacement in colonies was extremely variable. They found that neither swarming nor supersedure necessarily followed maturation of queen cells. One or more queens may be reared and rejected before swarming or supersedure occurs, if it does at all.

"Nearly all colonies possess queen cell cups throughout the period of the year when queen rearing is likely to occur, but only a small proportion are ever used to rear queens."

Emergency queen cell production has been extensively monitored in honey bee colonies following the removal of the mother queen (Fell and Morse 1984, Hatch et al. 1999, Tofilski and Czekonska 2004). Fell and Morse (1984) dequeened 13 colonies and followed their progress on a daily basis until after queen emergence. Observations were made on the number of queen cells, the temporal sequence of queen cell construction, cell location within the brood nest, the age of larvae selected for queen rearing, mortality of immature queens, and the scenting behavior of workers in queenless colonies. Queen loss was detected within six to 12 hours and was first indicated by an increase in scenting behavior (on colony disturbance) and queen cup construction. The number of scenting workers reached a peak in 12-24 hours and then declined, as queen cell numbers increased. The time of queen cell initiation varied from 12-48 hours in different colonies (Fell and Morse 1984). The rate at which new queen cells were started after queen loss was high for two to four days, but then declined although new queen cells were started as late as eight or nine days after queen removal. The number of cells produced by a colony usually peaked by the third or fourth day and then leveled off. Slight declines in total cell number often occurred because of cell mortality. The number of queen cells started by colonies varied from 11-49 with a mean of 20.4; cell mortality averaged 39.1%.

Emergency queen cells were usually started over worker larvae less than two days of age (64.7%), but cells were built over three (25.3%) and four (10%) day old larvae. Only 2 of 268 cells (0.8%) were started over eggs; one survived and developed into a drone larva. In six colonies emergency queen cells were started over drone larvae but these were destroyed immediately before or after capping. The overall rate for queen cell construction over drone larvae was 9.3%. Queen cells were well distributed throughout the brood nest but placement was biased toward the bottom of the frames and away from the entrance (Fell and Morse 1984).

Hatch et al. (1999) removed the queens from eight colonies to stimulate emergency situations and observed what happened in the colonies and the quality of the new queens that were reared. They found that when a queen is lost or removed, the majority of emergency queen cell construction was initiated within 24 hours. Additional queen cells were built for up to two days following her removal but no other queen cells were started on or after the third day. The colonies differed significantly both in the number of queen cells they built and in the number of queens that emerged. The number of queen cells capped per colony ranged from six to 56 with a mean of 27.1 and the number of queens that emerged in each colony ranged from three to 20 with a mean of 11.4. A total of 217 queen cells were capped in the eight colonies, but only 91 queens (41.9%) emerged. The remainder of the cells were either torn down by worker bees (53.0%) or the queens did not emerge from them (5.1%).

In four honey bee colonies, queens were isolated on empty combs for eight consecutive days, so that in every colony there were eight combs containing brood of known age (Tofilski and Czekonska 2004). Afterwards, the colonies were dequeened and the process of emergency queen rearing was observed. The average interval from egg laying to queen cell capping was 8.8 days and ranged from seven to 12 days. The average interval from queen cell capping to queen emergence was 7.2 days and ranged from five to eight days. The whole development time from egg laying to queen emergence was 15.7 days, ranging from 14 to 18 days. The age of brood at the moment of dequeening positively correlated with both time of capping and total queen development time. The average age of brood (at the time of dequeening) around which queen cells were built was 3.0 days. However, higher proportions of queen cells with younger larvae were destroyed; in effect, the age of brood at dequeening from which queens emerged was 3.4 days.

Hatch et al. (1999) found there was a highly significant effect of position on queen rearing. No significant difference was found between upper and lower brood chambers with respect to the number of capped queen cells. Most of the queen cells (46.1%) were found on frames located in the central three frames of both brood chambers. The further a queen cell was located from the center of the nest, the more likely it was to be torn down. Only 41.0% of the capped queen cells on frames in the 'center' and 'near center' frames were torn down compared to 71.1% of the cells on the more peripheral frames.

Queens were reared from eggs of all ages and from larvae that were up to two days old on the day the queen was removed. The majority of the queen cells (70%) were from eggs and half of these were from eggs 48 to 72 hours old. Queens produced from these older eggs were significantly heavier and had longer thoraces than did those reared from younger eggs or larvae. There was no significant relationship between queen size and the number of ovarioles the queen possessed in this test (Hatch et al. 1999).

The age of the brood used for rearing queens has a major impact on the quality of the resulting queens (Jakub et al. 2011). The best queens are reared from eggs. The aim of this experiment was to investigate whether the age of the eggs affects their acceptance by the rearing colonies. In four series, eggs at the age of 0-18, 24-42 and 48-66 hours were introduced to five colonies. All colonies in the first and third series had open brood and were one day without queens. The second and fourth series had no open brood and were ten days without queens. Out of the 720 introduced eggs, the bees accepted 44.4% for queen rearing. No significant differences were detected between the total number of eggs accepted by the colonies with open brood-one day after the queens had been removed (43.6%) and colonies without open brood-ten days after the queens had been removed (45.3%). However, significant differences

Define Polygyny -
1) an island near Hawaii.
2) A group of doctors
3) Plastic wrap used for vegetables
4) Having multiple queens

were detected between the acceptances of eggs of different ages. The age of the eggs did not significantly influence their acceptance by rearing colonies with open brood-one day after the queens had been removed. However, the bees significantly accepted the lowest percentage of eggs (25%) after the youngest eggs, 0-18 hours old were introduced, and the bees accepted the highest percentage of eggs (64.2%) after the oldest, 48-66 hours old were introduced into colonies without open brood – 10 days after queen removal.

The probability that an egg in a queen cell cup will be reared as a potential queen depends on its location within the rearing colony. Eggs in cells near the center of the broodnest are reared more frequently than those on the edges, and those near the top of the frame more frequently than those lower down. The importance of this effect is greater when bees are more selective among potential queens; when larvae are grafted into queen-cell cups acceptance is greater than when eggs are used. There is a non-significant tendency for cells near the center to be accepted in preference to those near the edges (Visscher 1986).

The reproductive potential of a queen is inversely proportional to the age at which she is initially reared (Tarpy et al. 2000). Woyke (1971) raised queens from eggs and newly hatched larvae which developed normally, whereas, queens reared from three-day-old worker larvae were reduced in size and ovariole number. Selection could therefore be acting on colonies to rear more fecund queens by raising them from the youngest possible brood source. It has been shown that workers raise queens from worker larvae of different ages. In addition to the variation in quality among potential replacement queens, the difference in age among newly raised queens can be as large

as five days (Hatch et al. 1999, Fell and Morse 1984, Fletcher and Tribe 1977). The age difference of only a few days among queens can be of great importance to a colony for several reasons: 1) the average development time of a queen is 16 days; 2) it can take the surviving queen up to three weeks or more to mate and begin oviposition; 3) it takes 21 days to rear new workers from egg to adult; and 4) the life span of adult workers is approximately six weeks during the active season. As a result, colony populations can decline dramatically during queen replacement and for several weeks thereafter (Tarpy et al. 2000). Colonies would therefore be expected to be under selective pressure to retain the oldest queen from among those available during temporary polygyny in order to minimize the broodless period. Because older queens are raised from older worker larvae, there may exist a trade-off between selection on queen age (to minimize the broodless period) and queen quality (to maximize the reproductive potential of the replacement queen). If queen age has been under selection, Taryp et al. (2000) predicted that workers would rear more queens earlier during the queenless period rather than later, and that older queens would have a fighting advantage over their younger sisters. If selection has also been acting on queen quality, they predicted that workers would not rear as many queens from older larvae, and that high-quality queens would have a significant advantage during polygyny reduction.

Tarpy et al. (2000) clearly demonstrated that queen replacement is a nonrandom process. The effect of grafting date on queen rearing was highly significant, such that workers reared many more queens from newly hatched larvae earlier in the queenless period rather than later. This effect is supported by Fell and Morse (1984) and Hatch et al. (1999), who found that all emergency queen cells are constructed within the first 48 hours after queen loss, most likely triggered by the absence of queen mandibular pheromone (Melathopoulos et al. 1996). Both larval age and time since queen loss are important factors that influence the requeening process (Tarpy et al. 2000). 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.

TANK MIX TROUBLES

Susan **Kegley**

Pesticide label restrictions based on tests of a single pesticide active ingredient are not likely to provide sufficient protection for honey bees from the effects of tank mixtures.

Pesticide applications are always something beekeepers would like their bees to avoid, but there is a general assumption that if you keep your bees clear of insecticide applications, you're home free. This assumption is backed up by the fact that laboratory studies tell us that most herbicides and fungicides are not acutely toxic to bees. However, several recent bee kill incidents have involved application of a "tank mix" of several herbicides or a fungicide and an herbicide that was not so benign.

The "tank mix" is an agricultural practice where multiple pesticide products are loaded into the spray tank at once. This could be a fungicide and an insecticide, several different herbicides, or a mix of an insecticide and an insect growth regulator. It almost always includes spray adjuvants that are added to help the pesticide's active ingredients penetrate leaf surfaces, act as de-foaming agents, reduce drift, or ensure that the mixture of dissimilar chemicals and the carrier (usually water or diesel oil) all stay in solution.

Tank mixing has advantages for the farmer, allowing a single pass with the tractor where two or more would be required otherwise, and plays a role in resistance management of pests. To the farmer, it represents a savings in energy and time and potentially better pest control, but for the beekeeper, it could spell disaster.

From a chemist's point of view, the tank mix is reminiscent of doing experiments in the organic chemistry lab to find out what happens when you mix chemical X with chemical Y and some solvent. The end product? Well, that was the puzzle to be figured out. Pesticide chemicals can and do react with each other, creating new compounds that we know nothing about, in terms of toxicity or efficacy against the target pest. In fact, little is known about mixtures of pesticides even if they don't react with each other – U.S. EPA doesn't require toxicity testing of mixtures, even for the mixtures of active ingredients contained in a single product. U.S. EPA currently only evaluates the toxicity of pesticides one at a time, which can produce an inaccurate estimate of anticipated adverse effects on bees. Pesticide label restrictions based on tests of a single pesticide active ingredient are not likely to provide sufficient protection for honey bees from the effects of tank mixtures.

Dead bees. (photo by Jeff Anderson)

Tank mixes can be particularly deadly to bees for several reasons:

Additive effects If the bee is exposed to two chemicals that act on the same biological pathway, the toxicity of the mixture is the sum of the toxicity of each component. For pesticides that react with each other to form a new compound, the toxicity of the mixture may actually be less than the sum of the toxicity of the component pesticides.

Synergistic effects For certain mixtures of chemicals, the toxicity is greater than the sum of the toxicity of the two chemicals alone. For example, a new study of mixture toxicity to aquatic insects (which are very much like bees in their susceptibility to pesticides) show that the toxicity of a chlorpyrifos/ imidacloprid mixture is 10-12 times greater than that predicted by simple additive toxicity. The fungicide propiconazole may increase the toxicity of the insecticide lambda-cyhalothrin to bees. In fact, tank mixes can be used to accentuate the effectiveness of a pesticide active ingredient. Synergistic effects can be caused by the activation of enzyme systems that metabolize the chemicals to produce highly toxic intermediates, by the deactivation of enzymes that metabolize the chemicals to low-toxicity degradation products, or by the formation of a new compound that is more toxic than the two starting pesticides.

Surfactant effects Surfactants are like soap – they act as emulsifiers, allowing dissimilar substances like oils and water-soluble chemicals to mix. They also enhance the penetration of the pesticide into the bodies of insects, increasing the rate of absorption of the active ingredient in exposed insects. While most surfactants aren't acutely toxic to bees, recent work out of the Mullin and Frazier labs at Penn State's Entomology Department shows that doses of organosilicone surfactants of 20 micrograms per bee impair the proboscis extension

reflex in honey bees, an essential behavior bees use to extract nectar from plants.

One more cause for concern is that tank mixing is not well-regulated. Occasionally, there is information on a pesticide label that indicates what products can be mixed or should not be mixed, but not often. Considering the fact that there are 16,667 currently registered pesticides on the market, about 7,000 of which are agricultural use products, the lack of definitive label guidance from EPA or manufacturers on tank mixing is surprising.

The Departments of Agriculture in Wisconsin and Oregon2 recommend against tank mixing because of potential adverse effects, but some extension offices actually encourage it. The Illinois Pesticide Applicator Training Manual (IPATM) has an entire chapter on tank mixes and promotes the practice, noting:

The correct tank mix of two or more pesticides may save time and labor and may reduce equipment and application costs. In addition, such a mixture might also control a range of pests or enhance the control of one or a few pests.

Pesticide manufacturers also recommend tank mixing as a general strategy for resistance management. Example label language includes statements like the following:

Because resistance development cannot be predicted, the use of this product should conform to resistance management strategies established for the crop and use area. Such strategies may include rotating and/or tank mixing with products having different modes of action.

The IPATM also provides guidance on how to test for product compatibility in tank mixes, instructing the applicator to mix products together in a jar to watch for any reactions or adverse effects. Really? If tank mixes are to be part of agricultural practices, it seems that compatibility testing would be better done in the lab by the manufacturer, with clear directions on the label as to what products can and cannot be safely mixed. EPA could also improve the situation by requiring the pesticide manufacturers to conduct toxicity testing of mixtures for pollinators, humans, and wildlife. This information would provide a way for growers to make informed application decisions that would better protect honey bees and other wildlife. In the meantime, it's worth keeping your bees away from all pesticide applications as much as possible. BC

Photo by U.S. EPA.

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Dan O'Hanlon
BEE
CROSSING
PLAN BEE!

In September, a group of people interested in saving pollinators met in Charleston, West Virginia. The Native Pollinators in Agriculture co-sponsored the meeting of key policymakers with the West Virginia Conservation Agency and the Capitol Conservation Agency to discuss how we could best help all pollinators including honey bees.

Our new Agriculture Commissioner had asked beekeeping leaders how we might double the amount of honey produced here. We told him we needed more forage for bees and so he helped arrange this conference to achieve that goal.

Several important commitments came from this meeting, all aimed at increasing the amount of quality forage to replace disappearing farms and fields. The first was a pilot project to stop mowing along state and federal highways and plant permanent forage for pollinators instead. The Highway Department will keep track of how much money they save by not mowing these acres every two weeks. They think the savings will more than pay for the right flower seeds, flowering shrubs and trees such as sweet clover, vitex and linden trees.

The second commitment was from the West Virginia Coal Association to reclaim mine land with the same mix of pollinator-friendly trees, shrubs and flowers. Dr. Tammy Horn showed how successful this can be in Eastern Kentucky and the coal companies are eager to expand this into West Virginia. Our Ag Commissioner has made a promise to help beekeepers who put hives on this reclaimed land to purchase good bear fencing so that we are not just creating fatter bears!

We are very excited to start these initiatives in the Spring and then move it out all across West Virginia. We hope this will be a big part of the solution to the diminishing fields of trees and flowers so necessary to the success of our bees and hives. BC

IT'S NOT EASY BEING GREEN

Third of Three Parts

Mike **Johnston** & Mike **Griggs**

Foresters and forest health managers are watching some of our most important forest resources change or outright disappear.

(Bees and Trees Face Similar Challenges from Exotic Diseases and Strange Weather but Respond to the Challenges Differently)

The last of three articles comparing how bees and trees respond to disease.

Bees and Trees facing similar challenges (We have met the enemy and it is us - Pogo)

In recent years both our bees and trees have been suffering multiple attacks by a myriad of disease agents often exaggerated by the affects of unusual weather. Most of these maladies have been inadvertently caused by human activity as these microbes, invasive insects and fungi have been imported from foreign lands by human movement of goods. This is not new as man has traded for millennia but the volume of goods and speed at which they are moved amongst continents has greatly increased. While the greater amount of publicity has gone to bee decline (CCD) because of the potential damage to our food supply, foresters and forest health managers are watching some of our most important forest resources change or outright disappear, a frightening scenario of itself. Both bees and trees have natural defenses against disease but there are some significant differences in the way in which the two can respond are notable.

The effects of climate change

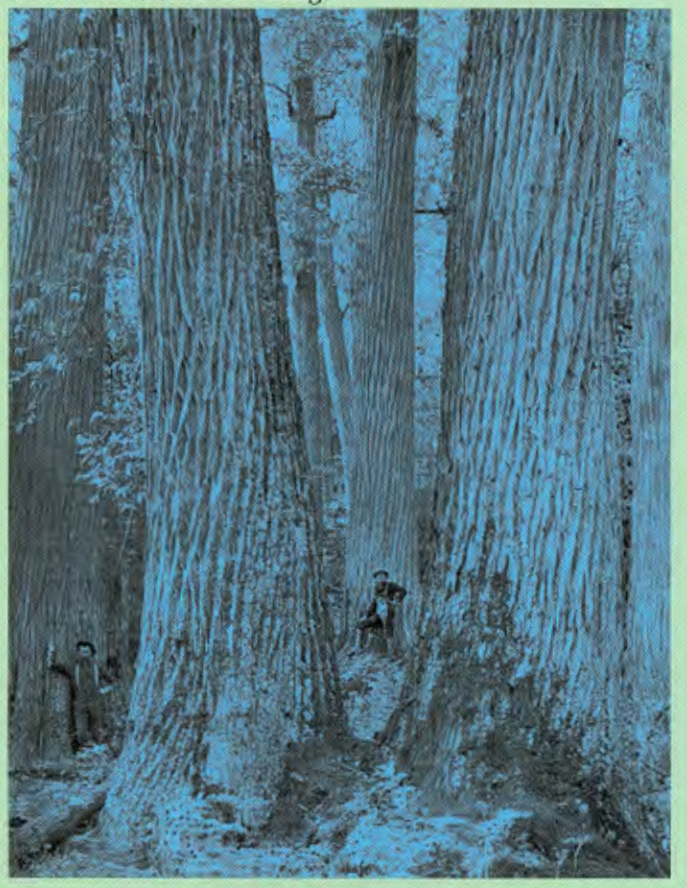
Regardless of cause, human or natural climatic cycling, climate change is causing all forms of challenges to agriculture. forestry, and ecologic systems. The effects of these changes are much more injurious to tree species than they are to *Apis mellifera* because this flexible insect can and has adapted to many differing climates around the world, unlike plants that are non-mobile and are usually adapted to specific zones and specific climatic conditions. If you look at a map of the earth, you will notice that around 30° north (and south) that the great deserts predominate including the Chihuahuan, the Sahara, the Arabian, and the Gobi Desert of China. As the earth's climate warms, the latitude where dry climates predominate is modeled to shift farther north, impacting the cool, moist temperate plant communities that we in upstate NY (for example) experience. While dry conditions may not outright kill established trees, drought stress can predispose tree species to be susceptible to attack from new disease factors otherwise considered of little concern. Tree species will need to migrate to more northern latitudes or higher elevations to find environments to which they are better acclimatized. Trees more adapted to warmer drier conditions will start to displace these trees of cool damp, more northern climates. Unfortunately, tree migration can only occur from one generation to the next and many of the climax species only cast their seeds a relatively short distance. A warming climate may also be injurious to our colonies of honey bees as drought can lead to a dearth of pollen and nectar upon which our bees depend. Poor nutrition can lead to poor overwintering and predispose honey bees to the onslaught of other inciting diseases. Unlike tree species, though, bees are champions of migration through swarming whereby they do some natural dispersal annually. Beekeepers certainly assist in this migration process by throwing beehives onto trucks and delivering them to greener pastures far and ⇨

Dutch Elm Disease is caused by an introduced fungus.

wide. Some areas of bee forage may actually benefit from a warming climate. Canada, Russia, and the Ukraine are already great honey producing areas, for example, and if ample rainfall is available in these areas, how much more honey might be produced if their growing seasons lengthen adding days or weeks to an already long Summer-time day length?

The effects of exotic microbes causing disease

In recent years both our trees and bees (and our ecosystems) have been suffering multiple attacks by a myriad of introduced agents, novel organisms from abroad: new pests and microbes causing disease. In fact there is great concern around the world over these invasive species or Invasives. The term Invasives includes everything from plants to insects to bacterium and virus that are being moved around the globe. New interactions are occurring amongst these new associations of organisms that have never before met. Often upon entering a new ecosystem these novel organisms no longer play by the same rules as they did at their original home, surrounded by their familiar friends and enemies (plants or animals). A tree that could withstand insult from a common insect is easily overcome by an introduced invasive.



We have a history of tree diseases invading North America and the results have not been good. Dutch Elm Disease is caused by a fungus carried by an introduced bark beetle. The vast majority of our elms were destroyed during the 1950s, 60s and into the 70s. While not proven the fungus is now thought to have also been introduced from Asia and our American Elm had no resistance to this novel pathogen. The American Chestnut was once the dominant canopy tree in the northeast forest and there were an estimated four billion of these trees or one out of four trees with some reaching diameters of 10 feet. The lumber from this tree is rich in tannins and resistant to decay; it was used in furniture, home construction, fencing, flooring, paper, and telephone poles. Many forms of wildlife fed on its nuts and train car loads of these nuts were shipped into our cities in the Fall for human consumption. Asian bark fungus was imported on Asian chestnut trees that had long evolved with this blight and had developed resistance. By the time that chestnut blight was identified in the New York Botanical Garden in the Bronx in 1904, there was no chance of blocking disease spread. Those of us born after 1950 are generally not familiar with this tree species because of its rapid disappearance. This was another case of an introduced pathogen for which our trees had no chance of adapting resistance, without help from man. Today we are observing another two foreign insect invasions attacking our trees. Emerald Ash Borer is out of control and has spread from Michigan eastward and is now found in many counties in New York. It has the potential to wipe out the White Ash from which our baseball bats, flooring, furniture and tool handles are made. Asian Longhorn Beetle (ALB) also imported from China, threatens to wipe out Sugar Maple and other hardwood tree species. So far, fortunately, USDA APHIS (Animal Plant Health Inspection Service) and assisting state agencies have been able to prevent ALB from becoming permanently established though there has been a great loss of neighborhood trees in formally infested areas.

The honey bee has been affected by multiple invasive species over time. When wax moth first appeared in America in 1806, it wiped out entire apiaries of skeps and gums throughout the new colonies. Tracheal mite disease, first known as Isle of Wight Disease, was devastating to English beekeepers in the early 1900s, especially before anyone really knew what was causing observed disease symptoms. Subsequently, upon invasion in North America in 1986, tracheal mite caused significant short term harm, but perhaps because tolerant stock already existed longer term harm appeared to be less. However, this was overshardowed when we first learned about the presence of *Varroa destructor*, initially misidentified as *Varroa jacobsonii*, in North America in 1987 as it obliterated entire bee outfits. Even those beekeepers that did medicate commonly suffered high losses, as most bee stock at that time was very susceptible. Since then, we have had small hive beetles, *Nosema ceranae*, deformed wing virus, Israeli acute paralysis virus, and the mysterious cloud of Colony Collapse Disorder (CCD). Still to come might be large hive beetle, the external parasite Tropilaelaps, competition from cape bee (*Apis capensis*), and who knows what else. Each time the honey bee is exposed to a new invasive, large losses in bee populations are originally observed. This is followed after a number of years later by more resilient honey bees (or resourceful keepers) that bounce back restoring populations. Why is ⇨

Wax moth, tracheal mite, small hive beetle, Varroa mite, Nosema ceranae – all introduced honey bee pests.

it that honey bees can recover from these attacks while we have not seen a similar recovery by our lost tree species? Are there similarities in the way both react to these invasives? And do our bees react better, worse or similarly?

The ability of bees and trees to respond

During our insect classification course, we were taught that the honey bee is at the apex of evolution from the estimated 6-10 million insect species on earth. Honey bees have a supercharged genetic system that allows them to adapt much more quickly than most plants or mammals. Consider the following.

Under normal conditions a beehive with a one year old queen will swarm because this is the honey bee's method of reproducing. In some years, some hives may toss swarms multiple times. So in the past two thousand years there have probably been close to 2,000 generations of honey bees. Each generation is a new opportunity to recombine genes and test their ability to survive and each generation is an opportunity to test mutations that may have occurred to genes.

Honey bees practice polyandry and a queen can mate with 20 drones before settling down to become the mother of the hive. That means there are 20 crosses in one year. One of the daughters can mate with a different 20 drones so there are potentially another 20 x 20 (400) crosses. After three years, you can potentially have 20 x 20 x 20 (8,000) crosses. Of course you are not going to have 400 descendants after two generations but there is potential for a high rate of gene recombination. As a new disease passes through a population of bees, those that survive can potentially produce bees more tolerant than in the previous year.

The sex determination system of the honey bee and other members of the hymenoptera order is called haplodiploidy, which, as it turns out, is an important mechanism in adapting to some but not all disease threats. Honey bee males (drones) have one set of 16 chromosomes and are haploid (1N) while females (workers and the queen) have two matching sets of 16 chromosomes (32 total) and are diploid (2N). Genes in drones are fully expressed and are not modified or dominated by an accompanying matching gene. If a drone possesses a highly negative gene that would be recessive in a diploid organism, this gene cannot hide. Let's say that some drones possess genes that make them highly susceptible to tracheal mite while some do not. The drones with the susceptible tracheal mite gene will be more sickly and less fit (or maybe even dead) and are at a severe competitive disadvantage in the process of mating and passing on their genes. This could be why tracheal mite did not have a huge impact in North America and almost none of our bees today are suffering from tracheal mite disease even though it appeared here just shortly before the introduction of *Varroa* mite. This mechanism does not seem to be having a strong effect in resistance to the external parasite *Varroa*. We can hope that drones that are highly susceptible to the digestive system disease *Nosema ceranae* are less able to reproduce. In humans, negative recessive genes are never eliminated from a population. Diseases such as sickle cell anemia only appear when an individual possesses two recessive genes. Individuals with one harmful recessive gene and one non-harmful dominant gene are normal.

As if bees did not have enough advantages, bees also recombine their genes more quickly than other species during mitosis when the chromosomes "conjugate" and swap genes prior to cell division.

Compared to the genetic system of the bees, the methods used for inheritance in tree species is really in slow motion. When the colonists came to North America 400 years ago, they found forests with mature trees that were 200 years old. Many of the Douglas Firs in the western forests were a thousand years old while many of the redwoods were actually several thousand years old. Even if a redwood tree is cut down in a selective cut it can sprout from the roots and re-establish itself. So how many generations had passed in the 2000 years before the colonists arrived? For the deciduous hardwood forest that could be as little as 10. For the redwoods, maybe only one. Each generation is an opportunity to recombine genes and a new opportunity to test possible mutations and permutations as to whether they are positive or negative.

Trees also practice a form of polyandry and can produce many seeds from a variety of pollen sources. They cast their seed on the forest floor but if there is not an opening in the canopy, these seeds have little hope of becoming a mature tree. If a tree dies of a new pathogen, there are many other tree species that are very willing to take their place. Invasive pathogens, like Chestnut ⇨

Man has caused these problems. Hopefully, man can solve them.

blight, completely removed a dominant species from the landscape.

What is the net result

Bees have suffered big losses during past encounters with invasive diseases but the survivors repopulate after a certain amount of time, and relatively quickly. The best example is the Russian bee that survived and repopulated without any assistance from mankind. Trees, on the other hand, suffer devastating losses from invasive diseases; because competition from other species is so intense, they are not able to regain a foothold to repopulate. Survivors, if any, are few and far between and have a difficult time crossing their genes to make a new generation of trees that would repopulate the forest.

What is the solution?

Going by past experience, honey bees seem to be able to withstand the onslaught of a new disease; the bees initially take heavy losses in population but then manage to rebound. They have a very resilient genetic system that allows them to adapt faster than just about any other complex multi-celled organism. Since the introduction of *Varroa destructor* in North America, beekeepers have been using an ever-expanding list of medications to fight this pest: Apistan, Checkmite, Hivastan, Hopguard, Mite-away, Mite-away Quick Strips, Oxalic Acid, Apiguard, Apilife Var. While we have had success in keeping our bees alive for the most part, we are actually slowing down the honey bees natural ability to develop stock resistant to this pest. Of Course, Commercial beekeepers can't afford the big losses that would result by going cold turkey and stopping medications; they have payrolls to meet, pollination contracts to fulfill, and bills to pay. That being said, it would be a good idea if beekeepers with large operations would leave a portion of their operations untreated. The untreated hives would serve as a control by which they could tell if the medications are actually working and queen breeders would have a population (if any survive) from which to select breeder queens, thus furthering selection towards resistance.

Tree species are not anywhere nearly as resilient as the honey bee. Time and again exotic pests have invaded North America decimating many of our tree species, look at Chestnut to see the devastation. Breeding programs have been underway at some of our forestry schools but it is a slow and arduous process. By the time results from breeding programs are observed, a researcher's career may be nearing an end. There has been an extensive breeding program to develop chestnut trees resistant to chestnut blight with thousands of trees planted but there has been no real success so far. The New York State College of Environmental Science and Forestry is currently trying to produce genetically modified chestnut trees by inserting genes for disease resistance from another species into chestnut cultivars. In a ceremony in Spring of 2012, some of these trees were planted at the New York Botanical Garden where chestnut blight was first detected over 100 years ago. While many people (especially Europeans) question the use of Genetic modifications to produce our food, the use of this technology to restore a majestic tree to the landscape should be viewed positively. This technology may provide a tool whereby we can save other threatened tree species from utter extinction.

The outlook for the survival of the honey bee species is quite optimistic in spite of the great losses that beekeepers have suffered in the past 25 years. The Russian bees provide an example of this species ability to adapt to a disease threat with no help from humans. Our American stocks (from various origins) show mite tolerance where there was little to none in 1990, only 25 years ago.

In the case of tree species facing threats from invasive diseases, we still have a long way. New tools and methods employed by researchers may speed the process of protecting trees from the onslaught. Genetic tools increase our ability to target new pathways and physiology to more quickly achieve balance amongst organisms important to our planet. While mankind has been the cause of these problems, it is hoped that somehow we can ultimately provide the solution. BC

Mike Johnston and Mike Griggs raise bees and trees near Ithaca, New York.

BIG DATA
And Local Food

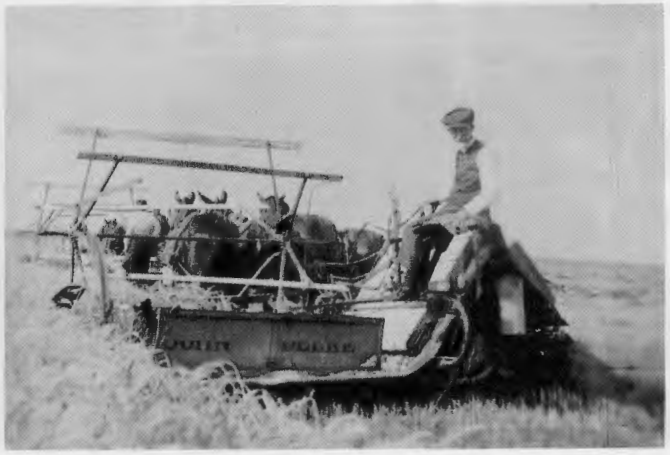
Blake **Hurst**

Nothing is more important in agriculture than place. What is successful on one kind of soil in one kind of climate won't necessarily work in another place with a different soil or different weather patterns. Farmers have always gained the knowledge necessary to understand a place through hard-won and rarely transferable experience. What farmer Brown knows about his land might travel down the road a few miles, but it is less applicable on a similar farm in a different part of the country. This idea of place is what drives the local food movement. Wineries brag about the perfection of the marriage between their varietals and soil. On our farm, every acre that I've farmed for 35 years and that my father has farmed for 65 years has a story. We know which weeds grow where, when the wet spots will appear, and we all remember that time the combine caught on fire down by the hackberry tree. Farmers' personal relationship to place, one of the salient facts that distinguish agriculture, is about to change.

Most combines traveling across fields in the Midwest this Fall had a GPS receiver located in the front of the cab. Although agriculture has been experimenting with this technology for a decade or so, only now is the industry starting to consider all the uses of this transformative technology. For several years, farmers have had the ability to map yields with global positioning data. Using that information, firms can design "prescriptions" for the farmer, who uses the "scrips" to apply seed and fertilizer in varying amounts across the field. Where the yield maps show soil with a lower yield potential, the prescription calls for fewer seeds and less fertilizer. This use of an individual farmer's data to design a different program for each square meter in a field spanning hundreds of acres could replace a farmer's decades of experience with satellites and algorithms. What we have gained in efficiency and by avoiding the overuse of scarce and potentially environmentally damaging inputs, we may be losing in the connections of the farm family to the ancestral place. Precision technology will allow managers to cover more acres more accurately and will likely lead to increasing size and consolidation of farms. While Michael Pollan, Mark Bittman, and Alice Waters continue to argue that we need to turn back the clock on technology in agriculture, much of the world is moving in a quite different direction.

Advice for individual fields is only the beginning of the uses for this technology. The leading agricultural equipment firm, John Deere, is running a pilot program this Fall with 500 farms and 1,000 combines across the Midwest. Data is uploaded every several hours to the cloud, where it can be used – well, we don't really know all the ways it can be used. If 1,000 machines randomly spread across the Corn Belt were recording yield data on the second day of harvest, that information would be extremely valuable to traders dealing in agricultural futures. Traders have traditionally relied on private surveys and Department of Agriculture yield data (the latter delayed by a month this year because of the government shutdown). These yield estimates are neither timely nor necessarily accurate. But now, real-time yield data is available to whoever controls those databases. The company involved says it will never share the data. Farmers may want access to that data, however, and they may not be averse to selling the information to the XYZ hedge fund either, if the price is right – but that's only possible if farmers retain ownership of the data.

One of the most important issues around "big data" goes directly to property rights. As Christopher Caldwell points out in the latest issue of the Claremont Review of Books, just because Facebook, MasterCard, or Google keeps track of what I searched for or where I buy lunch, it is not altogether clear why they should assume ownership of that data. For many of us, the convenience and enjoyment we receive for free from Facebook or Google may well be worth the loss of privacy. The value relationship between farmers and the companies that collect their data is considerably different. The risks to privacy that the farmer endures, such as his pesticide or GMO usage that may be accepted practice but not politically popular, are considerably greater than the fact that Amazon knows I have a weakness for thrillers and murder mysteries. Not only that, but the individual farmer's data has considerably more value than the average consumer's data. Many farms are fairly large businesses, spending hundreds of thousands on fertilizer and seed and producing millions of dollars of crops. It's not difficult to imagine a smart phone ad arriving within seconds of a farmer encountering weed or insect damage while he's harvesting his crop. Farmers' information is valuable to the companies



A.I. Root.

sponsoring ads, so farmers should be compensated when their data is sold. Farmers need to protect their data and make sure they bargain wisely as they share data with suppliers and companies who desire access to their information.

Farmers look forward to the ability to improve their yields and efficiency by comparing their results to neighboring producers. If my neighbor is receiving better results because of superior seed selection or because he times applications of inputs differently, then I'd really like to have that information. But this knowledge can have other results. If investors have data from all across the country, the access to better information could correct any market imperfections in the market for farmland. What has been a dispersed and unorganized market will likely be more accurate and rational with the advent of agricultural "big data." Knowledge of soil types, weather patterns, and productivity has been limited to close neighbors, but now access to data maps will replace the value of local knowledge. Owners of the database will have a decided advantage when it comes to pricing agricultural inputs, whether seed or farmland.

Farmers are rightly concerned about data privacy. Even if an individual operator does everything to the best of his ability, following all the applicable rules, regulations, and best management practices, there is still concern that the EPA or one of the numerous environmental organizations that bedevil agriculture might gain access to individual farm data through subpoenas or an overall-clad Edward Snowden. This concern about privacy will likely slow the adoption of the technology. The data will be invaluable to regulators and to parties in future litigation, and it may also help protect farmers from accusations of wrongdoing. Of course, some farmers will never be comfortable sharing any kind of farm information with strangers.

Amazon and "60 Minutes" made headlines recently with the news that Amazon is beginning to experiment with the use of drones for delivery of purchases to customers. We're a long ways from Amazon CEO Jeff Bezos's ideas about the delivery vehicle of the future, but it is fun to think about what it might mean for agriculture. Nothing is more irritating to farmers than having to stop harvesting and travel dozens of miles for parts for their machines. With real-time monitoring of machine data and drone delivery, the local implement dealer may spot a bearing that is outside of the recommended temperature range, recognize an impending part failure, and dispatch a drone rescue mission before the actual operator of the machine realizes he is in trouble. That's unbelievably efficient, but more than a little spooky. Although delivery by buzzing FedEx drones may be a part of the distant future, drones will certainly be part of the data revolution in agriculture in the here and now. Though the industry complained loudly when they discovered that the EPA was using aerial surveillance to monitor livestock firms, the advantages of cheap and ubiquitous drones to monitor crop conditions and forecast yields will be too valuable to ignore.

Big data on farming will also likely affect the private-public partnership that brings us subsidized crop insurance. In the present system, insurance rates are set to maximize enrollment in the subsidized program, because encouraging participation by producers is seen as a public good. Insurance rates in marginal areas are lower than they would be if prices reflected only actuarial risk. But with access to the data about individual farms, insurance companies will be able to identify the least risky, most productive farms, which will likely buy less costly private insurance. This will end the ability of the present crop insurance programs to spread risk and will increase costs for farmers in more marginal areas, if the government doesn't increase subsidies further.

If a farmer can manage one machine guiding itself across a field by satellite, applying inputs and measuring outputs, reporting by-the-minute data on yields, oil temperature, and a gazillion other data points, what is to stop that same farmer from managing dozens of machines on farms the size of New Hampshire? Tyler Cowen argues that we're about to see an even wider disparity in incomes between the 10 to 15 percent of the population that can relate well to computers and the vast majority of us who will deliver services to the computer-savvy class. Farming may be one of the first industries to explore the validity of Cowen's thesis. All of us involved in agriculture will soon have to decide whether we want to occupy the nostalgic niche providing artisanal beets and heritage pork to Cowen's 10 percent, or whether we'll roll the dice on surviving the transition to a data-driven agriculture. Farming will be more efficient, more environmentally responsible, and easier to regulate and measure. But it won't be the same. BC

Blake Hurst is a Missouri farmer and a frequent contributor to THE AMERICAN.

Get BIGGER P

Jessica W

The best thing about Winter is getting seed catalogs in the mail. Everything is all gloom and doom, cold weather and dark clouds, and then lo! A seed catalog sits in your mailbox. I don't know about all of you, but that's like a toy catalog for me, and a sad day for my bank account. I always get so excited by the possibilities of the upcoming year that I buy WAY too many seeds, too many varieties (Do I really need 18 different types of tomatoes? YES I DO.), and too many flowers. I have only the vaguest of concepts of space planning when it comes to Winter seed purchases. After realizing that my Pinterest "Garden love" board is covered with more seeds than I can ever hope to plant (I ordered almost $500 of seeds from Johnny's and High Mowing last year, most of them are still left), it gave me the idea to share some planning thoughts with everyone about the upcoming planting/bee/gardening/outdoor season.

There are a lot of really cool new varieties of vegetables now. Have you seen the graffiti cauliflower? It's freakin' purple! I had burgundy spineless okra for the past two years just because it was awesome (I hate okra). The calypso beans for sale at High Mowing are really neat, and the yard long red noodle beans are eye-catching even if you don't eat them! I also invest in the Shanghai Pac Choi because it's hard to find in the store and it's my favorite leafy green. The most important thing here is to decide the level of contentment between what your eyes see and what your belly (garden) can hold. Is it really a good idea to plant 30 tomato plants to get the varieties you want if you run out of space for other things? No, but normally that doesn't stop me. I do understand that having less plants will mean they get more attention and will probably produce better fruit, but I always go overboard with my – we will call it "over-enthusiasm" rather than "over-confidence" in my growing capacity and skills.

I would suggest to everyone to measure your gardening areas and check out a few growing guides on the space requirements for the vegetables you want to plant. Then, I would start out with the staples – what can you absolutely not live without having in your garden? For me, tomatoes and the pac choi are essentials because store-bought tomatoes suck and pac choi is hard to come by. I do like to plant basil with my tomatoes, but I have a hard time even keeping that to one variety (usually I make do with two). Maybe your favorite thing ever is fried squash in the Summertime, but you have acid reflux and can only handle the yellow tomatoes, so you plant a couple yellow globes and leave the rest to squash hills. Either way, you need to understand not only the space requirements, but also the productivity of your plant. How many squash can you get from each plant? Are your tomatoes determinate or indeterminate? Will you even like what you get? I have learned from personal experience that I do not like purplish tomatoes. I love a big juicy Brandywine, or a crackled, ugly pink German Johnson that only takes one slice for a sandwich, but those dark tomatoes are way too much acid-bitter instead of sweet. If you're really interested in tomato tastes, check out the brix scale. I bought a book on heirloom tomatoes that was really neat. It had "glamour shots" of different varieties of tomatoes and explained how they rank based on the judged characteristics.

While you are checking out the growing capabilities of your desired plants, you should also think about rotation, succession planting, and days to maturity. With my pac choi, I can replant it every couple weeks, usually around five plants a day for three days in a row every 15 days, and I always have awesome pac choi. If you plant something like corn, you can't really plant anything in the same season when it's done. You can plant your fall garden after the corn is done, but nothing else in the Summer run. Regardless of the initial crop, the soil composition should also be considered. Most vegetables take a lot of nutrients out of the soil, and it needs to be replenished after each harvest. Most plants that produce a fruit (like a tomato or eggplant) will take more nutrients because they had to make a plant baby and it took a little longer to make. Root vegetables will take up a lot of your nutrition as well since it's basically a ball of nutrition for the leaves to consume. Leafy plants like lettuce don't seem to leach too much of the soil components initially, but because they have a quick turnover for replanting you're going to need to reapply nutrients at around the same pace for every section that gets reused. I like to use a mix

PICTURE

wrence

Ready

of vermicompost, finished compost, and topsoil. Too much compost can burn plants or stop a seed from germinating if it is too hot or not mixed appropriately, so keep that in mind if you have problems with your garden.

Speaking of nutrients, you should at this point in time be thinking about amending your soil for the Springtime. Especially if you do a Spring and Fall garden, you can wipe out a section of soil if you don't replenish it properly. While I do have raised beds, I also have a few plots in the soil that I like to plant. When I have time, I till my garden space and throw on a bunch of compost beforehand, and then put down a thick layer of cardboard, then mulch over that with more compost. Preferably, this would happen in the late Fall/early Winter, but time doesn't always go the way you want. If you can let this stay on for a little while, the weight of the compost and the cardboard will kill off any weeds (I leave it on until safely past the last frost) and you can till all that in before you start planting for the year.

Now, let's get onto the bees for prepping. There are (I'm sure) plenty of people ready, willing and able to give you advice about what you need to do to get ready for packages, nucs, queen rearing and pollination. What I am recommending has nothing to do with that kind of preparing. I've taught a class for a couple years at the Alamance County beginner beekeeper class on setting up an apiary, and you guys know as well as I do (okay, maybe not everyone goes out and buys paint by the pint to have rainbow hives) that beekeeping is expensive. It can be cost prohibitive to a lot of would-be beekeepers. Besides the expenses, not knowing what you are doing as a beginner beekeeper can lead to losing your hives, and sometimes maybe never trying again. This is the season for the beginner beekeeper classes, and I urge you to get involved in your bee community. Most of these programs are run by volunteers and really, none of the newbees really want to hear the same person speak every week, not even if it's me! If you have some specialty, or just some good ideas for one of the classes, offer up your time to help out. If you happen to graft your own queens, offer a weekend class to the more advanced beekeepers to help them learn how – this is a great way to improve the quality of the locally available queens! A honey extraction demonstration is usually a crowd pleaser as well, and sometimes you can get free help from volunteers so they learn the process for themselves. If nothing else, you could always offer to help on the field day, either by doing the demonstrations, offering the use of a few hives or having it at your apiary. I understand that there can be some downsides to this and some people wouldn't be comfortable with a bunch of new beekeepers running around their bee yard, especially if they are strangers or don't yet know for sure how they react to bee stings. I used to help with a local field day, but I took my hives to their location and I think everyone was okay with that.

A second idea for volunteering your awesomeness and teaching people about bees is joining up with a community garden. Our church has a garden that is used to supplement the food pantry with fresh vegetables, but it seems that no one has a background in bees. I recently learned about the patron saint of beekeeping (Saint Benedict) and how Catholic beekeepers put medallions on their hives. Our priest will come out in the Spring to do a rite called the Blessing of the Bees, which seems to have been a common occurrence in Europe "back in the day" and seemed like a good idea to us. After our bee blessing, honey-themed supper and honey tasting, we will move two hives to the garden to help with the pollination. Hopefully they will be big enough that they will produce some honey, and we will donate that to the food pantry. To me, this is a great way to teach the community some general information on bees, being friendly to bees and understanding their importance in gardening (sometimes I also teach a bee/plant interaction class), as well as giving some local people who need help a little bit of sweetness in their lives. BC

Jessica Lawrence is a Research Entomologist for Eurofins Scientific, an avid gardener, beekeeper and tattoo collector.

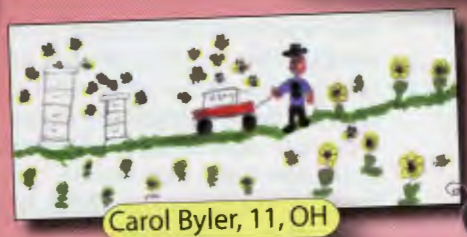
All The Buzzz in...

Send me a rebus letter.


Gary Weaver, 9, IN


Cam Lee, 8, WA


Autumn Cates, 10, AL


Carol Byler, 11, OH

Learn more about Heifer International at www.heifer.org.

4-H: Head, Heart, Hands, Health

Sage and Rogan Tokach from Kansas started a project with 4-H raising money to purchase beehives for families in Honduras through Heifer International. They gave away some of the 8 ½ gallons of honey from their hives and sold the rest to help support this project. They both love Heifer International because not only does the organization give hives to people they also teach the families how to take care of the bees. They plan on doing this project again next year.

The project got its start at the Willowdale 4-H Club. The club did not have a beekeeping component so Sage and Rogan created their own project under the self-determined category. They created the "Honey for Heifer" Facebook page. People from around the country bought their honey and made donations. They raised $600 which was enough to buy 20 hives!

This brother and sister team began keeping bees when they received beekeeping equipment through the Kansas Honey Producers Scholarship program. Both were accepted and worked under the mentorship of Becky and Steve Tipton. They love keeping bees and want to try making cut comb honey next year.

Thank you Sage and Rogan for inspiring all of us to "pay it forward."

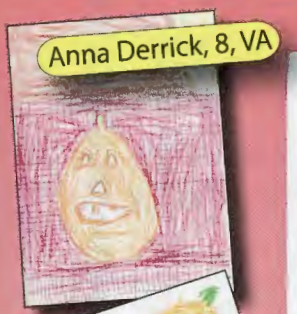
4-H and Beekeeping

Want to join more than 6 million youth who are involved in 4-H? Go to www.4-h.org.

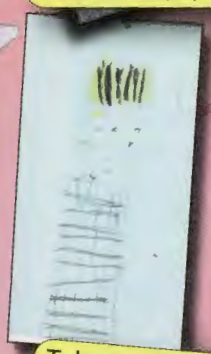
One of the most valuable resources for doing beekeeping with a 4-H club can be found through Purdue University. They have free online manuals and record sheets. www.four-h.purdue.edu/

Bee kid's corner

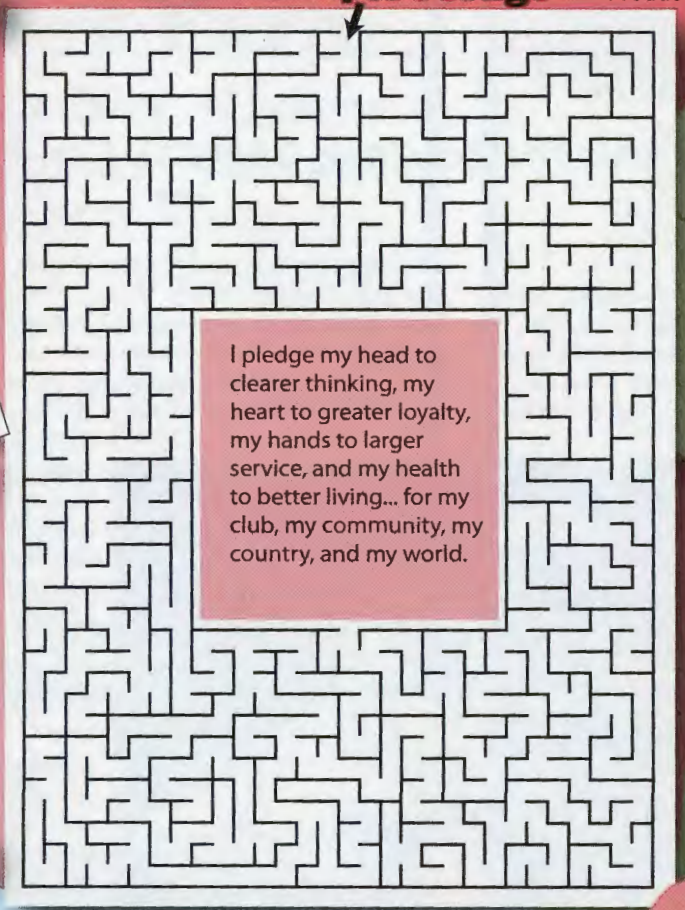
Produced by Kim Lehman - www.kim.lehman.com
www.beeculture.com
February 2014


Anna Derrick, 8, VA


Jed Derrick, 6, VA


Toby Lee, 5, WA

Find the 4-H Pledge



2014 4-H Beekeeping Essay Contest

The essay topic for 2014 is "Beekeeping in Colonial Times." Students interested in submitting an essay should contact their local 4-H offices for contest details. For more information go to www.honeybeepreservation.org or call 912-427-4018.

Bee Valentine

Make special valentines for your friends and family.

1. Cut out two heart shapes for the wings. Write a special message.
2. Make chenille stick antennae.
3. Make a body. Cut a rectangle out of yellow paper. Make stripes using black tape. Glue eyes in the middle. Turn over and tape the antennae to the back. Roll into a tube and tape.
4. Tape the wings together and glue on the body.

Bee Buddy

Ava Hess, age 9 from Ohio, has become the bee expert for her school. She brought an observation hive and talked about pollination, the life cycle of the bee and the workings of the hive. The students tasted honey and asked many questions. Ava was such a hit, the teacher already asked if she can come back next year and talk to all the fourth graders!

Ava is also doing a beekeeping project with her 4-H Club. She is working independently by reading books and doing activities like finding the queen in her colony. Another of her 4-H projects is working with her corgi dog to show at the fair. She also wants to work with rabbits.

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.

When It's Springtime In Atlanta. . .

February In Georgia, And The South In General, Can Be Tricky.

Jennifer **Berry**

At this point, it is too late to order packages, nucs, and even queens from most bee operations. Usually, by the end of the year, package, nuc, and queen supply houses will stop taking orders for the next season – especially for the early delivery dates. By the beginning of the New Year, the opportunity for Spring orders has passed, but there may still be hope for Summer shipments. When we have a research project that calls for more bees than we can provide, we place our order in the preceding year, between March and April.

But, not all is lost. Hopefully, established beekeepers will have bees that have survived the Winter and have built up colony populations to take advantage of the upcoming nectar flows. If this is the case, then you can split an original colony to make two or more colonies. Or, if you're new to the game of beekeeping and, this year, you were hoping to start with your first hive, pick up the phone and start making calls, beginning with the contact list of your local bee club. There's got to be a colony for sale somewhere.

However, for those who have colonies now, remember, the worst of Winter isn't over yet.

February in Georgia is always a critical time for honey bee colonies. For the last eight or nine months, they have survived off stored pollen and honey, fought off mites, beetles and other pests, shivered their way through several months of cold weather, and are now utterly at the whim of mother nature (or, if they're lucky, a gracious beekeeper!) to provide some much needed relief. I relate it to when I haven't been to the store in a while, and all that's in my cupboard is a paltry can of creamed corn and a package of ramen noodles. Yum! Ok. Maybe, it's not exactly the same thing, but, for some reason, the idea brings back memories of the good ole days!

Feeding bees. (Ben Rouse photo)

As many of you realize, Winter survival for bee colonies is not a given. Getting colonies to this point either means that you did some important things very well last Fall or that your unmanaged bees have rolled the dice and somehow beaten the odds. Typically, successful Winter survival begins with late Summer and Fall preparations, including: ensuring queen health and productivity, assessing food stores, managing mite loads, and adjusting honey and pollen frames around the bees and brood. No matter what you did or didn't do, hopefully your bees are healthy and alive today. But, now is not the time to rest on your laurels (or luck!). Your bees could be in dire need of your assistance.

Weather patterns over the past several years here in Georgia (or everywhere) have really played a part in how well colonies survive. Winter seasons of late have had cold starts, warm middles and below-average temperatures towards the end. The 2013 spring season in the Piedmont region of Georgia brought cold rains just as the blooms were opening. Unfortunately, our bees were stuck inside their hives as the long-awaited nectar flow was being washed out of the flowers and onto the ground. With the normal build up of populations in anticipation of Spring, the small amounts of the remaining food supplies were quickly exhausted and many colonies crashed.

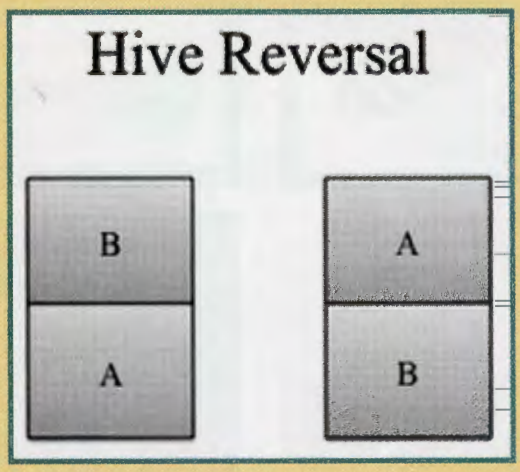
Despite the cold temperatures, the longer days and ➪

related early-Spring blooms of trees like Red Maple, Willow and American Elm arouse honey bee brood production. Once the warm days of Spring roll around, they will have enough worker force to accomplish their two major goals in life: to survive (forage) and reproduce (swarm)!

Spring management for the beekeeper begins with assessment. In Georgia, February will usually offer a few days, here and there, that are suitable enough to open hive covers and assess honey stores, pollen stores and population levels. However, much care must be taken.

Let's start from the beginning.

Temperature is an important factor to take into consideration when you're about to open a hive. But before you begin, look at what the bees are doing or not doing outside the hive. The other day, bees in my apiary were flying in ambient temperatures in the 40s (°F); however, it was in full sun with no wind, no clouds and low humidity. Because of this, lids were popped and honey frames examined. Given the cold weather, we quickly opened the hives to check stores and gauge populations, but the cluster was never compromised. In other words, the frames in which bees were clustered were not disturbed (pulled for examination). This is important. Muy importante! There is a common misconception that the bees keep the interior of the hive warm during the Winter. They do not. They only maintain temperature in the cluster. Removing hive covers will not harm bees in the conditions mentioned above. But, if covers are opened during cold, wet, blustery days, or if the cluster is broken by pulling brood and bee frames, there could be significant harm done. Remember that individual bees have very little body mass and chill easily, and chilled bees become immobile. When bees become separated from the cluster and fall onto the bottom board or the ground, they will typically not be able to crawl back and will die. Keep this in mind as well when moving bees in extremely cold weather. Bees jarred out of the cluster may not be able to return. However, it is better to open covers and check whether the colony has ample food than to do nothing at all.



But if temperatures are too cold, you can lift a colony from the back, tipping it forward to feel the weight, but this may give a false impression of what's really going on if you're not attuned to the feel of weight variations. The other day, the crew and I were out in the field lifting colonies in the rain with temperatures in the 30s, as conditions were not suitable to opening hive covers. Upon cursory examination, all the colonies seemed to pass muster. So, back into the truck we went to warm our chilled bones. As we were about to drive away, I noticed one hive on the end with a few dead bees on the landing tongue of the bottom board. Back out into the cold I went to inspect closer. I knocked on the side of the hive and heard nothing. So, I knocked again even harder, but there was still no buzzing sound. With concern, I progressively began to dismantle the hive looking for signs of life. I did not find a single bee or a cell of honey. Hmmmm? Yet, the box had felt heavy enough during our first Lift Test pass. While conditions may dictate limiting hive inspections to just the Lift Test, this example goes to show its subjectivity and potential for error. We were just feeling the weight of the woodenware. Be careful when using this procedure. Make sure you are feeling the weight of the honey stores and not misinterpreting the weight of the woodenware, brood and bees. If you've ever picked up a frame packed from corner to corner with brood and bees, you know that it is dense and quite heavy. By February, some colonies may be busting with brood and bees. So, when possible, the best assessment method is to see for yourself whether there are adequate honey stores.

Now, if the colony is light on stores, you must feed, or they will starve. February in Georgia will offer only a few drops of nectar here and there, but what's mostly available is pollen from red maple trees. The heavy nectar flow won't begin until mid-March to April – depending on location (latitude). Then, there's always the question of what ratio (cane sugar to water, by weight) to feed: 2 to 1, or 1 to 1? Most literature recommends a 1 to 1 ratio at this time of year to stimulate the queen to lay eggs. A 1 to 1 ratio more closely resembles natural flower nectar. We've never been as meticulous at the UGA Bee Lab (or home) as to weigh components, we just have a feel for it. Granulated sugar is added to about the ¾-full point in a five-gallon bucket and then hot water stirred in until full. I imagine that our concoction is somewhere in between.

Also, what's the best way to feed? After trying all the feeding contraptions out there, we've settled on two-holed (with 2-7/8" apertures), migratory covers with inverted half-gallon mason jars to feed our bees (see Figure 1). Top, entrance, and division board feeders will not deliver the needed syrup if temperatures are cold. The food delivery method needs to be right on top of the cluster; it cannot be to the side, at the entrance or in a top feeder where the bees have to travel up and around to access the syrup. If "the weather outside is frightful," the bees will not be able to move any distance at all; therefore, they will starve. Bees in cluster can starve with pounds of honey just inches away. This usually occurs when extremely cold weather sets in for a few days. The bees eat all surrounding honey and can't move to access the rest. Normally, larger clusters are not as susceptible to this, but smaller clusters can loose the battle quickly if they get separated from the honey source. That's why, during warmer days (50's and above), it's a good idea to move those distant honey frames in closer and over the cluster.

Your apiary location will dictate how much pollen and honey can be foraged in a nectar flow season. Heavily-developed areas may not yield as much resources compared to fallow land with bramble and flowering weeds. However, friends of mine in downtown Atlanta have had several good honey yields in the recent past. So, who knows? But, the old proverb "location, location, location," is always applicable even though the harvest may vary from year to year. You wouldn't put a cow in a pine forest, because there is nothing to eat. Well, the same idea applies to a bee hive; it needs to be in a location that can provide enough food for the colony's survival.

Over the years, I've rarely had to feed pollen supplements. Bees seem to collect enough natural pollen in

our region. Pollen is the protein source for the bees, and an adequate supply is critical to brood production. If pollen stores are low, then you may want to consider adding a few patties. Typically, small hive beetles (SHB) are not a problem in early Spring, but, this year, we are seeing significant SHB populations over-wintering within the cluster of bees despite our efforts at trapping! Since pollen patties are an ideal media for SHB larvae growth, and SHB love to lay eggs in lingering pollen patties, I advise more smaller patties than fewer larger patties; this gives the bees more surface area from which to collect the material and speeds up the consumption rate. Also, note that when a given bee population is low, there is a tendency for beekeepers to add more pollen supplement for population growth. But, fewer bees means a slower consumption rate – thus, more time for SHB adulteration. All it takes is one "breeder hive" of SHB in an apiary to inundate all the hives in the area with beetles. Don't make this mistake.

One more thing to consider when opening hives; honey bees use propolis, a resinous substance collected from conifer (sap-bearing evergreen) trees, to seal cracks and crevices, and fill spaces between lids, inner covers, hive bodies and frames. They use this substance to protect the colony against the weather. It also helps to seal out (and sometimes confine or corral) invasive critters while undergirding a hive's structural integrity. Plus, its antibacterial properties serve to sterilize the interior of the hive as well. With that said, every time we crack open a colony we break those protective layers that the bees have so painstakingly applied. Further, since propolis is hard and brittle in cold temperatures, it won't conform to the contours of the hive body surfaces when haphazardly placed back into position. This renders useless the hard work of the bees to prepare their home for Winter. So, when making mid-Winter observations, be mindful of this by minimizing hive inspections, returning woodenware in the same orientation that it was found, and avoiding the usual beekeeper impulse to scrape away excess propolis.

Another item on my list for upcoming bee duties is to reverse hive bodies. Reversing hive bodies will actually accomplish several things. First, the practice is an incentive for the beekeeper to inspect their hives and get a sense of what is going on with the bees when weather permits:

- Is there enough food (honey and pollen)?
- Has the queen started laying?
- How does her pattern look (only check this if it's warm enough to actually separate the frames and disturb the cluster)?
- How is the population level?
- Do you see Deformed Wing Virus, mites, beetles or other signs of disease?
- Has a sneaky little mouse moved into the bottom on the hive without paying a deposit?

However, don't reverse hive bodies until the nectar flow is on if a particular colony is out of resources and you are performing emergency feeding (as described above), otherwise the food source will be too far from the cluster.

The second reason to reverse the hives is to allow more space above the bees. This relieves congestion, which is a major step in swarm control and may buy you some extra time before the bees hit the trees (swarm). As

Inspecting honey. (photo by Ben Rouse)

the Winter months ticks on by, the bee cluster is slowly moving upward consuming their honey reserves. This leaves nice, drawn, empty comb below and, perhaps, some missed honey frames along the periphery. If the hive has honey frames, and the cluster is no longer in the bottom hive box, it is possible to reverse the boxes to put the bees and brood back on the bottom. Then, rearrange any remaining honey frames directly over the brood.

Another important strategy in reversing hive bodies is to maintain the integrity of the brood, i.e., keeping the same cluster arrangement as found. If the cluster spans across two supers, then keep those two supers together when moving them down (as a unit) onto the bottom board. We are only moving empty boxes from below and putting them on top. If you split the cluster, where half is on the bottom of one super and half is on the top of the other, the bees and brood will die.

Once temperatures have risen, don't leave too many empty supers on top since the excess room is a perfect place for unwanted pests like SHBs and wax moths to multiply. We just want enough room for the bees to be able to expand and store the incoming nectar. This is also a good time to put queen excluders between the brood chamber and those new, empty supers on top. This will keep the queen from laying in the honey frames. Just make doubly sure that the queen is not in any of those empty supers that you're reversing and, hence, trapped above the excluder.

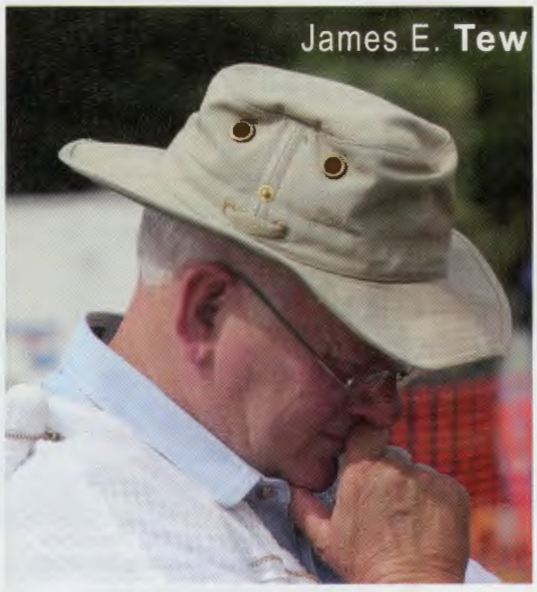
February can be such a wonderful time for the beekeeper and the bees. Hints of Spring are turning up everywhere. You can smell it in the air, you can see it as tiny buds begin to break free and you can hear it as the high-pitched chorus of Spring peepers begin their mating calls. To the bees, it brings about the promise of limitless nectar hopefully just around the corner. Just make sure your bees are ready for all this excitement.

Be good to you and your bees.

See ya! BC

WINNERS & LOSERS IN TODAY'S ENVIRONMENT

Where Do Honey Bees Fall?



I'm not qualified

I don't have the training and/or the academic background to write the following article. Population dynamics, societal shifts, epidemiology, disease etiology, outbreak investigation, disease surveillance and screening, bio-monitoring, statistics, social sciences and exposure assessment are some of the areas beyond my pay grade. The only attribute I have to offer is that I have lived 65 years. I have seen cycles come and go. *I know what my world once looked like and I know it does not look as it once did.*

I caught the tail end of something

In my early life, many roads were unpaved. A kid could ride on the tailgate of a pickup truck and knew enough not to fall off. Yards were swept clean. In fact, grass in the yard was unacceptable. A "short" Coca Cola cost 5¢ and came in a bottle that had to be returned. Cracker Jacks™ had real prizes that could readily be swallowed by kids who should have known better. A *Western Flyer* bicycle was your gateway to the world. The *"rolling store"* came by the farm one day per week and crop dusters landed in the road to reload. There were no general herbicides but there were some other serious insecticides that were readily available. Even a kid could buy them. All chickens were free range and I personally knew the cow that provided my raw milk. This is a quick, somewhat dirty written snapshot of my early world in the 1950s and it was the world in which U.S. beekeeping attained its highest numbers at around 5.7 million colonies. That world is gone and with it, about 50% of our bee colonies; but our bee numbers were already declining before Africanized honey bees, neonicotinoids, predaceous mites, and Colony Collapse Disorder *(whatever that was...)*. Why?

The answer remains elusive

No one has been able to show clear reasons why honey bees are in trouble. Clearly, it's more than a single reason. In academic worlds outside mine, it has frequently been said that honey bees are an environmental *indicator species*. This has been defined as *"a species whose presence, absence, or relative well-being in a given environment is indicative of the health of its ecosystem as a whole*[1]*."* As passionate bee people, we have a myopic view of bee health. Clearly something is wrong with our bees, but even if we did not have all our present problems, bee colonies would (seemingly) still be declining. Should not the proper question be more along the lines of what's up with the general health of our environment? It's a bit like realizing that our "mine canary" is unhealthy so we begin aggressively studying canary diseases. We need to be finding out what's wrong within the mineshaft. Upon correcting that, the canary should improve.

Things change – then quickly begin to look normal

Gasoline prices, airport security, mobile phones, and automobiles with air conditioners are some disassociated examples of things that have experienced radical changes in the past decades. Things change and then those changes quickly become the new normal. Today's normalcy would certainly not be normal in the 1950s. I have written time and again about the use of herbicides to clean our lawns, roadsides, playgrounds, farm fields, airfields, and access areas. Indeed, in Ohio, only about 10 years ago, our springtime lawns were beacons of yellow dandelions. Not now. My point is not that honey bees do not have access to that Spring food resource, but that we have successfully removed that plant and many others in the process of de-weeding our world. If we could restore our bee colony numbers to the peak 5.7 million, are there presently enough environmental resources to support them? I don't know but I suspect there is not *(See my first paragraph)*.

As simple as fence rows

Ostensibly, fences were to keep farm animals restrained and delineated property boundaries. But from my youthful perspective, that's where the quail, pheasants and rabbits hid. Blue birds nested in rotting fence posts cavities that woodpeckers hollowed out. It was an artificial ecosystem that worked well at the time. That simple farming procedure – fencing – has undergone significant changes. Modern fencing is just that – fencing. It is no longer a haven.

Some of the non-honey bee losers

The plight of the blue bird is well known. I have several bird boxes set out but it is a struggle to keep other birds out and to fend raccoons and the neighbor's cats. I do try. Rattlesnakes – who wants them? But I never thought they would essentially disappear from our Alabama farm. My grandmother's primary lecture was to watch for snakes, but I have not seen one in nearly 40 years. It's a bit like being told to watch for sharks in Ohio.

In the early 1980s, I went to the monarch butterfly wintering site in the volcanic mountains of central Mexico. Apparently, that stunning population is now 1/15th of what it was when I was there. I saw not a single monarch in my yard this past year. Bats with white nose disease are losers. Many species of amphibians are in dire straits. Stocks of both trophy fish and food fish are stressed. Most of us have increased difficulty

[1]Definition from: http://www.thefreedictionary.com

trying to find supplies of wholesome oysters and small Maine shrimp. I had to cut down my only Ash tree thanks to the intrusion of the Emerald Ash Borer. Ash trees everywhere are losers. White pines in the Pacific Northwest are under attack. Losers seem to be everywhere.

A North Carolina farm in the late 1930s. Photo from: **www.loc.gov/pictures/resource/fsa.8b33997/**

The sting of Bob White quail

But I am particularly stung by the precipitous decline of the Bob White quail population – particularly in the Southeastern U.S. That bright, piercing *"BOB WHITE"* would ring across the country side on those halcyon days now long gone[2]. It was Spring time and all things were good and always would be – or so it seemed all those years ago. Many times, I have climbed over a fence only to have a dozen half-chicken-sized birds explode from their covey right at my feet. The confusion that explosion caused was clearly a defensive procedure that usually worked well on me. My relationship with these wild birds was exhilarating. I didn't think about them or worry about their numbers. They were just always there. Now, they are not. There is an unexpected comparison between quail populations and honey bee populations.

Quail populations peaked early in the 1900s[3]. In 1950s and 1960s, the time period to which I am referring, the population had already begun to decline at about 2% per year. At the time, I thought they were abundant. In the early 1970s, the decline accelerated to more like to more like 10% per year. Now, in most areas, there is essentially not a remaining hunting population. During the great blizzard of 1977, quail populations died in Ohio and were subsequently caught in the general quail decline across the region. They have never made a meaningful comeback in Ohio.

I incorrectly thought that coyotes and armadillos (two of the present ecological winners) were the cause of the quails' decline, but apparently the real reason is drastically modified farming practices. Fire ants certainly have not helped. But quail numbers were only as high as they were in the 1900s because pioneers had earlier cleared so much land into small acreage plots. Before that, quail numbers were lower, but no one knows how much lower. I have no way of knowing, but I wonder if the quail population today is approximately what the population was within old growth forests.

I have not found anyone who expects the high quail population to return. Too much has changed. So I must ask - is it realistic to think that bee colony numbers could ever be expected to reach the 1950 high numbers? So long as pesticides and *Varroa* are here, our bee herd is going to be restricted. Quail are not near extinction but their numbers are probably lowered forever. Comparably, honey bees are not near extinction, but their numbers are also probably lowered forever. As with quail, too much has changed for bee colonies to be expected to come roaring back.

Ecosystem dynamics

We have seen it time and time again. If changes are made in our ecosystem, sometimes those changes have unintended consequences. At the outset, the class of chlorinated hydrocarbon pesticides seemed too good to be true. We know how that ended. We just about eliminated our national symbol – the bald eagle. Flooding and soil erosion are frequent issues in parts of the U.S. We got all those old growth forests cut down. If fact, in the 1600s our fore-parents casually introduced the honey bee to the virginal early American ecosystem. That could never happen today. As I write, the polar caps are receding at record rates. If global warming predictions are accurate, will future bee populations thrive due to longer blooming seasons or will some areas become so dry that they become useless to bee foragers? That is how it has always been – good times and bad times – sometimes good and sometimes very bad. Right now, honey bees are in the struggling category – between good and bad.

Virginia fence row, 1930s. special-collections.nal.usda.gov/photograph-farm-fencing-usda-history-collection

[2]Quail producing "Bob White" call: **http://www.youtube.com/watch?v=nEKlAteCDYU**

[3] Quail behavior and numbers: **http://outdooralabama.com/hunting/game/quail/quailbook.pdf**

Alabama fence row, 2012.

"Should not the proper question be more along the lines of what's up with the general health of our environment?"

Some present day winners

In all my early years, roaming the forests of Southeast Alabama, I never once – not a single time – saw a deer. There were essentially none to be seen. Recall the high population of quail in the 1900s. At the same time, there was a dramatic decline in deer populations due to overhunting and the screw worm fly. The screw worm eradication program finally pushed the pesky fly out in the late 1950s and hunting restrictions were implemented. Since then, the deer herd has been steadily recovering. In the mid-1940s, there were an estimated 4,000,000 deer in the U.S[4]. Today, the herd is around 32,000,000 or about an 800% increase since the 1940s. Presently there are more deer in the U.S. than when Columbus sailed here in the 1400s.

Alligators have recovered currently showing a 400% increase. Turkeys and Canadian Geese are now common. Beaver, raccoons and wild pigs have shown significant recovery to the point of becoming pests. Even gray wolf populations are looking better. Starlings, House Sparrows, Kudzu and Autumn Olive are on the winning list – not necessarily desirable in our view – but these organisms are winning. And right now, *Varroa* is a ***big*** winner in the bee world.

I get about 2000 words

Editors Kim and Kathy allocate me about 2000 words per month to talk to you. My comments here can only serve as an introduction (or a rant) to the broader world in which we and our bees live. It's not just bees that are besieged. Many other species are losing while others are in a good place.

Also, it is important for me to clearly say that my comments are not an indictment of any industry or any philosophy. Herbicides are here for the foreseeable future. Modern production agriculture cannot be expected to go backwards. Our human U.S. population is growing. More space and food production will be required. Generally, our quality of life remains high. I am trying ***not*** to rigidly compare today's beekeeping to yesterday's beekeeping.

At a recent Idaho Honey Industry Association meeting, George Hanson, noted bee industry leader, casually said that over time, honey production per colony seems to be declining. If that is true (and I sense that it is), I can't say why. Reduced floral sources? Over populating? Decreased genetic vigor? Beekeeper incompetence? We have correctly picked out the most logical suspects – pests and pesticides – as being our primary villains. They probably are much of the cause, but we have other more insidious issues that are more difficult to decipher. Beekeepers and their bees are part of a much bigger and constantly evolving environmental picture.

I thoroughly enjoyed my early outdoor life, but I like my present life much better. I really like the computer on which I am presently typing, the iPhone in my pocket, the pickup that is parked just outside my shop, my DVR recorder and the world-wide-web. I hope I never see another rotary-dial, party line phone again. I just really wish my bees would stop dying so easily. It hasn't always been that way. 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.***

Honey bees – threatened by both pests and questionable resources.

[4]Von Drehle, David. 2013. *Time to Cull the Herd.* Time Magazine. December 9, 2013.

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Got A Question?

Ask Phil

Phil **Craft**

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A beekeeper in Kentucky writes:

From time to time I see used bee equipment, hives, etc. for sale on craigslist. Isn't there a risk that they could have mites or diseases?

Phil replies:

I have two concerns on behalf of beekeepers, especially new beekeepers, considering the purchase of used equipment or existing hives – particularly when they are responding to ads from anonymous sources such as newspapers or the internet. My concerns are lessened if the seller is a member of a local beekeeping group where you attend meetings. However, acquiring equipment is not cheap, and you need to get good value for your money. In terms of disease, the greatest danger is from brood diseases – those associated with developing bees in brood comb. American Foulbrood is the most common example. This risk may be minimized by avoiding the purchase of frames with drawn comb or even of used frames. When I buy used comb or existing hives, I always conduct a careful examination prior to the purchase. The problem faced by novice beekeepers is that they usually lack the experience to determine whether hive and comb are disease free. I have always cautioned new beekeepers to purchase existing hives only with the advice and assistance of a trusted, more experienced beekeeper (or local inspector if required, and it is in some places). I also suggest that they avoid the purchase of used frames or comb since the cash savings is not worth the risk. For more about disease concerns in used equipment, see the related Q&A, in my February '13 *Ask Phil* column.

My other concern for newer beekeepers buying used equipment is the risk of over paying or of paying for something of little value, i.e. worn out equipment. Judging the value of such equipment, especially wooden ware, requires experience that new beekeepers have not yet had time to acquire. So my advice for the novice beekeeper interested in buying used equipment is the same as for those considering the purchase of existing hives. Seek the assistance of an experienced beekeeper in evaluating the used equipment prior to making the purchase. There are some exceptions. Protective clothing: coveralls, gloves and veils, can be evaluated like other used clothing. If it looks new or has only minor wear, it still has value and a fair market price would be a percentage of the catalog price for similar, new items. If it looks worn out, it probably has little value left in it. Another exception is metal ware. Though I would not encourage a novice beekeeper to spend hundreds of dollars on expensive extraction equipment, some inexpensive tools made from metal (such as smokers and hive tools) can also be easily evaluated by observing the amount of wear and comparing the asking price to catalog prices. In summary, if you are unsure of the value of equipment offered for sale, don't make the purchase. Buy new equipment from a beekeeping supplier.

Bad woodenware.

Another beekeeper in Kentucky writes:

I always enjoyed your tips when you were our state apiarist, and your "Ask Phil" column in Bee Culture is the first thing I turned to each month.

My question concerns small hive beetles, which apparently was a major issue in Kentucky this year. I had one bee yard with just two hives, and when I concluded they had a mite issue early in the Fall, I put in Miteaway Quick Strips(MAQS), which I'd never used before (hadn't treated with anything for several years). The day after I put in the strips, a robbing frenzy began that I was unable to stop. I'd hoped at least it was one colony robbing the other so that I might lose only one hive and retain the stored honey, but alas, the thieves came from elsewhere and wiped out both of them.

When I opened the dead-out hives a couple days later, I found them absolutely crawling with hive beetle larvae, which took hours to clean out so I could freeze the frames. On the advice of

Small Hive Beetle adults.

another beekeeper, I mixed up a slurry of mineral salt and dumped it where the hives had been in an attempt to kill the pupating beetles in the ground.

My question is how to proceed in the future. Is mineral salt effective, and how large a radius around the hives must be treated? Should I leave that yard hiveless for a year to interrupt the beetles' life cycle, or do they not winter over in the ground anyway? Would putting the hives a couple hundred yards away make any difference at all?

I've also put vegetable oil traps in some other hives in which I've seen beetles, but they've caught only a couple of them. Those colonies look strong otherwise, but I didn't get down into the bottom box for fear of setting off another robbing frenzy.

Any advice you can offer would be most appreciated - by a lot of Kentucky beekeepers, I'm afraid.

Phil replies:

In most of the U.S., adult small hive beetles (SHB) are common squatters and pests, and last Summer's rain and humid weather in Kentucky created more favorable conditions than usual for their proliferation. I'm sure that, as beekeepers, we would all like to completely eliminate them from our hives. Hence the numerous commercial beetle traps, designs for homemade traps, and suggestions for soil treatments to kill the beetles in the pupa stage. However, SHB are very difficult to eradicate. You can never kill them all, and if you could, they would quickly repopulate. Adult beetles can fly several miles, are attracted to odors from hives, and are capable, as you observed, of producing thousands of larvae in weak or dying hives, as well as in unmanaged, feral colonies. As the colonies collapse, the remaining bees abscond - fly away to seek out a new home. The adult beetles also fly away to find new honey bee colonies to establish themselves in. Therefore, even if we dramatically reduce the number of adult beetles in a hive, it's likely to be only be a temporary victory. Because of this, the most practical method of managing SHB is to maintain strong colonies.

A colony with a strong, healthy population of bees can control a large number of adult beetles and prevent damage to the hive. (I've touched on this topic in a previous column; see the June 2013 issue of *Bee Culture*.) Honey bees will literally herd adult beetles into the inner corners of the hive or of the inner cover, and inhibit their reproduction by separating them from their favorite egg laying location - in or on the edge of brood comb. They prefer the periphery of the brood because, like honey bees, small hive beetles require pollen to reproduce. We often refer to the corralled adult beetles as being held in *bee jails*. Understandably, controlling them in this way becomes more difficult as a colony's population drops because of varroa, disease, or queen problems.

In this case, what caused the sudden explosion of SHB larvae in your hive and what set off the robbing? I suspect that all three events; the *Varroa* problem (possibly including your treatment of it), the sudden appearance of the beetle larvae, and the robbing, were interrelated and that they all began with mites – especially since you say you haven't treated with anything in several years. *Varroa* mites weaken hives, and both robbing and the production of large numbers of SHB larvae are common problems in weakened hives. In addition, opening the hive as you did to insert the MAQS, may have disrupted the bees' efforts to control the beetles. You may have unwittingly aided a jail break, but I suspect that it was a jail break waiting to happen. The robbing most likely occurred after the larvae explosion, but it's possible that it happened first and provided an opportunity for the SHB. The bottom line is, weakening ⇨

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of the hives by a *Varroa* infestation is probably what started this sequence of events. I suspect that you waited too long before attempting to control the mites.

Let's talk about the strategies you mentioned for controlling SHB in the future. Applying salt to the ground around a hive is an attempt to interrupt the beetles' reproductive cycle by drying out the soil. As you indicated, SHB larvae must leave the hive and make holes in order to pupate underground. To do that, they need moist earth. Treating the ground around a hive with salt may make it less hospitable to the larvae and perhaps somewhat reduce their ability to achieve the next stage in their life cycle, however, SHB larvae are capable of crawling long distances. Most of them will probably just crawl to untreated soil. This may be true for any method of ground treatment. Leaving the bee yard hiveless for a year would more effectively interrupt the cycle because, as you suspected, small hive beetles do not Winter in the ground. Only the adults live through the Winter, and they survive by moving into the colonies' wintering cluster during cold weather. Unfortunately, moving hives – either a few hundred yards or to a different bee yard – does not eliminate beetle problems since the beetles move with hives. One thing which will help is destroying the SHB larvae from your dead outs. Don't let them get into the ground. Dumping the larvae and larvae containing frames into a bucket of soapy water will kill them quickly. If the frames are not heavily damaged they can be rinsed off with a hose, dried, and re-used.

I typically have large numbers of adult beetles in my hives and while I occasionally do some trapping, using the small traps that fit between the frames, I have never used ground treatments and rarely suffer larvae damage in my hives. The times when I have had a problem have involved hives that have become very weak, usually due either to the loss of a queen or because I made a new nuc without enough bees to control the beetles. I have always considered these instances to be as much a management problem on my part as a SHB problem. My response is to quickly combine weakened colonies or to disassemble them and remove them from the apiary, shaking any remaining bees from the frames, before the beetles have a chance to gain control.

Of all the management techniques available to beekeepers to control SHB, maintaining strong, healthy colony populations is by far the most effective. That means monitoring and/or treating for *Varroa* and maintaining queen right colonies. We need to think of adult beetles as predators waiting for an opportunity. The opportunity comes when the population of a hives declines or is weakened and the bees lose control. Listen to any talk on small hive beetle control or read articles on this topic and you will hear the same refrain: *maintain strong colonies.*

One more beekeeper in Kentucky writes:

I think my bees have enough honey to get them through the Winter, but I'm not sure after that. Should I start feeding my hives in the Spring?

Phil replies:

Hives should be fed, not according to the season (though there are specific times of year when they are most likely to benefit from supplements), but depending on available food stores and nectar sources. I often draw an analogy to farmers feeding hay to their cows. (Many of the beekeepers in my neighborhood also keep cattle.) They feed with hay, not by the calendar, but rather when there isn't sufficient grass in the fields for cattle to subsist on. We should think about feeding bees in the same way. Hives should be given supplemental feed (typically sugar syrup) when there

Hefting a hive.

is insufficient stored honey in the hive, and a lack of nectar for the bees to collect.

How much honey is sufficient? At any time, a healthy hive should contain at least 10 to15 pounds (the equivalent of about four deep frames) of honey to provide for the colony's immediate needs and to get them through cool or rainy weather when the bees cannot fly to forage. During certain times of year and under certain conditions, such as in winter or during periods of drought, hives require greater quantities of stored food. Without a sufficient amount going into Winter, a colony may exhaust its stores before Spring flowering brings a fresh supply of nectar and pollen, and it will need supplemental feeding to survive. In fact, most Winter starvation occurs in the late Winter or early Spring (now), so you have reason to be concerned at this time of year.

However, instead of feeding automatically in early Spring, you should first check your hives' honey stores. It is important to know, in the Fall, what your hives food stores are like and to feed, if necessary, before the onset of cold weather. If you're unsure about the stores in your hive and if weather permits (see the question and answer in my February 2013 column about Winter feeding and opening hives), open them up and have a look inside. If not, you can get a rough idea by hefting, or lifting up on, the back of each hive. While not as accurate as direct inspection, hefting your hives can help you gauge approximately how much honey is inside by the weight alone. Even with little experience, you can conclude that when a hefted hive feels very light, it is also light on food stores and that emergency feeding is in order. Emergency feeding of hives in danger of starvation should be done using heavy syrup (two parts granulated sugar to one part water) or, as an alternative in the very early Spring, using bee candy. (again, see my February 2013 column for more on emergency Winter feeding). BC

Finding The Market For You and Your Bees

Ian **Bens**

Finding the Market for You and Your Bees

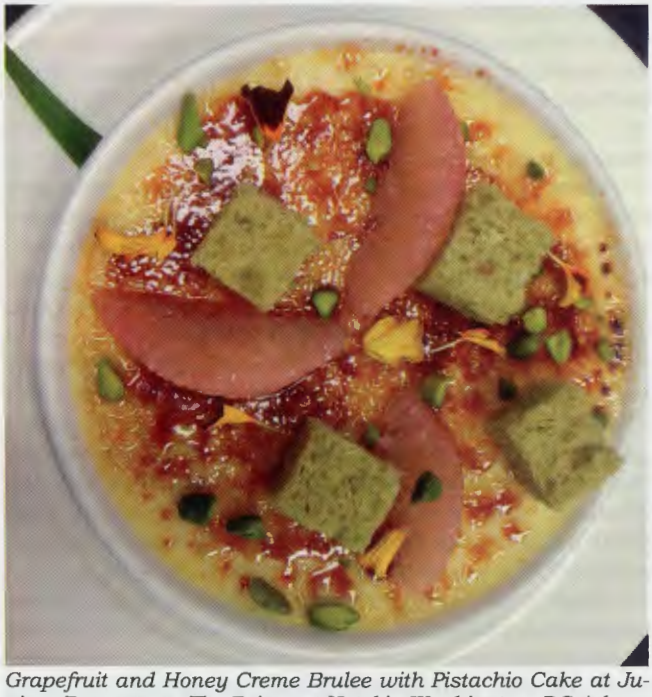
In the last few years, many food businesses and professionals, especially chefs like me, have become interested and involved in beekeeping and hive products, some managing their own hives, some setting up relationships with local beekeepers. It really helps to understand the business of hospitality, the excitement of connecting to local ingredients and producers, and the needs of all concerned if you want to connect with and benefit from these relationships and business opportunities.

These hotels, restaurants, cocktail bars and breweries are getting into rooftop beekeeping for various reasons. First, rooftop beekeeping is a big trend right now, so some are just trying to keep up with the Jones'. Most like the idea that they are doing something good for the community, it gets them closer to nature and to where their ingredients come from, it is a learning experience for their staff and their guests, and it helps them be more creative with their offerings. For beekeepers, there are opportunities to help these establishments get started with this project. Very few properties will try this completely on their own. At the Fairmont Hotel, we have a beekeeping mentor, who helped us immensely in getting started and is always ready to answer questions and help out whenever we need it. In return, we allow the Washington DC beekeeping community to use our kitchen for harvesting, which is fun, informative and gets all of us together. In a pinch, we are also there to help if the beekeepers we know need something, and we have participated in several collaborative efforts together.

Some hotels or hotel chains that have rooftop hives will not allow their staff to work the bees because of liability reasons, so they will pay a beekeeper to set them up and do most of the work, but the kitchen will usually help out with the harvesting. This may not be for every beekeeper because of travel and other logistic reasons, and may not be feasible in all locations due to space, safety or legal issues. The fee for supporting these rooftop hives would be different depending on location and you would need to do some research to find out what it would be worth in your area. Another bonus this provides is the opportunity to hang out with chefs in the kitchen, perhaps exchange some ideas, learn some recipes and gain a stronger relationship.

Marketing your honey to chefs and restaurants

As a chef I am always looking for ways to bolster our mission of what good food is and add to the fabric of our restaurant's story, creating our identity. There is a whole movement of chefs and guests that have embraced the "farm to table" movement. The most exciting way to convey our story is through our food. Talking about the individuals that nurtured and cared for the plants and animals that grace their plates connects us.



Grapefruit and Honey Creme Brulee with Pistachio Cake at Juniper Restaurant, The Fairmont Hotel in Washington, DC. (photo by Ian Bens)

My collaborations with local producers to obtain top quality ingredients energizes my menus and is a wonderful way to reconnect my guests to their food and the earth. This is what I am interested in and I think there is a lot of potential for you as a beekeeper to reach out to one or more chefs in your area to sell them YOUR honey with YOUR story to keep them coming back for more. There is also potential in making additional money by helping chefs to start their own hives while, at the same time, learning various techniques that they employ

Whole hive dessert: beeswax cannele, honeycomb, propolis ice cream, bee pollen and rooftop honey by Rebecca Clerget at Juniper Restaurant. (photo by Ian Bens)

to turn your liquid gold into countless recipes of which you may never have thought. There is also potential to take it even further and start a new business or new direction for your business. What do chefs gain from this? We see things in a new light, learn more about where our food comes from, perhaps even get out of the kitchen and work directly with the bees or start our own hives. Creating and serving a recipe made with honey that I helped to harvest is extremely satisfying. The chef wins, the beekeeper wins, the guests win and the community wins. With hard work and some luck, perhaps even the bees win.

How to meet a chef

One thing about chefs: we work in a very busy, high stress environment where people are constantly demanding attention. We are not purposely trying to be rude, but may not always come off in the friendliest way possible if you catch us at the wrong time. Perhaps Table 13 wants the recipe for honey creme brûlée; a table of three that just walked in has a dairy allergy, a nut allergy and a gluten allergy and wants to know what they can eat from the menu; the manager is on the phone with a guest who wants a special five course menu for tonight; the pastry chef needs help bandaging her finger, the breakfast cook just called out for tomorrow, and then someone walks in during the middle of the lunch rush and wants to sell us something.

There are a few ideas I would consider before approaching a chef or any other food service professional to make the meeting as effective as possible. Consider paying a visit and having a meal at an establishment before you call, perhaps visiting several to figure out which ones seem to be promoting local seasonal products and which have the best quality food and engaged service (and who will mention where the honey comes from)! Keep in mind that you want to select the places that would benefit you the most. When you have decided on a restaurant, call ahead to make an appointment and avoid the lunch rush (11am-2) and dinner rush (6pm-10) – although this will depend on the chef. Before you call, think of what you want to say and write some bullet points: you do not need to go into detail about your idea or product on the phone. It's great to start by complimenting them on a meal that you had in their restaurant and informing them that you keep bees close to the restaurant. Then ask if you can meet the chef to taste your honey, see your price list or discuss an opportunity together. Before you meet, practice your spiel to keep it short and to the point, and have all of your information ready in an easy to read color format – with photos if possible – most chefs are visual learners and will remember you better this way. Bring small samples of honey or other products and think about how you will serve them ahead of time, like bringing small biodegradable tasting spoons and napkins. Chefs really want to support local seasonal producers, and to do special creative projects with others, but if they think that you won't respect their time, or if you don't make a great first impression, they may easily forget about you.

Size matters

At Juniper Restaurant we go through roughly 700 pounds of honey per year. 200 pounds of that is from hives on our own rooftop and about 500 pounds is Amish honey from Pennsylvania. We also go through at least 700 pounds of commodity honey for the rest of the Fairmont Hotel in Washington, DC. It is sometimes difficult to justify the cost difference of using artisanal honey in a large operation, especially if it is going into baked goods where we do not promote it as an ingredient. We use a lot of honey in recipes that the guest never knows about, so we need to save some money where we can. But if I could get a less expensive artisanal honey, especially one in 16 gallon pails, I would buy it from a local or regional beekeeper.

Hotels and restaurants in your area are a great place to try to sell your honey. I would suggest offering honey in 60 pound pails to shave off as much money for the hotels as possible, and larger operations may even be interested in a 55 gallon drum. I would also suggest offering little mini honey bears or other two ounce containers that many hotels might sell or give away as local amenity. I would call around to local food suppliers to find out what the price per pound for different honeys are in your area. Beekeepers know that it can be difficult to directly compete with commodity honey prices, and to get chefs to integrate honey as a new, high profile element in their offerings, but by finding ways to package in bulk and selling your honey's unique story, you are sure to find quality minded chefs who are willing to give you a chance.

Caledonia Spirits Inc. owner Todd Hard[illegible] his honey and honey based spirits to h[illegible] board. (photo courtesy of Ian Bens)

Chefs may also be interested in honeycomb, beeswax, pollen, or propolis so having these on a price sheet, with little explanations of what they are, may increase your sales. I would offer these items in smaller amounts as they would be used less often.

Leasing hives

What if you could sell your honey ahead of time by packaging it as 'leasing' a hive or two from your beeyard? The idea would be for the chef or restaurant to "own" a few hives kept by a local beekeeper. For example, they would invest at the start of the year and receive the 40 or more pounds of honey from each hive they 'lease' for the year after harvest. The package may or may not include the chefs or their staff coming several times throughout the year to help with various jobs, especially harvesting. At the Fairmont Hotel, the staff has enjoyed participating in the harvest and in promoting our role in both "greening" the city and providing an ultra-local, high quality product as part of their work. Pricing out a hive-lease or shared labor arrangement might be challenging, and would depend on the situation, but determining the average harvest of honey from one or more full hives would get you in the ballpark. The Ballard Bee Company in Seattle rents out hives to urban beekeepers for a set up fee plus $110 monthly, and I have seen a few other companies starting to do this for restaurants.

Become a distributor

As someone who routinely seeks out local producers and ingredients wherever I work, I am frequently surprised at how challenging it is to get those local products into my kitchen in an easy and reliable manner. It takes a lot of research to find producers who can ship reliably to my restaurant and then I need to make many phone calls and emails to separate farmers, often several days in advance, to get those items delivered. It is often so much easier to call one of the big produce companies, any time the day before, and have your items delivered the next morning. Of course the quality of the local items is much better, and you start to develop relationships with the producers, which is great. I understand the challenges that many farmers face, and the difficulties involved in shipping. As chefs, I believe we need to fundamentally change the way we cook and serve food in order to properly utilize the best local ingredients at the peak of their season. But I also believe we need to have a few middlemen, who seek out the best seasonal ingredients in one area, and bring these items to restaurants. I do work with several of these cooperatives in my area, but many areas do not have this luxury. So, a little research might turn up a valuable business opportunity in your area, one in which you could sell your honey products alongside fruit, vegetables and meats from neighboring farms. I would suggest to do research to see if you area could support such a business, or if one already exists; speak to your local producers and compile a list of items that are currently available and when; email or speak to chefs directly with the list of items and ask them what other products they would be interested in; and go back and see which producers could assist in getting the chefs the products that they want. When a chef wants a specific item and can have it produced just for them, they will order other ingredients to keep getting that product.

ft) has hundreds of hives and is marketing and restaurants all over the Eastern sea-

Rooftop hives at the Fairmont Hotel in Washington, DC. (photo by Ian Bens)

Not just chefs . . .

Chefs might seem like a logical place to start if you want to sell your honey products, but other food service professionals worth talking to directly are pastry chefs, bakers, brewers and mixologists. Pastry chefs and bakers are a natural choice as honey adds moisture, flavor and shelf life to desserts and baked goods. Local brewers might be interested in making a collaborative honey ale or making a local mead. Specialty cocktails are really hot right now and mixologists are always on the hunt for original ingredients like varietal honeys, pollen or propolis to flavor their drinks. You are sure to find someone in your area who would be very happy to purchase your honey or start a project with you that would enrich both of your businesses.

Creative and productive collaboration is what beekeeping and professional kitchens are all about, and there are lots of opportunities for new markets, experiences, businesses, and friendships if beekeepers and chefs connect. Fun and profit: sweet! BC

Ian Bens is the Sous Chef for the Fairmont Hotel in Washington, DC.

12 Things To Do With Beeswax –

Ann **Harman**

Last month you discovered 12 things to do with honey. Now we will have a look at another product of the hive and see what we can do with it. Both honey and wax are so versatile I am certain you could make your own lists.

Beeswax has a number of interesting properties. Its melting point is about 143°F (62°C), quite a bit higher than that of paraffin wax, an artificially made wax. Of the plant waxes only carnauba wax has a higher melting point but cannot be used for candles.

Many say that the first settlers found they needed to bring bees to America because honey was important as a sweet. Now give this idea some thought – beeswax was perhaps more important in their lives than honey. As we count twelve ways to use beeswax perhaps we will see why it was so important to the settlers.

1 Probably the first item that comes to your mind is using beeswax to make candles. Beeswax does indeed make the best candles – slow clean burning without drips (unless you put candles in a draft). That faint odor of burning a beeswax candle is agreeable and pleasant.

We can find a huge assortment of candle molds and even create our own. We can bleach and color beeswax and still retain its properties. Although beekeepers know and love the natural color of beeswax, customers buying candles frequently want colored ones to match table decor or seasonal colors such as Halloween or Christmas.

You can buy molds in votive and tealight sizes. Candle scents are also available. Yes, beekeepers usually prefer the natural aroma but customers may have other ideas about colors and scents. Use your imagination and make some beeswax leaves, flowers, berries for decorating your candles.

I had mentioned the settlers using beeswax. Tallow candles burned with a sooty, somewhat smelly flame and burned for a short time. No wonder beeswax was preferred.

2 Beeswax ornaments have been made and used in other countries, such as Germany, for a long time. Some of them are painted and make a colorful addition to Christmas trees. However, ornaments can be matched to other holidays and some can be for no occasion at all – just something pleasant for decoration.

As you look through the beekeeping supply catalogs you will see molds for ornaments. You can also make your own. Look through cooking and baking catalogs. Some of the cookie molds make excellent wax ornaments.

Special paints are needed for beeswax ornaments. These can be obtained from candle supply catalogs.

3 Beeswax as lubricant. You can buy a mold for making small one-ounce beeswax bars. Beeswax is not drippy and messy like oil and it does not leave stains. Therefore a bar can be rubbed on the sides and runners of drawers in wooden furniture.

Since beeswax does not corrode metal it makes an excellent lubricant for screws and nails. One trick to keep screws from falling off the screwdriver is to put a tiny amount in the slots.

Rubbing a small amount of beeswax on the sides of a handsaw will make it glide through a board.

Zippers, especially in heavy outdoor clothing, frequently seem difficult to zip. A small amount of beeswax will help them to travel smoothly.

The settlers used beeswax as a lubricant in working with metal, such as boring the hole in a rifle barrel.

4 Quilters frequently use beeswax to coat their thread. The wax keeps the thread from tangling and makes it easier to pass through the quilt batting. However, if you are making blocks for sale to quilters and tailors it should be clean, light-colored wax such as that from cappings wax.

Sewing a button back onto to a thick, tightly-woven fabric can be difficult. So keep a small block of beeswax with your needles and threads.

5 Beeswax makes excellent waterproofing for leather. For work boots and hiking boot, melt a small amount and apply where the sole meets the uppers. Beeswax can also be applied to leather boots or other leather articles.

Beeswax was extremely valuable to the settlers since it was their only source of waterproofing.

6 Woodworkers frequently have metal tools that are used only occasionally and therefore may develop rust over time. The tools can be coated with beeswax and stored safely.

Excess wax can be removed before use.

7 Cabinetmakers, for centuries, have used beeswax in their finishes for wooden furniture. Beeswax, melted into furniture finishing oils, gives a lustrous waterproof finish to fine furniture.

8 Beeswax has been used in cosmetics for several thousand years. It is a safe wax that does not cause allergies. Containers for hand creams and lip balms are available from beekeeping equipment suppliers.

LIP BALM

3 tablespoons + 1 teaspoon sunflower oil
1 tablespoon (1/2 ounce weight) grated beeswax
essential oil or flavoring, optional

In a double boiler melt the oil and beeswax together. Add essential oil or flavoring if desired. If using essential oil, add 10 drops *maximum*. Pour into small containers or tubes.

HAND CREAM

¼ cup beeswax
¼ cup coconut oil
3 tablespoons baby oil
1/3 cup glycerin

Melt the beeswax and coconut oil in a double boiler. Add remaining ingredients and heat and stir until mixture is smooth, about four to six minutes. Pour into a container while still hot. It will harden as it cools.

9 Beeswax can be used as a preservative. It can be eaten safely. A very thin coat on some fruits, such as apples, and on vegetables, such as cucumbers, will keep them from dehydrating so quickly.

Hard cheeses can be covered with a thick coating of beeswax that can easily be peeled off before slicing.

10 Reenactments of various battles, wars and other events are very popular and are gaining members. Such reenactments are also attracting a growing number of visitors. A good reenactor uses clothing and equipment identical to the period being reenacted.

Metal canteens were in use during the 19th century but the seams of the canteens were difficult to make and furthermore the canteens had a hard life of being banged about. So the canteens leaked. To fix this problem the canteen was warmed; beeswax was melted in a small container then poured into the warm canteen, sloshed around and the excess poured out. Thus, today's reenactors coat their canteens with beeswax in the same way. The reenactors of Roman battles coat their pottery containers with beeswax.

11 Make a floor-sweeping compound for cleaning up dusty floors in garages and workrooms. It can be used repeatedly until it becomes too dirty.

SWEEPING COMPOUND

Measure parts by weight.

1 part beeswax (can use discolored wax)
10 parts dry sand
5 parts sawdust
4 parts light motor oil

Melt the wax and oil together in a double boiler. Stir the mixture into the sawdust and mix well. Add the sand and more sawdust if the mixture is too damp. Sprinkle this mixture on a floor and use a push mop to sweep. **Do not store this floor-sweeping compound near flames or extreme heat.**

12 Beeswax has been used in art for many centuries. The wax can be carved or molded and then kept as an artwork or can be used in the lost-wax casting for metal figures. Batik, using wax to resist dyes, produces beautiful fabrics to be used as clothing or wall hangings. A few simple tools and a way to heat colored wax give encaustic paintings. The Ukrainian decorated eggs called pysanki also uses wax to resist dyes. Traditional patterns for the designs can be found or you can create your own.

These 12 ways are just a start in your list of uses for beeswax. However, one use you may never use but still enjoy. Have you ever visited a wax museum with figures of famous (and even infamous) people? These wax museums have existed ever since Madame Tussaud opened hers in London in 1835. Today beeswax is still used to give the sculptures their lifelike quality. BC

Ann Harman keeps bees and uses all of her extra beeswax at her home in Flint Hill, VA.

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BUILD AN INNER COVER

Ed **Simon**

The inner cover is placed between the top super and the telescoping cover. Its main use is to stop the bees from gluing the telescoping cover to the top hive body making it impossible to remove the telescoping cover without a sledge hammer. It is also used as a support for feeding pails. Most commercial inner covers have intricate corner joints. But, a joint is a joint is a joint. Fancy is neat but it is not needed. Here is an easy to construct inner cover that doesn't require any more skills than an average person has.

Parts (Thickness x Width x Length)

1. ¼" x 16¼" x 19⅞"– Cover base - hard board or any thin wood.

The thickness does not matter.

2. ⅛" x ¾" x 19⅞" – Thin rim sides (2)
3. ⅜" x ¾" x 19⅞" – Thick rim sides (2)
4. ⅛" x ¾" x 16¼" – Thin rim ends (2)
5. ⅜" x ¾" x 16¼" – Thick rim ends (2)

A 4' x 8' sheets of hardboard or thin plywood available at most lumber supply stores will make ten inner covers.

Construction

Step 1: Cut the cover base (part #1) from a sheet of hardboard or plywood. The thickness of this part is generally of no consequence. It is normally made of thin wood or a hard board type material. No part of the inner cover will be exposed to the elements.

Step 2: Drill a 2 ¾" hole in the center of part #1. This is to allow access to a pail style feeder from the supers. It also allows for ventilation during the hot months. If you don't have a large drill, drill multiple small holes

Hint: To find the center of the base, draw lines from the opposite corners. Where the lines cross is the center.

Note: If you are going to use a bee escape with this cover then cut the hole to fit the bee escape.

Step 3: Cut parts 2, 3, 4 and 5 from a piece of standard 1" (¾") lumber.

Step 4: Place a part 2 on one side of the base and a matching part 3 on the other side of the base. Stagger the corner positions so the parts are placed as shown in the accompanying picture. Align the parts with the edge and then glue and nail the parts in place. Work your way around the base until all the edges are glued and nailed in place.

Hint: Use a glue gun to fill in any cracks where the wood joins. A little crack is a great hiding place for ants.

Step 5: Trim the extended tails off of the rim pieces. Then if needed, use a sander to smooth the corners.

Step 6: Paint the surfaces of the wood with your free recycled paint. Although the inner cover will not be exposed to the weather, painting them makes them easier to clean.

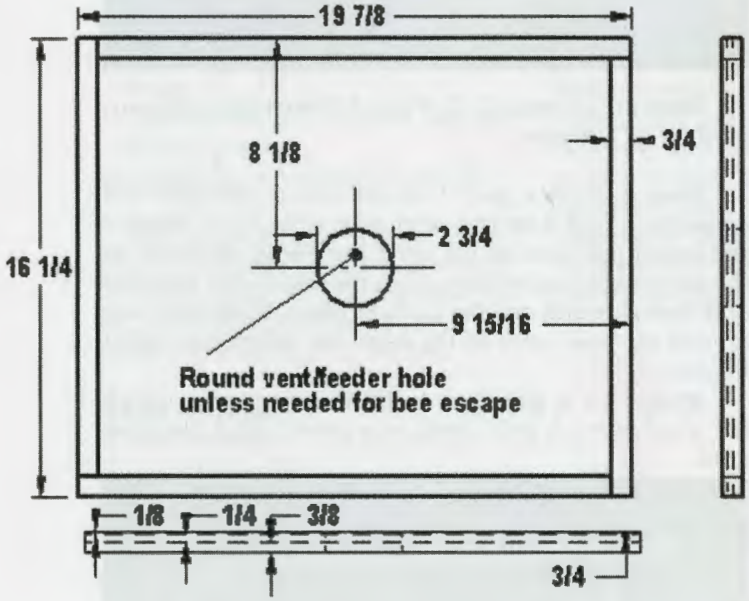
Usage

The inner cover is placed between the top hive body

and the telescoping cover. Its main use is to stop the bees from gluing the telescoping cover to the top super making it impossible to remove the telescoping cover. It is also used as a support for feeding pails. In the summer the thin rim is toward the hive body to reduce the bee space and hopefully reduce comb building. In the winter the thick rim is toward the hive body to allow for easier movement of the bees when they need to get access to the honey and feeder.

The inner cover is easy to build and saves you money at the same time. BC

This article is the fifth in a series that provide instructions on how to build a complete bee hive. Get a copy of Ed Simon's book *Bee Equipment Essentials* with detailed drawings, construction hints and how-to-use instructions for dozens of beekeeping tools and equipment from ***www.wicwas.com***. Ed can be contacted through ***Ed@TheBeeShed.com***.



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ROSS HEXAGONS

Ross **Englehart**

Last year I decided to do an experiment that required the cooperation of my bees. I thought it would be cool to have comb honey sections in the shape of hexagons.

I custom made a medium frame, and a deep frame with hexagon "cells". The medium frame was designed to have four hexagon cells, and the deep frame eighteen plus cells.

For the deep frame, I drew the hexagonal pattern onto paper. Next, I transferred the pattern onto ¼" plywood by laying the pattern on the plywood, and using pushpins to outline each hexagon. The pushpins made holes in the plywood, and after removing the pins, and paper, I connected the "dots" (holes) with a pencil. I had to do this procedure two times for the deep frame. For the medium frame, I drew four hexagons directly on the plywood.

The next step was to cut out the hexagons with a jig saw. This took many hours of patiently sawing so I would not cut into the borders of the hexagons. Since each panel was cut out separately, I clamped two panels together in order to file away areas that did not match up.

I purchased sheets of beeswax to use as foundation. The sheets were cut to size, and then sandwiched between the two panels of the medium hexagonal plywood frame, and the two panels of the deep hexagonal plywood frame. The panels were secured with screws. Top bars from Langstroth frames were attached to the panels, thus completing the medium, and deep frames.

My part of the experiment was now complete. The next part was up to my bees. Would they cooperate, and accept these Ross Hexagons by drawing them out, and filling them with honey? I would have to wait for their answer since the nectar flow was two months away.

The medium, and deep hexagon frames were inserted into honey supers at the onset of the nectar flow. Impatiently, I waited for the bees to draw out the foundation, and fill them with honey. After months of anticipation, it was time to inspect their progress. To my dismay, the bees did not accept the Ross Hexagons, but chewed holes through the beeswax foundation! Bummer, my experiment was a flop! Wait, I thought to myself, there is always next year.

This Spring I decided to just try my luck with the medium hexagonal frame. My wife was doubtful, but after all the work I had done, I had to try once more. The frame was placed into a strong hive that had survived two Winters.

It was a good year for honey production from this hive (68 lbs. extracted, and two medium supers of honey left for the bees). To my great delight, the bees cooperated. They had repaired the holes in the beeswax foundation, and filled all four hexagons with beautiful white capped honey. Wanting to display this marvel, I made a case from a walnut tree that came from my neighbor's yard.

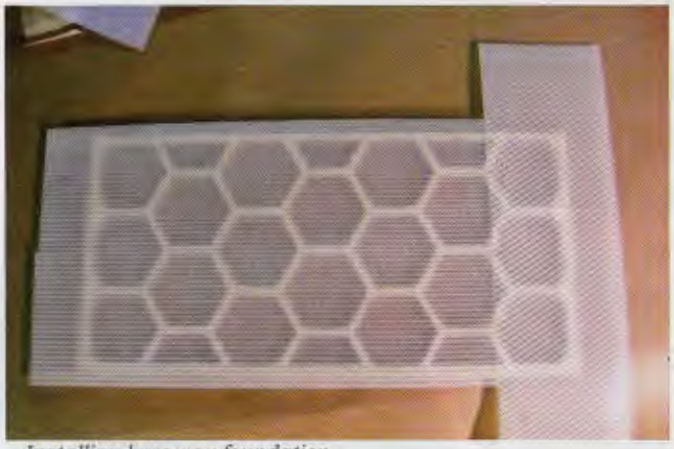
Our Howard County Beekeepers Association hosts a Bee Booth each year at the Howard County Fair in Maryland. I entered the Ross Hexagons in the "Frame of Honey" category. To my surprise, it won a first place ribbon!.

Transferring hexagon pattern to plywood.

Cutting out hexagons.

Cutting out hexagons.

Clamping panels together for filing mismatched areas.



Installing beeswax foundation.

Completed medium frame.

Completed deep frame.

Next year I will try again with the Ross Hexagons deep frame, and hope that the bees like it as much as they did the medium frame. BC

Ross and Leslie Englehart are members of the Howard County Beekeepers Association, and the Maryland State Beekeepers Association. Their apiary is located in Dayton, Maryland

Frame of honey – first place winner.

Ross Hexagons ready for next year (display case hand-made from maple).

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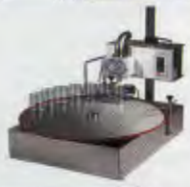

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SMALL CELL DEVELOPMENT TRIAL

Ross **Conrad**

Introduction

The health of European honey bees (Apis mellifera) in the U.S. has eroded in the past decade. Since 2006 beekeepers throughout North America have lost approximately a third of their colonies each year (vanEngelsdorp et al. 2013). This phenomenon does not seem to have a single cause and has therefore been termed Colony Collapse Disorder (CCD) (vanEngelsdorp et al. 2007). One of the few consistent factors that have been identified in nearly all CCD cases is that bee's immune systems are compromised and severely stressed. One of the primary stress factors bees have to deal with is the stress imposed by parasitization of *Varroa* mites (*Varroa destructor*). The use of chemicals to control *Varroa* have been found to accumulate in beeswax comb and have sub-lethal effects on hives reducing the colonies overall health and vitality (Maryann Frazier, et al., 2008).

If new approaches to controlling *Varroa* mite predation on honey bees can be found that do not rely on toxic pesticides it will certainly help beekeepers. This would be beneficial for the bees, the beekeepers and the farmers and gardeners that rely on honey bee pollination.

It has been proposed that foundation with brood cells sizes larger than exists naturally, honey bees have become more susceptible to damage from *Varroa*. One theory is that the larger cell size of the commercial comb typically used today (5.4 mm) allows the mites more room to move around within the birthing cell of the bee, facilitating mite reproduction. In contrast, smaller sized cells (4.9 mm) would not provide enough room for mites to reproduce as easily. This theory has been tested in numerous studies and trials that have raised colonies on small cell (4.9 mm) and standard comb (5.4 mm) and then compared the total number of mites found in each colony. Of the five trials that have shown some level of benefit in reducing mite populations in hives raised on small cell comb, three of them were done on bees with African honey bee genetics and only two (Oliver (2008) and Maggi et al. (2010)) were conducted on European honey bees. Meanwhile, there are numerous studies using European honey bee stock that do not show a correlation between small cell size and lower mite infestations (Davidsson (1992), Fries (2004), Liebig & Aumeier (2007), Dahle (2008), Taylor et al. (2008), Ellis et al. (2009), Wilson et al. (2009), Coffey et al. (2010), Berry et al. (2010), Seeley & Griffin (2010)).

One might conclude from the evidence that small cell comb does not negatively impact the ability of *Varroa* to reproduce in honey bee colonies. However, this is not reflected by the many beekeepers that have converted to small cell hives and report anecdotally that their colonies handle *Varroa* pressures much better without any miticide treatments.

There is another mechanism that may account for the apparent ability for hives with small cell comb to better handle *Varroa* mite stress. The average development time from egg laying to adult emergence is generally considered to be 21 days for European worker bees. The *Varroa* mite's natural host, the Eastern honey bee (*Apis ceranea*), is a smaller bee that builds combs with a smaller cell size than European honey bees and has a shorter development time from egg laying to adult emergence. This shorter development time represses *Varroa* reproduction and prevents the mites from building up in population and overwhelming colonies as they do in European honey bee hives. It has been theorized that a smaller cell size in European honey bee hives will similarly reduce the time between when the egg is laid and when the mature bee chews its way out of its birthing cell and this would help suppress mite reproduction in European honey bee colonies.

Supporting this theory are observations reported by beekeeper Michael Bush who reports observing the development time of European honey bees in an observation hive at only 19 days, rather than the more typical time of 21 days; and brood cell capping on the eighth day of development rather than on the 9th day as is considered typical for *Apis mellifera*. (Bush 2004-2011). Stiglitz and Herboldsheimer also report shortened development time in small cell bees compared to the accepted average generally considered to be normal (Stiglitz, Herboldsheimer, 2010). Dee Lusby of Arizona Rangeland Honey has suggested her experience indicates that small cell comb of 4.9 mm will produce bees that can survive *Varroa* infestation year after year without the need for treatments of any kind, (Erickson et. al. 1990, Flottum, 1998). Unfortunately these reports are anecdotal and I could find no trials to date that have tried to duplicate and test these observations. Although

I am a beekeeper and not a scientist, I decided to run some trials to test the ability of comb derived from small cell foundation to impact brood development time.

Materials and Methods

Two trials were run in 2012 and 2013 to test the hypothesis that honey bees raised on small cell comb (4.9 mm) will develop from egg to adult faster than bees raised on today's standard comb (5.4 mm). Frames of wax comb built by bees from standard large cell foundation, and combs derived from small cell foundation along with bees from my own apiary were used to test this hypothesis.

I obtained two Ulster Observation hives from Brushy Mountain Bee Farm in North Carolina. Two frames of drawn comb (one made from 4.9 mm small cell foundation (Betterbee, Greenwich, NY) and one made from standard 5.4 mm foundation (Dadant and Sons, Hamilton, IL) were selected from my equipment for each trial. One half of the comb in each frame was removed and switched with half the comb in the other frame. Above the queen excluder in each observation hive I installed the frames composed of half comb with cells that were drawn from standard 5.4 mm foundation and half with cells drawn from 4.9 mm foundation.

A total of four hives were selected at random from my apiary (two for 2012 and two for 2013), and five frames of bees, brood, honey and pollen were removed from each hive and installed into the bottom compartment of each observation hive. Both hives appeared healthy and normal even though low levels of *Varroa* mite infestation were visible (phoretic mites). No effort was made to monitor mite infestation levels.

The queen from each hive was placed on the upper comb, above the queen excluder in each observation hive. Workers were allowed to naturally make their way through the excluder separating the brood and food combs from the queen. The queen in each observation hive was observed and the time and day that various eggs were laid in both comb derived from small cell foundation and the comb derived from standard foundation was recorded. The surface of each observation hive window was marked in order to help identify the cells under observation for the duration of the trial.

Beginning 18½ days following the laying of the first eggs in the cells under observation the hives underwent manual surveillance until all the cells under observation hatched. All cells under observation were viewed every 15-30 minutes, 24 hours a day until the developing brood it contained hatched. The date and approximate time that each cell was vacated by the newly hatched bee was recorded. All development and capping times recorded and calculated were rounded off to the second decimal point.

All colonies were given access to the outdoors and allowed to forage naturally during the trials. The pairs of hives were kept together within the same vicinity of each other throughout each trial in order to help reduce the impact in variations in temperature and humidity between the hives.

Results

During the first trial (May 30-June 21, 2012) data on comb derived from both 5.4 and 4.9 mm foundation was obtained from hive #1, while only data on comb derived from 5.4 mm foundation was obtained from hive #2. During the second trial (July 13-August 11, 2013) data on both types of comb was obtained from hive #3, while only data from comb derived from 4.9 mm foundation was obtained from hive #4.

Although an attempt was made to collect data on both types of comb in all four colonies, numerous obstacles prevented data from being collected on all the cells in which queens were observed to lay eggs during the trials. Obstacles included, burr comb obstructing the view of the cells, clustering bees obstructing view of the cells, cannibalization of eggs by workers, and early brood removal by workers (*Varroa* Sensitive Hygiene (VHS) trait).

Development Times

In hive #1, the average development time for the eggs laid in comb derived from 5.4 mm foundation was 19.57 days (range 19.49 days to 19.68 days). For eggs laid in comb derived from 4.9 mm foundation, the average development time was 20.67 days, (range 19.91 days to 21.56 days).

In hive #2, the average development time for the eggs laid in comb derived from 5.4 mm foundation was 20.74 days, (range 19.85 days to 21.7 days).

Hive #3 had an average development time of 20.12 days for eggs laid in comb derived from 5.4 mm foundation (range 19.25 to 21.22 days). For eggs laid in cells derived from 4.9 mm foundation, the average development time was 19.73 days (19.62 - 19.95 days).

Hive #4 produced an average development time of 20.07 days for 4.9 mm foundation (range 19.85 to 20.32 days). To my surprise, two 4.9 mm derived cells under observation in hive #4 had to be dropped from the trial after the capped cells were vacated after about 13 days. This observation seems to indicate that my efforts to breed the VSH trait into colonies that make up my apiaries may have produced some success.

When the results from all hives were combined, the over-all average brood development time for brood cells in comb derived from 5.4 mm foundation was 20.05 days, while the over-all average development time for brood cells in comb derived from 4.9 mm foundation was 20.19 days – about a 3.5 hour difference.

Capping Times

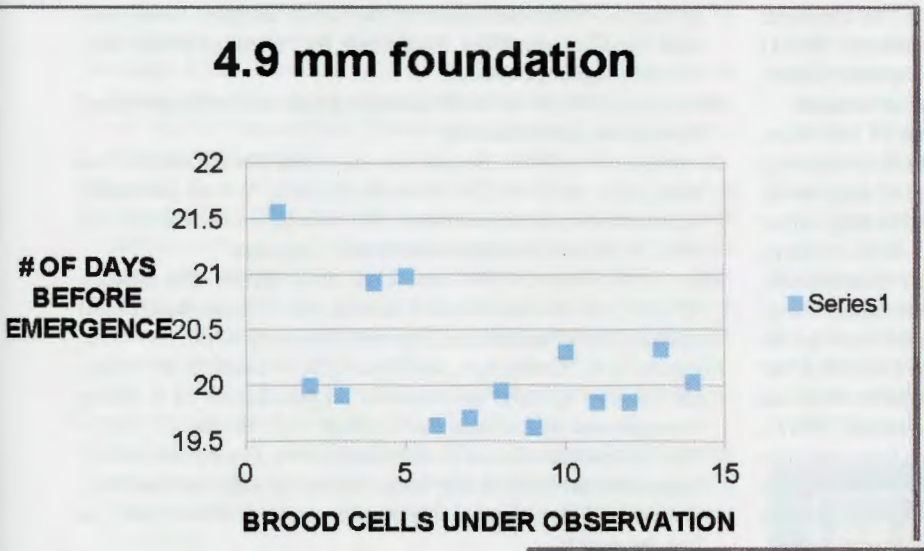
During the 2013 trial, the capping time of a number of cells was also noted. Hive #3 produced an average capping time of 8.3 days for cells derived from 5.4 mm foundation (range 7.47 to 9.19 days). In cells derived from 4.9 mm foundation, the average capping time of the brood under observation was 7.98 days (range 7.92 to 8.11 days).

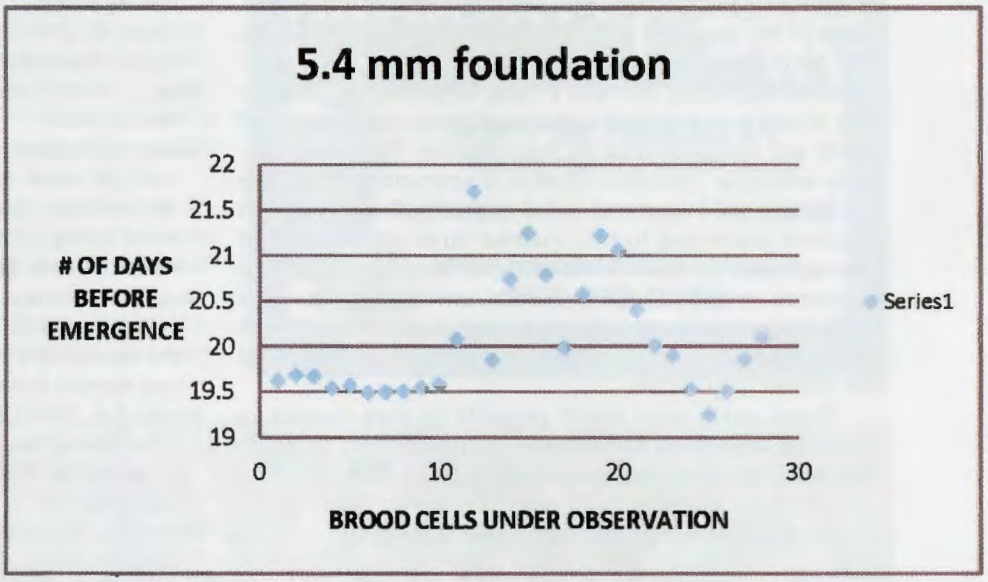
In hive #4, the average capping time raised in comb derived from 4.9 mm foundation was 8.17 days (7.91 to 8.5 days).

The combined average capping time in hives 3 and 4 for brood raised on comb with 4.9 mm foundation was 8.1 days, compared to capping time for brood raised on comb derived from 5.4 mm foundation of 8.3 days – about a 5.2 hour difference.

Discussion

The observations reported by Bush, Stiglitz, and Herboldsheimer of brood cells in small cell comb taking about eight days before being capped and honey bee brood





DEVELOPMENT TIME
4.9 mm Foundation – 20.05 days
5.4 mm Foundation – 20.19 days

fully developing into the adult stage in about 19 days was confirmed. However, the results of these two trials do not support the theory that bees raised on comb built from small cell foundation reduces the bee's development time from egg to adult. The shortest brood cell capping time of 7.47 days (Hive #3) and the shortest brood development time of 19.25 days (Hive #3) were both observed in brood cells derived from 5.4 mm foundation. When the development times from all four hives was averaged, the large cell comb (5.4 mm) had a lower average time than the small cell comb (20.05 days vs. 20.19 respectively).

It appears that there are many factors that impact the development time of the honey bee including brood nest temperature, humidity levels, and nutritional stress from under feeding (Winston 1987), all of which may be effected by the population strength of the colony. Additional variables that impact brood development include chemical contamination of the brood comb (Wu, et. al. 2011, Mussen and Brandi 2010) and honey bee genetics (Winston 1987), If cell size is a factor in the length of time of honey bee brood development, it does not appear from these trial results to be significant compared to these other factors.

It should be noted that this trial has several limitations that may have impacted the results. The overall number of cells under observation was small. This problem was exasperated by the fact that not all cells originally marked for observation were able to be viewed throughout the length of the trial.

Another variable that was unaccounted for was the difference in age and potential chemical contaminants of the brood combs used during the trials. No effort was made to test the combs used for potential contamination levels. While full sheets of commercial foundation were used in all frames of comb, the only treatments the combs could possibly have been exposed to at some point were: thymol (ApiLife VAR), formic acid (Mite Away II/ Mite Away Quick Strip), powdered confectioner's sugar, and/or Honey-B-Healthy. In 2012, the comb derived from 4.9 mm foundation was a much lighter color than the older and darker comb derived from 5.4 mm foundation. During the 2013 trial, an attempt was made to try and address this difference by using combs that were a similar shade of color.

These trials only focused on worker brood. Varroa mites are six to 12 times as likely to prefer to raise their young on drone brood rather than worker brood. This may be due to the fact that mortality among mite offspring is much lower in drone cells and the number of new viable female offspring produced by each foundress mite follow-

ing drone brood cell invasion is about twice the amount that can be produced in worker brood. (Martin 2001) Thus, observations of the capping and development times of drone brood may provide more meaningful results.

I did not expect to find that regardless of cell size, hives in my apiaries have lower average brood capping and development times (approximately one full day each) compared to the widely accepted average of nine days after the egg is laid before the brood is capped, and 21 days from the time the egg is laid to adult worker emergence. There is considerable variation in the time it takes a fertilized European honey bee egg to develop and emerge as an adult worker. Variations that have been recorded for worker development from egg to adult emergence from as little as 16 days to as long as 24 days. (Winston 1987). Since the ability of *Varroa* mites to reproduce successfully is impaired as the brood development time shortens, bee stocks whose average development time is shortened can be expected to exhibit partial resistance to *Varroa* mites. Hives in my apiaries with truncated development times may help to explain the consistently higher than average over-wintering success I have experienced, despite only using natural and organic mite controls, some of which are considered to be less effective than commercially available synthetic chemical acaracides. Over the last four years I have not used any mite treatments on my hives preferring to rely instead on a combination of management controls consisting of stock with proven resistance, screened bottom boards, making regular splits or nucleus colonies, regular replacement of old comb, and culling and destroying capped drone brood all to control the *Varroa* population.

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Ross Conrad is the Author of Natural Beekeeping.

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GREEK BEEKEEPING

Heidi **Fuller-love**

The home of the world's healthiest diet is also the place where award-winning honey has been produced since Minoan times. Heidi Fuller-love heads to the mythical island of Crete and meets a Greek couple who raises bees to make honey.

A loud buzzing greets us as we enter from the bright sunlight into Giannis' dim lit barn. "The bees won't harm you – they only sting bad people," he tells me. Dipping a spoon into a large earthenware crock-pot he gives me a spoonful of honey to taste. Rich and golden, it oozes with the fragrance of thyme and origano herbs that flourish like weeds on the surrounding mountains.

Honey has been top of the menu here in Crete since ancient times, and though the origin of beekeeping is unknown, rock art showing honey hunters dating back several million years has been discovered in countries, such as India, Egypt and Greece. Hives, honey extractors and other beekeeping equipment were found at the Minoan Palace of Knossos, and information about beekeepers documented by ancient Greek writers, such as Aristotle, has proven beekeeping was a big industry on Crete – and in Greece – in Minoan times.

Before moveable-comb hives were invented, honeycombs were fixed, providing simple shelters for bees much like wild hives. Because it was difficult to harvest honey from the roof and walls of these structures without destroying the bee colony, farmers killed most of the bees during the harvesting process. In the 19th century, however, Lorenzo Lorraine Langstroth, a descendant of English parents who immigrated to the United States, invented a beehive with removable combs, revolutionizing beekeeping.

In Europe and America today, there are more than 25,000 species of wild bees according to the International Bee Research Association, but the species preferred by most apiculturists is the western Honey bee or *Apis mellifera*.

The western Honey bee is not native to America but was imported from Europe in the early 1600s for honey and pollination.

Combs of Crete

Based in the tiny mountain village of Armeni on the beautiful Greek island of Crete, Giannis Tsouganakis comes from a family that has been keeping bees for three generations. "My grandfather used to take me to the hives, and he'd tell me, 'Don't be scared. Bees sense if you're scared, and they will sting you,'" Tsouganakis says with a chuckle. "I got stung, of course."

A friend of Tsouganakis, Athens-based beekeeper Adonis Koutsouras, who is on holiday in Crete, explains, "I used to watch Giannis with his bees and really envy him, but I never thought I could have any myself because I live in a big town. Then I saw this program on TV about urban beekeeping and that got me started. Now, I have eight hives and produce and sell more than a thousand jars of honey per year."

Where to Bee-gin

The Honey bee, a discreet insect clad in brown-striped fur, is the main honey-producing bee in Greece.

With its diversity of landscapes, climates, soil types and plant life, Greece is an ideal country for raising bees. "The best thing is that you don't need much equipment to get started," says Tsouganakis. "The main thing you need is a piece of land where bees can fly back and forth without bothering neighbors. You also need some hives, good weather to stimulate flower growth, a healthy colony of bees and a honey extractor."

Tsouganakis' hives each consist of a wooden box with an outer cover coated in latex paint to protect against bad weather and an inner cover that insulates the hive and pre-

vents bees from attaching the outer cover to the top box with propolis. This box is filled with frames of comb – where bees store their surplus honey, which is later harvested – and other combs where they store honey for their own use.

Tsouganakis provides the queen her own chamber fitted with a small grill called a "queen excluder," which stops her from leaving the brood nest.

"I make all my own hives," says Tsouganakis. "It's very easy to do, and it costs me far less money."

Perhaps Tsouganakis' (as well as any other beekeeper's) most costly piece of equipment is his honey extractor, a tub that extracts honey using centrifugal force. Even so, Tsouganakis' friend has found ways to save when purchasing these items, such as buying from online auctions. "I bought a lot of my beekeeping equipment on eBay," says Koutsouras.

Tsouganakis repairs his equipment.

Start a New Colony

Never having purchased bees for his hives, most of Giorgios' bees were started from the family hives; however, he "tops them up" (aka supplements them) with bees he collects from wild colonies.

If you don't have a heritage colony to build on, you can buy a complete colony, which includes 10 to 12 frames, a fertile queen, workers, brood, food stores and drones; however, for beginner beekeepers, it's probably better to buy a nucleus (four to five frames with a fertile queen and brood in all stages of maturity), where the number of bees is smaller. Many bee-breeding companies produce hybrid strains like the Buckfast bee or others that are resistant to parasites, but bear in mind that this resistance will diminish in succeeding bee generations.

"If you buy an existing colony, check that the woodenware is clean and the wood isn't rotten. When you open the colony, the bees should be calm and the queen's eggs should lay in a clear pattern so that there are few skipped cells," advises Tsouganakis .

A cheaper option for experienced beekeepers is to capture a wild swarm from a tree by placing a bucket below the swarm and spraying the bees with sugar syrup. Shake the branch so that the bees fall into the bucket, then cover the bucket and take your swarm back to its new hive. "I've done this several times, but you really need to know what you're doing if you don't want to get stung," says Tsouganakis. This option is best left to the experienced apiarist who knows how to catch the bees.

Whether your hive is bought or captured, you'll need to feed your relocated bees syrup (made of one part sugar, one part water) until they are settled. After that, however, you shouldn't feed them again unless their own honey supplies are low, which is typically following the harvest of a honey crop.

Home Sweet Home

Along a narrow path fringed by waist-high dry stone walls and lined with small white-sailed windmills that are used to pump water from the region's wells is Tsouganakis' xipo, aka garden. Situated near the garden and shaded by blossoming apple trees, several dozen hives sporting finishes in reds and blues stand in a semicircle. Beyond them, large clumps of rosemary and thyme are coming into flower and are buzzing with hundreds of bees.

Though bees can travel a mile or more to find pollen and nectar, it's best to have flowers and plants as close as possible to the hives. "If the food source is closer to the hives, the bees will spend less energy seeking it

Tsouganakis' Honey Cake

2 tsp. baking powder
1 cup flour
1/4 teaspoon salt
3/4 cup butter
3/4 cup sugar
3 eggs
1 tsp. cinnamon
1 tsp. orange zest
1½ cups chopped walnuts

HONEY SYRUP FOR TOPPING
1 cup honey
1 cup sugar
3/4 cup water
1 teaspoon lemon juice

Preparation
Grease a 9- by 13-inch cake tin, and preheat oven to approximately 350°F. Mix baking powder, flour, salt, cinnamon and orange zest. Set aside. In another bowl, combine butter and sugar until creamy. Add eggs one at a time to butter mixture, stirring the batter after each addition, then add flour mixture and milk. Finally, add walnuts. Pour into cake tin, and bake for 40 minutes. Honey Syrup Put honey, sugar and water in saucepan, and simmer for five minutes. Add lemon juice and pour over warm cake. Serve warm or let cool and store for later.

Using an uncapping fork for stubborn cappings missed by the uncapping knife.

out and have more energy to produce honey," says Tsouganakis.

He recommends choosing a site that's sheltered from winds and partially shaded, but not somewhere that is damp in Winter. Place the hives facing south to maximize the number of sunlight hours.

He also suggests providing a safe source of water for the bees. In the mountain villages in the eastern part of Crete, small windmills are used to pump water out of deep wells; the water is then placed in basins for the birds to drink. "You need a source of water, which keeps the hive cool and dilutes the honey, but you should fill it with bits of floating wood or Styrofoam chips so that if the bees fall in, they can crawl up onto them and they won't drown," says Tsouganakis.

Getting into gear

Pictures of beekeepers dressed in hazmat-like attire might bring a smile to your face, but protecting yourself when you tend to your bees is no joke. "If one bee stings, it releases a pheromone that acts as a signal for the whole colony to attack, so you should be careful to cover up," warns Tsouganakis.

If you don't want to invest in a full suit, a bee veil that covers your face and neck is a must. Wear light-colored clothes – bees are attracted to dark colors – and make sure that your trousers are tucked into your socks. Beginner beekeepers should also wear gloves, which they can shed once the bees become accustomed to their presence. Regardless of your attire, you're bound to get stung in the beginning, so ensure that you're not allergic to bee stings before you order bees or hives.

Another vital piece of equipment is a bee smoker. Fueled with pine, straw or grass, this metal and leather bellows pours smoke into the hive and calms the bees. "You should always have a smoke machine on hand because it makes bees docile, but be careful you don't overdo the smoking, because you could drive the bees away from the hive," says Tsouganakis.

Honey Harvest

Nowadays, successful bee farmers harvest a lot more than honey: Pollen, royal jelly, propolis, beeswax and even crop pollination provide valuable extra income for apiculturists. Protecting your bees from pests, such as *Varroa* mites and American Foulbrood, can be difficult, especially when you're trying to avoid negatively impacting honey quality. "You don't just harvest the honey; you have to make sure that there are no diseases inside the hive," says Tsouganakis. "Before I harvest honey from July to October, I don't treat my hives because I don't want to contaminate the honey, but after harvest, I use the latest treatments to control those pests."

When the long-awaited honey harvest arrives, Tsouganakis, clad in his protective clothing and armed with a smoker, removes the supers from the hive and brings them home. Using a heated blade called an uncapping knife, he carefully removes the wax sealing the honey into each cell on the frame, places the frames into his honey extractor, then sits back and watches the liquid gold flow out into a bucket beneath as the extractor spins the frames.

After straining several times to make sure it's pure, the extracted honey is left to settle for a few days, then bottled in clean jars, ready for home consumption or to sell for a tidy profit. "It's wonderful! It's the moment every beekeeper looks forward to. It even makes you forget the stings," says Tsouganakis with a laugh.

In addition to growing and selling vegetables, Tsouganakis sells his honey from his house in Armeni on the island of Crete and on Tuesdays at the farm-produce market held in the east Crete town of Sitia. BC

Heidi Fuller-love (www.heidifuller-love.com) contributes to a mix of publications worldwide and owns an olive tree small-holding on the glorious island of Crete. She is the author of East Crete *magazine (**www.eastcretemagazine.com**) currently working on the project of creating a tour company dedicated to travelers who wish to discover beekeepers and their smallholdings overseas.*

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CALCULATING QUEENS

Buddy **Marterre**

A Spreadsheet Calendar For Queen Rearing

Many small scale beekeepers have realized the advantages of rearing a few queens for themselves or for nuc production. But this is a daunting task for many of us. Most don't wish to read Laidlaw and Page[1], even though it's the "Gold Standard." And although there are easier, more up-to-date books available[2,3] are my personal favorites] as well as resources on-line, the whole queen rearing calendar thing is still an area of concern for most of us.

Once you've decided which method of queen rearing you will use, how many days do you need to wait after your queen cells are capped before you look for successful mating? Do you just look for eggs or do you need to wait longer before you sell that queen or nuc? What calendar system do you use? Any at all? Do you just take a monthly calendar and circle dates? Do you use an old-fashioned wheel? Do you put reminders into your smartphone's calendar? Do you just guess? Do you know when a drone's sperm counts peak? Or on which days after emergence a virgin queen will take her mating flights? How do you decide when you can begin the queen rearing process in the Spring?

If you have a very basic understanding of Microsoft Excel, you can use one of the templates I've written. I have one spreadsheet for Egg Frame Transfer (which is a simple and easy way to rear just a few queens and is essentially what you do when you do a split), one for the Swarm Box method and another for the Cloake Board method. Either of these last two electronic calendars are nice if you are either grafting (which few of us hobbyists ever care to learn) or have a bedroom chamber kit (which is really "no-touch" grafting). If you're rearing a bunch of queens and don't wish to use a swarm box, the Cloake Board method is great, but keeping track of what to do when in that method gets difficult in a hurry! The spreadsheet removes all the guesswork. It tells you exactly what you need to do and what day to do it. All you have to do is fill in the day that you graft with the Swarm Box method, or transfer your frame containing eggs with Egg Frame Transfer method, or cage your queen in the bedroom chamber with the Cloake Board method, and it calculates the rest. All three spreadsheets will be available on the *Bee Culture* website for your free download. Go to **www.beeculture.com** and start trying them out for yourself after reading this article. It's easy. And if you know Excel, you can modify them for your own use. I will concentrate the rest of this article on the Egg Frame Transfer method, because it is what most hobbyists do.

It is not my intention to comprehensively teach you how to rear queens, but I will cover some basic queen rearing and mating biology to help explain the need for a calendar. I'll also give you some of my personal opinions on the subject. A note about my notation: Of course queens lay eggs continuously (such as at both 11:59 PM and 12:01 AM the next day), and development periods are only averages (they can vary by about one day shorter when the broodnest is very warm to a few days longer when it's cold) but we have to use some system. I use Day 0 as the *day* on which the egg was laid and move forward from there to emergence; I also label the stage of development. For example, for workers, there would be Day 0 to Day 2 Eggs, Day 3 to Day 8 Larvae (the egg hatches at the beginning of Day 3), and Day 9 to Day 20 Pupae. The adult worker bee emerges – in the average broodnest – 21 days after the egg was laid. It is 16 days for a queen and 24 days for a drone to emerge.

You want to rear the biggest queen you can. Period. Bigger queens have a bigger spermatheca and therefore hold more sperm and are even better mated than smaller queens[4, 5]. Plus, they have a greater number of ovules, so can produce more eggs. And queen size is ALL based on the nutrition they receive during the first four days that they are a larva. So you only have a four day window of royal jelly feeding for your potential new queen to be big and beautiful and lay lots of eggs for two or three years! Therefore you need to ensure that your queen rearing system contains LOTS of bee bread AND nurse bees so that those queen larvae are fed lots of royal jelly during that entire time. Bee bread (that moist, predigested pollen) is a lot better than dry pollen or a pollen patty or pollen substitute [6]. Make sure there's a whole side of one frame of bee bread in your mating nuc or split! And lots of nurse bees that are already eating that bee bread and are primed to do that royal jelly feeding!

To achieve the best possible queen development, you also need to KEEP the larvae whose cells are the LEAST developed (certainly not

Table 1: Adult Queen Characteristics Based on Graft Day, adapted from Woyke J, 1971[4]

age at graft (days)	0-2 (Egg)	3 (Larva)	4 (Larva)	5 (Larva)	6 (Larva)
weight (mg)	209	189	172	147	119
# of ovarioles	317	308	292	272	224
spermatheca volume (mm^3)	1.18	1.09	.094	0.82	0.59

Table 2

Egg Frame Transfer Queen Rearing Calendar

Drone Stage	Age	Queen Stage	Age	Date	Procedure
egg layed	*0*			February 23	
young larva	*4*			February 27	
capped cell	*10*			March 4	Ensure lots of capped drone pupae on drone rearing frames in outyards.
pupa	*16*	egg layed	*0*	March 10	
pupa	*18*	egg	*2*	**March 12**	Make a split or nuc with a full side of a frame of bee bread, lots of clinging nurse bees, a frame of eggs from the desired queen mother colony (mark with thumbtack), very few larvae, and appropriate capped brood and empty drawn comb / honey for the season. Reduce entrance and feed as necessary.
pupa	*19*	egg hatches	*3*	March 13	
imago	*23*	larva (jh increase)	*7*	March 17	Re-examine the colony (no smoke) for royal jelly and developing larvae in open queen cells. Remove all capped queen cells; leave only two or three least-developed cells.
emergence	*24/0*	larva capping	*8*	March 18	
		capped cell	*9*	March 19	Ensure adult drones within colonies.
immature	8	emergence	*16 / 0*	March 26	
orienting	10	orienting	2	March 28	Check drones on outer nectar combs for endophallus maturity and semen quality.
peak sperm ct	12	begin mating	4	March 30	*[Best mating weather is at least 69 degrees with no strong wind!]*
mature/mating	14	peak mating	6	April 1	
end peak sp ct	17	end peak	9	April 4	*[The following dates may need adjustment based on weather during mating period:]*
		end mating	12	April 7	Check mating nuc or split for a 12-day-old egg-laying queen, mark.
		egg laying	18	April 13	Recheck nuc for queen cells and cut them out if the queen is laying a good pattern (sometimes the brood cycle interuption makes the workers want to supercede her until the new queen has a lot of larvae present).
		phermone mature	24	April 19	Sell or expand nuc into hive. Sacrifice the queen and check her spermatheca if poor brood pattern or drone layer.

Table 3

Swarm Box Queen Rearing Calendar

Drone Stage	Age	Queen Stage	Age	Date	Procedure
				March 15	Ensure drone rearing colonies are populous w/ lots of pollen. Move drone comb
egg layed	*0*			March 22	to the edge of their broodnests and feed (1 deep frame / 5 virgins every 15 days).
young larva	*4*			March 26	Feed populous breeder hive heavily.
cell capping	*9*			March 31	
capped cell	*10*			April 1	
pupa	*13*			April 4	Ensure lots of capped drone pupae on drone rearing frames in outyards.
pupa	*16*	egg layed	*0*	April 7	
pupa	*18*	egg	*2*	April 9	Make a strong cell building colony: bottom brood chamber w/ queen, excluder w/ upper entrance, honey super, upper brood chamber w/ 9 frames of: eggs (center), young larvae, old larvae, pollen/nectar (outside), lots of nurse bees and drones!
pupa	*19*	very young larva	*3*	**April 10**	Make swarm box w/ 3 - 4 frames of nectar/pollen, > 8 frames of nurse bees from the cell builder. Graft Day 3 Larvae into cell bars and put in swarm box.
pupa	*20*	larva	*4*	April 11	Move the queen frame(s) into the center (between frames of eggs/young larvae) of the cell building colony and shake all the swarm box nurse bees back in to it.
imago	*23*	larva (jh increase)	*7*	April 14	Examine the cell building colony (no smoke) for royal jelly in queen cups on queen
emergence	*24/0*	larva capping	*8*	April 15	frame. Remove poorly tended ones and cut out all queen cups from other frames.
		capped cell	*9*	April 16	
		pupa	*12*	April 19	Examine the cell builders for queen cell development and cut out rogue queen cells.
		pupa	*13*	April 20	Make mating nucs w/ emerging capped brood, nectar/pollen, a frame of capped brood or empty cells, and nurse bees. Reduce the entrance.
		pupa	*14*	April 21	Transilluminate queen cells, protect extras, keep warm, and place one on each frame and place in the appropriate mating nuc. Cut out rogue queen cells.
immature	8	emergence	*16 / 0*	April 23	
orienting	10	orienting	2	April 25	Check drones on outer nectar combs for endophallus maturity and semen quality.
peak sperm ct	12	begin mating	4	April 27	*[Best mating weather is at least 69 degrees with no strong wind!]*
mature/mating	14	peak mating	6	April 29	
end peak sp ct	17	end peak	9	May 2	*[The following dates may need adjustment based on weather during mating period:]*
		end mating	12	May 5	Check mating nucs for 12-day-old egg-laying queen, mark.
		egg laying	15	May 8	Sacrifice queen and check spermatheca if poor brood pattern
		egg laying	18	May 11	Cage queens for sale; sell or introduce her into another hive.
		phermone mature	24	May 17	*[Reuse mating nucs every 15 days]*

capped yet) five days after you transfer the egg frame or make the split. This is why I hate the term "walk away split." You need to walk BACK to that split exactly five days after you make it (six days later works sometimes, but not usually) to ensure you rear the biggest queens possible.

Let me explain: Since queen cells are capped on about Day 8½ after the egg was laid (which was day 0), any potential developing queen in a queen cell that is already capped five days after the split/transfer didn't start getting royal jelly feeding until it was a Day 4 Larva. That's a larval age that is too old (see Table 1) to develop into a big queen. You want the developing queen larva that was fed royal jelly right from the time its egg hatched at the very end of Day 2 (or at the very latest as a Day 3 Larva). Such a queen cell won't be capped yet five days after the split/transfer. And at six days later, unless the nurse bees started with some Day 0 or Day 1 Eggs at the time of the split/transfer (which is

Table 4

Cloake Board Queen Rearing Calendar

Drone Stage	Age	Queen Stage	Age	Date	Day	Procedure
				14-May	Mon	Ensure drone rearing colonies are populous w/ lots of pollen. Move drone comb
egg layed	0			21-May	Mon	to the edge of their broodnests and feed (1 deep frame / 5 virgins every 15 days).
young larva	4			25-May	Fri	Put bedroom chamber in populous breeder hive for a few weeks for queen cup
cell capping	9			30-May	Wed	construction (no queen access), feed heavily and reduce the entrance. Add
capped cell	10			31-May	Thurs	candy and coat chamber with honey.
pupa	14			4-Jun	Mon	Move some capped drone pupae frames to outyards for 15 days.
pupa	16	egg layed	0	**6-Jun**	Wed	Cage queen in the bedroom for 24 hours, ensure eggs at the base, release her.
pupa	18	egg	2	8-Jun	Fri	Make a strong cell building colony: bottom brood chamber w/ queen, empty comb
						and closed back entrance; Open front Cloake board; upper brood chamber: open
						center space, 2 frames of young larvae, pollen, older brood, and nectar (outside).
pupa	19	egg hatches	3	9-Jun	Sat	Replace 2 frames of larvae w/ a frame of foundation and division board feeder.
						Keep nurse bees, insert slide and open bottom back entrance.
pupa	20	young larva	4	10-Jun	Sun	Move young larva cells to the bars of the queen frame in a warm room,
						transport and float it down into the center space of the cell building colony, feed.
pupa	21	larva	5	11-Jun	Mon	Remove the slide and close the back entrance again (queen cells accepted).
pupa	22	larva	6	12-Jun	Tues	Move remaining capped drone pupae frames to outyards for 15 days.
imago	23	larva (jh increase)	7	13-Jun	Wed	May repeat bedroom chamber confinement with new spreadsheet.
emergence	24/0	larva capping	8	14-Jun	Thurs	May move queen cells to a nursery incubator colony above a queen excluder.
		capped cell	9	15-Jun	Fri	Examine the cell builders for rogue queen cell development and cut them all out.
		pupa	13	19-Jun	Tues	Make mating nucs w/ emerging capped brood, nectar/pollen, a frame
						of capped brood or empty cells, and nurse bees. Reduce the entrance.
		pupa	14	20-Jun	Wed	Transilluminate queen cells, protect extras, keep warm, and place one in each
						appropriate mating nuc. Cut out rogue queen cells.
immature	8	emergence	16 / 0	22-Jun	Fri	
orienting	10	orienting	2	24-Jun	Sun	Check drones on outer nectar combs for endophallus maturity and semen quality.
peak sperm ct	12	begin mating	4	26-Jun	Tues	*[Mating weather is at least 69 degrees with no strong wind!]*
mature/mating	14	peak mating	6	28-Jun	Thurs	
end peak sp ct	17	end peak	9	1-Jul	Sun	*[The following dates may need adjustment based on mating period weather:]*
		end mating	12	4-Jul	Wed	Check mating nucs for 12-day-old egg-laying queen, mark.
		egg laying	15	7-Jul	Sat	Sacrifice queen and check spermatheca if poor brood pattern
		capped brood	18	10-Jul	Tues	Cage queens for sale; sell or introduce her into another hive.
		phermone mature	24	16-Jul	Mon	
					Sun	
					Mon	
					Tues	
					Wed	
					Thurs	
					Fri	
					Sat	

uncommon), ALL the queen cells will be capped, so you won't be able to tell which queens got the best nutrition as larvae (don't be fooled by capped queen cell size on the side of the comb as it's unreliable). This is the reason to check back after five days.

And how many queen cells do you keep in your split or your nuc when you check it on day 5? I typically keep the two or three LEAST developed cells (after I ensure there is a young queen larva sitting on a heap of royal jelly in them) and cut out all the more developed cells, including ALL the queen cells that have already been capped. One queen cell will work if that's all you have. If you leave three or more, in all likelihood at least one of those virgins may fly away, rather than stay for a fight that she knows she's going to lose. If she does fly away, she'll take a bunch of bees with her (an afterswarm). So why leave more than one? Sometimes a queen doesn't develop (perhaps due to Black Queen Cell Virus), and dies in her cell before emergence. Also, if you do leave two or three, it also gives the colony a chance to decide which queen they prefer. (The fight is rigged; the workers hold down the loser and let the winning virgin finish her off). I've always liked the concept of letting the bees choose which larvae to rear into queens (by not grafting) AND which virgin they like the best (by giving them two or three to pick from). In my experience, my bees have always made better decisions than I have as the beekeeper.

Some other key things to know are that virgins typically mate on days 4 – 12 after hatching. That's it. That's the entire mating window. And they must have about 30 minutes of a single warm, sunny, not too windy, afternoon (over 69°F) to do it. In my experience, the first day in that window that meets those criteria is when they mate. So how do you know how old your mating virgin queens are when you're watching the weather? The calendar . . .

Also, the drones that the virgin is mating with got their start (they were laid as eggs) a full 16 days before the queen's egg was laid. That's because drones take an additional eight days to develop in their cells and their peak sperm count is on days 12 - 17 after they emerge. All of this timing is built into the spreadsheet templates.

Before we go on to the spreadsheets, I'd like to mention one more timing consideration. Just because a queen is "laying a good pattern" of eggs, doesn't mean she's adequately mated or that she mated at all. Some unmated queens just start laying eggs, and sometimes the pattern is quite good. You must wait until her first brood set is capped to ensure that she's not a drone-layer. That only takes nine to 10 additional days after she lays her first egg (which is typically three days after she mates). And pheromone maturity (when her queen mandibular pheromone is up to snuff) isn't reached until she is day 24 of adult life. If you're planning on selling that queen you reared, or the nuc you reared her in, I advise you wait at least until you see her

If you're planning on selling that queen you reared, or the nuc you reared her in, I advise you wait at least until you see her capped brood first or you may have to do some embarrassing queen replacements.

capped brood first or you may have to do some embarrassing queen replacements. And many a colony of honey bees has reared a queen, let her return to lay a few eggs, and then superceded her before she reaches pheromone maturity. So the best queens are the ones who are at least 24 days from the date of emergence.

Now the three spreadsheets: The Cloake Board sheet and Swarm Box sheet assume that you are using a bedroom chamber and grafting, respectively. They also assume a fairly large scale queen rearing operation that uses drone holding colonies and either swarm boxes or Cloake Board starter colonies (that are being reused on a periodic basis). If you use either of these methods you will know exactly how old the grafted larva was (it should be between 72 and 96 hours after the egg was laid, or what I call a Day 3 Larva). Furthermore, they both calculate dates of queen marking and packaging for the purposes of sale. The Cloake Board sheet also includes days of the week as well as dates.

The Egg Frame Transfer method (which is what you do with a split) is less precise, and it assumes a small scale operation where all the components are all housed within the mating nuc and therefore are not 'recycled' into further use. That spreadsheet assumes that you are rearing the queen in the colony that you made up (either a split or mating nuc), you do not use either a swarm box or a Cloake board starter colony, and that you are only worried about having some nearby drones that are appropriate age for mating (no dedicated drone holding colonies).

More importantly from the calendar perspective, in the Egg Frame Transfer method the bees can choose any cell (or group of cells) from a Day 0 Egg to a Day 6 Larva to rear your future queen from (by Day 7 the larva develops into an intercaste or "half worker / half queen"). The timing of the Egg Frame Transfer sheet assumes that the nurse bees choose a Day 2 Egg for queen development on the day you made your mating nuc or spilt. You're going to ensure something very close to that timing with the above culling technique of older, capped cells exactly five days after you make it up, but the calendar may be off by a day or so in either direction. (When I make a mating nuc, I mark the frame with the eggs from my favorite queen mother with a thumbtack so that I know to be careful with that frame during my re-inspection and culling five days later). A sample Egg Frame Transfer spreadsheet is shown in Table 2.

I suggest that you save individual copies of the spreadsheet workbook that you choose to use with the "save as..." command first (or save a new worksheet within the same spreadsheet workbook file by copying and renaming sheets) according to the date of graft or transfer, and keep the original as a template for new dates. Then all you have to do is fill in the yellow box (it's called a cell in Excel) with the new date that you graft or transfer your frame of eggs or do your split, press enter and all the rest of the dates are calculated for you. Then print it out, and refer to it. It's really that simple. In each spreadsheet template the first or far left-hand column (column A) is the stage of the drones that will be mating with your virgin queens. Column B is the age of the drone in days; *italics* are used for developmental age (from egg to emergence or *0* to *23*) and non-italics are used for adult age. Thus *23*/0 is the day the adult drone bee emerges from its cell. Columns C and D are the same as A and B but for queens instead of drones. Column E is the date of each event or procedure.

Column F in the Cloake Board method spreadsheet is hidden; it is used to calculate the day of the week which is in column G. The last column (G or H) lists the procedures you need to perform and are indented on subsequent lines. The yellow cell is the only one you change, using an appropriate date format (such as 6/6/2014). Orange cells are only there to draw your attention to an important event or something you need to pay particular attention to. All three calendars become less precise depending on the weather near the end, but that should be relatively self-explanatory.

Good luck, and have fun rearing big healthy well-mated local queens! I hope you find one of these spreadsheets helpful. BC

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Dr. Buddy is a Master Beekeeper with both the North Carolina Beekeepers Association and the Eastern Apiculture Society. He currently owns six hives. He has used the Doolittle grafting technique and a bedroom chamber kit in the past, but now prefers egg frame transfer, because he only rears six to 30 queens a year. He has taught bee school to over 500 students in his county club since developing its curriculum in 2004. He enjoys keeping turtles and chickens, gardening, woodworking, nature photography, biking, and operating on patients with cancer when he's not with his bees.

GLEANINGS

FEBRUARY, 2014 • ALL THE NEWS THAT FITS

MARION ELLIS RETIRES FROM NE

Marion Ellis, Professor and Apiculture Specialist for the University of Nebraska, retired on December 31, 2013. After earning a M.S. degree in agricultural biology from the University of TN in 1973, he began his career as a Peace Corps Volunteer in El Salvador, teaching beekeeping at the Escuela Nacional de Agricultura and offering educational workshops. He then spent four years at Iowa State University as a research associate where his work included managing pollinators for pollinating caged crops. In 1979 he moved to Nebraska to accept a position as the state apiculture specialist for the Nebraska Department of Agriculture, a position he held for 15 years. In 1995 he was hired by the University of Nebraska as a teacher and extension specialist in apiculture, a position he held for 18 years.

During his tenure at the Univ. of NE he regularly offered workshops in Beginning Beekeeping, Advanced Beekeeping, Queen Rearing, Value-Added Products and Mead Making. Dr. Ellis' research initiatives focused on providing research-based guidance to beekeepers in dealing with bee diseases, parasites and pesticide exposure.

When asked about his retirement, he responded, " I have had the good fortune to work with a creature that fascinates me. In addition, I have also enjoyed the enduring friendships of those most affected by my work and my colleagues in the entomology department. If you love what you do and the people you work with, life is good."

PAGE NAMED PROVOST OF ARIZONA STATE UNIVERSITY

Honey bee geneticist Robert E. Page, Jr., emeritus professor and former chair of the UC Davis Department of Entomology, has been promoted from vice provost and dean of the College of Liberal Arts and Sciences (CLAS) at AZ State University to the university provost beginning this past December 5.

Page, who studies the evolution of complex social behavior in honey bees, from genes to societies, received his doctorate in entomology from UC Davis in 1980, and served as an assistant professor at OH State Univ before joining the UC Davis Department of Entomology in 1989. He chaired the department for five years, from 1999 to 2004 when ASU recruited him as the founding director and dean of the School of Life Sciences, an academic unit within CLAS. He organized three departments – biology, microbiology and botany, totaling more than 600 faculty, graduate students, postdoctoral fellows and staff – into one unified school.

Recognized as one of the world's foremost honey bee geneticists, he is a highly cited entomologist who has authored more than 230 research papers and articles centered on Africanized bees, genetics and evolution of social organization, sex determination and division of labor in insect societies. His work on the self-organizing regulatory networks of honey bees is featured in his new book, *The Spirit of the Hive: The Mechanisms of Social Evolution*, published in June 2013 by Harvard Univ Press.

Page continues to keep bees at the Harry H. Laidlaw Jr. Honey Bee Research Facility, UC Davis; they are managed by staff research associate/ beekeeper Michael "Kim" Fondrk.

A UNIQUE GIFT TO UC DAVIS

It was a gift to bee-hold- – and a gift meant to keep on giving. No, not a donor organ, tree, or a smile. In this case, the gift was for generations of honey bees at the Harry H. Laidlaw Jr. Honey Bee Research Facility at the University of California, Davis.

During a pollinator education program, employees of Valent U.S.A. Corporation, based in Walnut Creek, wanted to do something significant, something that would help the troubled bee population, and something that would promote team building.

So more than 270 employees engaged in a beehive building exercise, constructing 26 Langstroth bee hives. They recently delivered them to the Laidlaw facility where bee breeder-geneticist Michael "Kim" Fondrk, Extension apiculturist Eric Mussen and staff research associate/ Laidlaw manager Billy Synk, all of the UC Davis Department of Entomology and Nematology, gratefully accepted them.

"We are thrilled to donate these hives to the Laidlaw facility," said Meg Brodman, manager of marketing communications for Valent. "We recognize the incredible work being done by your organization and we thank you for your commitment to supporting the needs of America's farmers through pollinator research, particularly in California, where we are also headquartered."

"Pollinator safety," she said, "continues to be a focus within our organization, and we at Valent, along with our counterparts in crop protection, are keenly focused on efforts that will support education and research for pollinator safety in agriculture."

The boxes will be used beginning this Spring, just in time for the seasonal population build-up. Brian Johnson, assistant professor, keeps his research bees at the apiary; his lab studies the genetics, behavior, evolution, and health of honey bees. Fondrk, who keeps his bees in a nearby apiary, manages the research bees of Robert E. Page Jr., emeritus professor and former chair of the UC Davis Dept of Entomology. Johnson and associate professor Neal Williams, pollination ecologist, are co-directors of the Laidlaw facility.

Making the trek to UC Davis were Eric Tamichi, manager of registration and regulatory affairs; Linda Obrestad, regulatory division; and Brodman.

Brodman described Valent as a "growing crop protecting company, offering a diverse line of conventional and biorational products, including herbicides, insecticides, fungicide, seed protection and plant growth regulators that protect agricultural crops, enhance crop yields, improve food quality, beautify the environment and safeguard public health."

OBITUARY

Peter Donovan was the longterm, faithful and skilled coworker with Brother Adam at Buckfast Abbey in southwest of England. He came to the abbey 1939 at the age of 12 when the war started and helped Brother Adam in his work with the Buckfast bee. During his military service he was stationed in the far east. When he came home he returned to the bee departement at the abbey to work for and with Brother Adam. When Brother Adam died he continued his work developing the Buckfast bee, testing and refining new combinations of subpopulations (races) of bees, until several years after his retirenment age.

Peter Donovan was highly appreciated as speaker at conferences. He has been to Germany and Canada, not the least to many bee clubs in Great Britain. In his later years he helped the Canadians to build up their Buckfast strain of bees. He also collected material to publish an instructional DVD about beekeeping at Buckfast Abbey. Let's hope it will be published one day. Today the Bee Departement at the Abbey mainly produces honey for sale at their gift shop.

The funeral was held by the abbott at the monastry December 16 and he is buried at the monastry. Chief mourners, his wife Grace and son John.

submitted by Erik Osterlund

NORTH DAKOTA DEVELOPS HONEY BEE PROTECTION PLAN – NOT!

ND, which has long led the nation in honey production, has developed ***guidelines*** for farmers, ranchers, landowners and beekeepers to better protect honey bees and help reverse the effects of a mysterious disorder that has vastly eroded the insects' population in recent years.

The goal of the ND Pollinator Plan is to reduce the risk to honey bees from the use of pesticides and other farming practices while minimizing the impact of doing so on agricultural production, Agriculture Commissioner Doug Goehring said.

"***It is completely non-regulatory," Goehring said. "It contains best-management practices and other proactive measures and ideas to help agricultural producers and beekeepers find common ground, all on a voluntary basis.***"

Protecting their health has become a prominent issue since 2006. A federal report blames a combination of factors including a parasitic mite, multiple viruses, bacteria, poor nutrition, genetics, habitat loss and pesticides.

Beekeepers face other challenges, according to Minot beekeeper Will Nissen. There are fewer crops around that bees favor; canola and sunflower production has dropped due to recent wet years and there are fewer alfalfa hay crops because of a shrinking cattle herd, he said.

"Forage for the bees is the biggest problem in our state," Nissen said. Between that and colony collapse disorder, he said, he feels his livelihood is threatened "and it gets a little worse every year."

The eight-page plan – based on information from meetings of beekeepers, growers, pesticide applicators, crop consultants and others this year – has *numerous suggestions aimed at increasing cooperation among beekeepers, landowners and pesticide applicators.* It suggests beekeepers work with landowners on hive placements to ensure they are in prime spots for honey production while not disrupting crops or rural roads. The plan encourages farmers to seed plants bees like, and to help ensure applications of any pesticides do not harm hives. Commercial chemical applicators are coaxed to make bee safety a priority.

The guidelines will be revisited annually and updated as needed, Goehring said.

ND is the first state to heed the call of the National Association of State Departments of Agriculture to develop a formal plan and, if successful, it could provide a model for other states, Nissen said.

Some beekeepers, however, hope this plan is not adopted anywhere.

SEX DETERMINATION IN HONEY BEES

After almost 200 years, scientists in Arizona and Europe have teased out how the molecular switch for sex gradually and adaptively evolved in the honey bee.

The first genetic mechanism for sex determination was proposed in the mid-1800s by a Silesian monk named Johann Dzierson, who was trying to understand how males and females were produced in honey bee colonies.

He knew that the difference between queen and worker bees – both females – emerged from the different quality and quantity of food. But, what about the males, he asked.

Dzierson theorized that males were haploid – possessing one set of chromosomes. This was confirmed in the 1900s when the advent of the microscope allowed researchers to see that eggs that gave rise to drones were not penetrated by sperm.

But how this system of haplodiploid sex determination ultimately evolved at a molecular level remains one of the most important questions in developmental genetics.

Now Arizona State University provost Robert Page and Prof. Martin Beye of the Institute of Evolutionary Genetics in the University of Dusseldorf in Germany report in the journal Current Biology they have put together the final pieces of how these systems evolved.

They studied 14 natural sequence variants of the complementary sex determining switch (csd gene), for 76 genotypes of honey bees using several tools at hand that their predecessors lacked to solve this sexual determination puzzle.

First, honey bees are ideal study subjects because they have one gene locus responsible for sex determination. Also, Page and former graduate student Greg Hunt identified genetic markers – well-characterized regions of DNA – close to the complementary sex determining locus to allow gene mapping.

Hunt and Page also found the bees' high recombination rate – the process by which genetic material is physically mixed during sexual reproduction – is the highest of any known animal studied. This helped Beye isolate, sequence and characterize the complementary sex determining locus.

Page and Beye were also able to knock out an allele and show how one could get a male from a diploid genotype. However, the questions of which alleles were key, how they worked together and in what combinations and why this system evolved were left unanswered, though tantalizing close.

This forced the research team to step back to review what actually constitutes an allele.

"There has to be some segment of that gene that is responsible in this allelic series, where if you have two different coding sequences in that part of the gene you end up producing a female," Page says.

"So we asked how different do two alleles have to be? Can you be off one or two base pairs or does it always have to be the same set of sequences? We came up with a strategy to go in and look at these 18-20 alleles and find out what regions of these genes are responsible among these variants. We also had to determine if there are intermediate kinds of alleles and discover how they might have evolved."

The research team found that at least five amino acid differences can control allelic differences to create femaleness through the csd gene – the control switch.

"We discovered that different amounts of arginine, serine and proline affect protein binding sites on the csd gene, which in turn lead to different conformational states, which then lead to functional changes in the bees – the switch that determines the shift from female to not female," Page says.

The team also discovered a natural evolutionary intermediate that showed only three amino acid differences spanned the balance between lethality and induced femaleness. These findings, which have taken nearly 200 years of study to pin down, suggested incomplete penetrance may be the mechanism by which new molecular switches can gradually and adaptively evolve.

Alan Harman

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NATURAL AMERICAN FOODS ANNOUNCES COMPLETION OR SALE TO PEAK ROCK CAPITAL

Peak Rock = Natural American = Groeb Farms

Natural American Foods, Inc. ("Natural American Foods" or the "Company") one of the world's largest producers and distributors of honey and other food products, today announced completion of its successful sale to an affiliate of Peak Rock Capital ("Peak Rock"). Natural American Foods merged with Groeb Farms, Inc., which also concurrently completed a successful reorganization of its balance sheet under Chapter 11 protection in just 90 days. Natural American Foods now enjoys a fully recapitalized balance sheet with professional management and significant capital resources provided by its new owner to invest in and grow the Company.

"This is a very desirable outcome, and we are extremely pleased with the smooth transition to our new ownership," said Natural American Foods CEO Rolf Richter. "We thank Peak Rock for their dedication to helping us establish a strong, well-capitalized foundation that will allow us to focus on what is most important; making the highest quality honey products for our commercial and retail customers."

Richter, who joined the Company in July 2012 with more than 20 years of major food brand experience, led the Company through its sale to Peak Rock and remains at the helm of Natural American Foods. Richter is joined by additional new members of management who have also joined the Company since 2012 to head the new leadership team.

Natural American Foods produces a full range of honey and commercial sweeteners for some of the world's best known food manufacturers and food service customers, as well as national retailers and distributors. The company's footprint is significant, with global procurement operations and on-site laboratory where its products are tested for quality and safety.

"At Natural American Foods, we pride ourselves on integrity in all that we do, including producing the highest quality products and upholding top standards in honey procurement and production, according to our vigilant compliance processes," said Richter. "As we look to the future, we will continue to evolve with new innovations and seek to work together with others to continually raise the bar on industry standards," he said.

About Natural American Foods

Headquartered in Onsted, Mich., Natural American Foods is one of the world's largest producers and distributors of honey and has been producing high-quality honey under the The company provides top quality honey and related food products to industrial and retail Miller's American brand for more than a century. customers as well as the American consumer.

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POLLINATOR ADVICE FROM PAm

Almond bloom 2014 will be here before we know it. The single most important factor determining a good crop yield is adequate pollination during bloom period. Depending on your orchard, pollination costs range between 12-15% of your operational budget. Hive rentals are increasing as over-wintering losses of honey bees continue. Total losses of managed colonies nationwide were 31.1% from all causes for the 2012/2013 Winter, according to the survey conducted by Bee Informed Partnership and Apiary Inspectors of America and funded by the USDA.

Your beekeeper understands your pollination needs and has made an investment to ensure quality colonies arrive in your orchard. He has split colonies, requeened, fed, and monitored for pests and diseases to build colonies and enough frames of bees to pollinate your crop. Beekeeper operational inputs, on average, are over $200 to supply almond growers with 8-frame bees and close to $240 for 12-framers, according to Eric Mussen, UC Davis.

Project Apis m has developed Best Management Practices for Almond Growers. These guidelines help you help your beekeeper and ensure a successful season.

Pollination Contract

A signed contract protects grower and beekeeper and addresses each other's expectations. This agreement can eliminate misunderstandings and possible legal action later. A pollination contract template can be accessed at www.ProjectApism.org under the 'BMP' tab.The Almond Board of CA has a pollination directory. This list of beekeepers and brokers can be accessed at **www.AlmondBoard.com**. Grower and beekeeper should agree on number of frames of bees, including an average and minimum frame count and number of frames of brood if provided. Specify outside temperature and time of day at site for inspection. Outline terms – deposit, progress payment and final payment.

Colony Strength Evaluation

When colonies arrive check colony strength. Pollination success is dependent on both the number of colonies and the average strength of the individual colonies. Eight to 10 frames is optimum. An objective third party inspection of colonies will indicate if contractual obligations have been met. Typically, the inspection includes only a representative sample. Notify your beekeeper of inspection. They can observe the process and assist in handling the hives. UC Cooperative Extension has published a Colony Strength Evaluation PDF and online training course. This was funded in part by PAm and can be accessed at **www.ucanr.org**.

Hive Placement Location

Identify hive locations with appropriate buffers between pesticide-treated areas and colonies.Distribution of colonies should be accessible and convenient at all hours. Beekeepers need to place, service and remove hives routinely. Orchard roads should be maintained and graded for easy access. Encourage bee flight for pollination. Eastern and southern exposure for hive entrance is better for sun and warmer temperatures. Avoid areas prone to shade or flooding. Today's increased rental costs can result in colony theft. Be alert and report any suspicious behavior.

Monitor

Walk your orchard daily during bee flight hours to make sure you see plenty of activity. Record those hives that are weak or inactive. Allow your beekeeper time and opportunity to provide additional colonies if needed. Communication is key between grower and beekeeper in providing quality hives for pollination.

Nutrition

Assist your beekeeper in locating flowering forage prior to and after almond bloom. PAm would like to take this opportunity to thank the over 150 almond growers who enrolled this Fall in the 'Seeds for Bees' forage project. The 2,500+ acres of mustards, clover and vetch will help build healthy and vigorous bees for pollination. Your beekeeper will begin preparing for the subsequent season during this upcoming bloom. If interested in planting a cover crop that benefits grower and bees, email **ProjectApis@gmail.com** – 'Seeds for Bees' as subject line. Water is essential for bees to prevent dehydration. Provide abundant and potable water, free from contamination. Landings and screens over containers make water accessible and prevent bee drowning.

Agricultural Sprays

Bees can be protected from pesticides with cooperation between growers, applicators and beekeepers – its importance cannot be overstated. Bee poisonings occur when there is a lack of information, rather than intent to do harm. Protecting your pollinator from pesticides increases your production. Let your beekeeper know the agricultural sprays used. Avoid tank mixing, as mixtures may cause synergistic, toxic effects. Avoid prophylactic application of pesticides, including fungicides, while bees are present.

Management practices to minimize contact: Do not spray when bees are flying.Time applications late in the afternoon or at night. Do not spray during warm evenings when bees are clustered on the outside of hives. Do not spray when pollen is being produced by the tree. Do not spray on windy days, as drift can reach hives.

The greatest pollination event on Earth is about to happen! Preparing for your pollinator will help protect the honey bee and help protect your investment.

Meg Ribotto and Christi Heintz

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Executive Publisher – John Root
Associate Publisher, Senior Editor – Kim Flottum, Kim@BeeCulture.com, Ext. 3214
Assistant Editor, Design Coordinator – Kathy Summers, Kathy@BeeCulture.com, Ext. 3215
Circulation – Dawn Feagan, Dawn@BeeCulture.com, Ext. 3220
Advertising Manager – Peggy Games, 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 Laurence • Jeff Harris

POSTMASTER: Send address changes to
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V800.289.7668, Ext. 3220 • F330.725.5624
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The biggest exercise in fertility in the Universe – Every Year! photo by Meg Ribotto, Project Apis m

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Our hosts promised that a driver would meet us when we landed in Kiev, Ukraine. With a formidable language barrier, I wondered how we would connect.

Not to worry! A poker-faced gentleman, dressed in black, stood waiting for us holding a sign that read simply, "Ed Colby." When I shook his hand, he picked up my gal Marilyn's bag, and quickly led us to a waiting car.

My memory of the ride into town is a juxtaposition of golden-domed Orthodox churches and severe Soviet-style apartment complexes; road signs in inscrutable Cyrillic; dramatic Communist-era statues; the impatient but orderly flow of traffic; our guide and driver murmuring in Russian in the front seat; the broad Dneiper River; handsome, big-boned, angular Ukrainians hurrying in the streets, stunning women dressed to kill. I said, "Marilyn, we're not in Kansas anymore!"

At a four-story building practically right next to ancient St. Sophia Cathedral, the manager handed us the key to our top-floor apartment. Welcome to Ukraine! Welcome to Apimondia!

Let me make myself perfectly clear: Marilyn and I are not important people. Drivers do not pick us up at airports. We just got lucky.

In the Summer, as part of my job as a "ranger" on Aspen Mountain, I give weekly lectures on honey bees and beekeeping. At the first one, three Julys ago, I met the most charming family: beekeeper and former Ukrainian President Victor Yushchenko, his wife Kateryna, and daughters Khrystyna and Sophia. Nobody else showed up for my talk, so Mr. President and I did the secret beekeeper handshake, then sat down in the ski patrol hut and talked about our little darlings.

An hour later, I had a personal invitation to Apimondia 2013, the international bee conference in Kiev. When I muttered something about the cost of such a trip, the first lady said, "I'll find you a place to sleep."

She was true to her word, and then some. We found Champagne and roses on the dining table. And chocolates.

A few days later at their dacha outside of Kiev, Mr. President served his signature carp soup. We dined outside by the lake, all bundled up on a damp fall evening. Second course: pork kabob. I sat next to President Yushchenko. I watched him cut his meat into tiny slices and feed it to the cat under the table.

We were questioned "as average Americans" about our views on the Syrian chemical weapons crisis, then very much in the news. So for a brief moment in time, we represented the whole United States of America! Marilyn and I were both glad we had an opinion to share.

One of Mr. President's guests informed me that "Ed" was the shortest name he'd ever heard! Ukrainians have impossibly long names, like the president himself, and spellings can vary. So Mr. President's friends call him Victor Andreyovych. Or Viktor Andreyevich. Or simply Mr. President.

Passionate about honey bees, Mr. President keeps 300 hives. I got the biggest laugh when I explained that Michele Obama's single White House hive was strapped down tight to protect it from presidential helicopter prop wash!

Beekeeping is the Ukrainian national pastime. Victor Andreyovych explained that his country has four-and-a-half million beekeepers in a population of only 45 million!

He informed us that the monks at Ukraine's monasteries all make mead. I said, "Well, what do you expect in a country with so many monasteries and so much honey?"

He said, "When you come back next year, you'll have to sample my honey beer!"

After supper Mr. President led us on a tour of his private beekeeping museum – a vast collection that chronicles the evolution of Ukrainian beekeeping – from hollow logs to Ukrainian-style removable frame hives. You never in your life saw so much bee stuff! Long ago Ukrainian beekeepers believed that hives had to be high up in the trees. We looked at a giant wheel used to winch hives into the treetops.

Victor Andreyovych said, "I've taken many heads of state through my bee museum . . . Muammar Gaddafi, Vladimir Putin, Bill Clinton, . . . He mentioned a world leader whose name you'd surely recognize. "How did he like his museum tour?" I wondered out loud.

"Oh, him? He doesn't like anything," President Yushchenko laughed. Gentle reader, you'd chuckle if I told you who we were talking about. But I'm dancing on thin ice here.

Maybe I was on thin ice the other day when I e-mailed former President Yushchenko some political advice. Was that presumptuous? Because what do I know? But right now – mid-December, 2013 – hundreds of thousands of Ukrainians confront the police to protest a despotic president who threatens to pull his nation deeper into the maw of the Russian bear.

Politics is one thing, the beekeeper bond quite another. Marilyn and I reflect in near disbelief. What extraordinary kindness and hospitality! Two years after an impulsive offer from strangers, I wrote, in so many words, "We're coming. Did you really mean it?" And the reply: "We can't wait to see you!"

In these troubled times, we pray for Ukraine. And count our blessings.

Ed **Colby**

The Beekeeper Handshake