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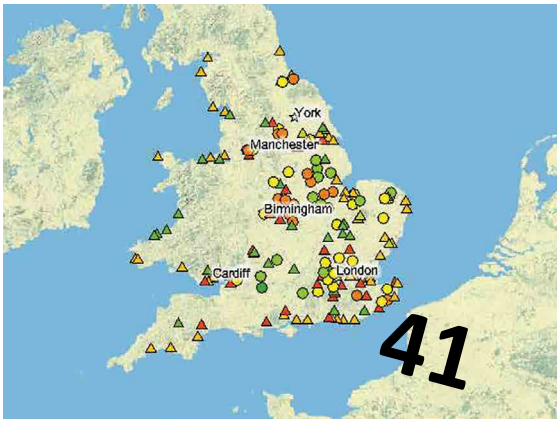

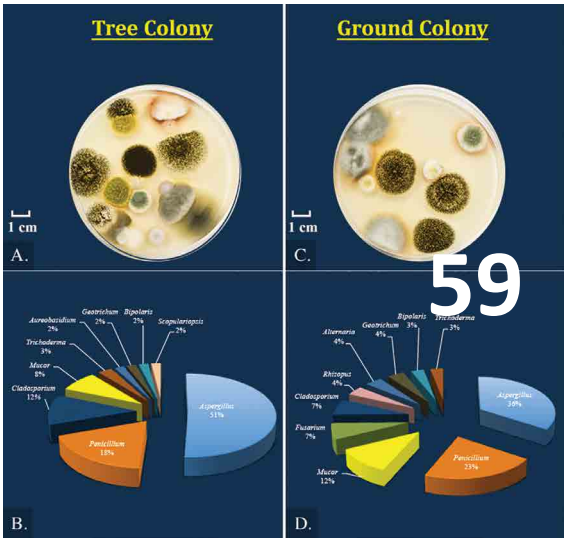

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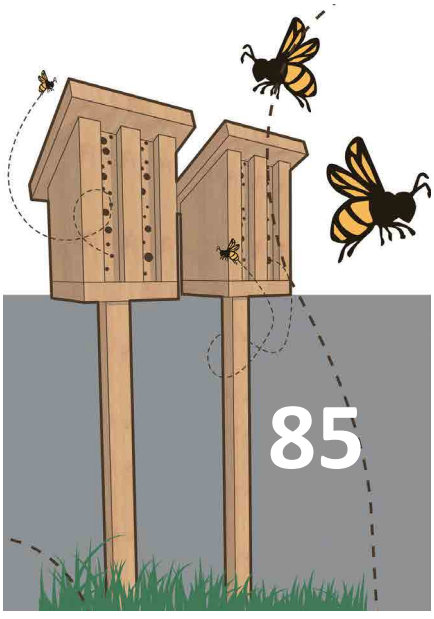

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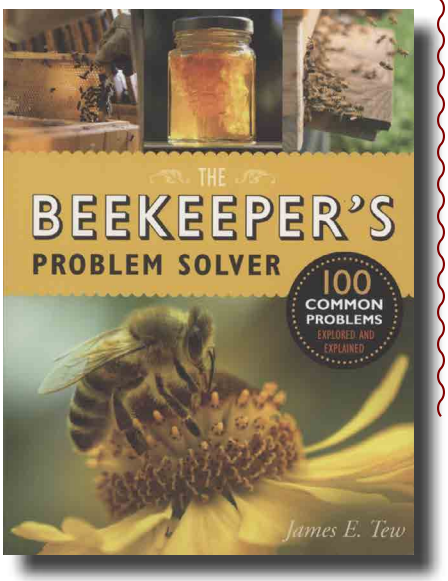
Beekeeper's Problem Solver. 100 Common Problems Explored and Explained. James E. Tew. Published by Quarry Books, Beverly MA. ISBN 978-1-63159-035-1. 9" x 6-3/4" 224 pages, color throughout. Flexisoft cover. $19.99.

First 500 Questions, and now 100 problems. *Bee Culture's* favorite columnist has come out with a new book this spring that solves 100 common problems for, as the back of the book blurb says, every newcomer and old hand. And it does. Nine chapters cover Beekeeping Basics, Beekeeping Equipment, Biology, Managing Hives, Queens, Diseases and Pests, Pollen and Pollination, Honey and Other Hive Products. The problems posed are typical, common and easy to imagine. The answers are straight forward and easy to follow. Every beekeeper I know has something that's bugging them, and they just know they read about it somewhere, awhile ago, in a book or magazine. This clever approach solves the 'where did I read it' memory lapse. If you like his column, you'll like this book, and sometime down the road, you'll have a problem you don't have an answer for. There, one less problem to solve.

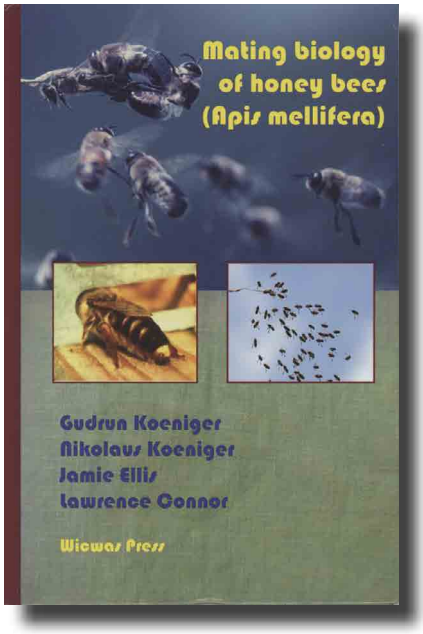
Kim Flottum



Mating biology of honey bees (Apis mellifera). Gudrun Koeniger, Nikolaus Koeniger, Jamie Ellis, Lawrence Connor. Published by Wicwas Press, Kalamazoo, MI. ISBN 978-1-878075-38-3. 9-1/4" x 6-1/4", 155 pages, color throughout. Hard cover. $30.00.

This tidy, wonderfully illustrated book is an English version of a similar version published in Germany. The Koenigers are world renowned for the skills and knowledge of the mating biology of honey bees, and the text and photos in this book support that distinction. Additions by Jamie Ellis and Larry Connor add a North American flavor and clarification to the book that only helps make it more useful. Chapters include Social Structure of the Colony, Avoiding Inbreeding, Rearing Queens, Mating Flights, and my favorite and probably the most exception chapter Drone Congregation Areas, Aerial Mating…those acrobatics are detailed in a series of exceptional photos, the function of the Mating Sign, Sperm Mixing, Drone Quality and African Honey Bee Mating Biology. The chapters are short and to the point, the photos are large, clear and well labeled and the reference section is pages and pages long. A raft of reviewers have summed up this book as 'Impressive'. I concur.

Kim Flottum



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Brushy Mountain Bee Farm Distributor for Solutionbee's Beehive Monitoring System

New easy-to-use technology will provide benefits to commercial and-backyard beekeepers alike.

Brushy Mountain Bee Farm announced that it will be distributing and promoting Solutionbee's Beehive Monitoring systems and equipment in North America.

Brushy Mountain Bee Farm's distribution gives access to this exciting new technology. They will inventory Solutionbee equipment and support beekeepers in setting up their equipment through videos and their renowned customer service.

Solutionbee users benefit by having access to valuable real time nectar flow information enabling data-driven management decisions. Furthermore, it provides invaluable information pertaining to feed reserves resulting in fewer losses from bee starvation.

Solutionbee Beehive monitoring systems (available through Brushy Mountain Bee Farm) now works with the database of Bee Informed Partnership (BIP). Beekeepers have the option to automatically send their data to the Bee Informed site, where it will be used to help generate real time treatment and management recommendations.

"While the Bee Informed Partnership is technology neutral, our testing of Solutionbee

equipment has proven it to be reliable, easy to set up and use," says Dennis van

Engelsdorp, assistant professor at the University of Maryland and Director of BIP.

"This will allow important data to be collected by beekeepers."

HiveAlive™ is a feed supplement using natural extracts that has been scientifically proven to strengthen bee health and increase honey production. It was developed and produced in Ireland by Advance Science, headed up by beekeeper and scientist Dara Scott. Now sold world-wide, it is already a standard in Europe and in 2014 HiveAlive™ entered the U.S. market. International research has shown that using HiveAlive™ routinely can significantly increase colony populations, up to 89%, and maintain lower disease levels.

To use HiveAlive™ you simply add it to sugar syrup in the fall and/or the spring. It can also be sprayed or drenched to revitalize bees that are underperforming, weak or not feeding. Other uses of HiveAlive™ include the prevention of syrup from fermentation, spraying it onto comb to get bees to work on old foundation and helping with queen introduction.

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For more information on HiveAlive™ or to get in contact with us, see **www.advancescience.com**.

China Bees

I would like to point out a few facts that seem to be overlooked. In the recent article called Bee Apocalypse reality check and other writers compare the hand pollinated Chinese pear bloom to over use of pesticides. If people would look at the Midwest Fruit Tree Growers Guide which is published by all the major universities in the Midwest one would soon learn there is no difference between China or Michigan concerning bees. The guide suggests spraying orchards at least once a week for the entire growing season including while in bloom with fungicides. If there is a certain infestation such as shot hole fungus, spray with tetracycline every five days. If I left my hives any were near my orchard during the summer I would have no bees very quickly.

In America because of our access to transportation we can move our bees in and out of danger zones while the Chinese farmers at this time cannot. I am starting to get sick of every one bashing the Chinese over using pesticides as America uses almost 15 times as much. In the near future the Chinese will be trucking bees around the same as we do. As for adulterated honey just open up one of the older beekeeping books and there is no difference again. Don't kid yourself into thinking all local honey is pure. There will always be people trying to make a buck by adding corn syrup or other things to increase profits. The Chinese are just are 30 years behind us, but catching up fast. I absolutely love *Bee Culture* and Phil Craft.

George Ruble

Calendar Kudos!

I wanted to thank y'all for the awesome calendar. I always think it is lovely, but this year's – geez. What dramatic, interesting shots. Thanks!

Best regards.

Charlotte Hubbard

Struggling With PowerPoint . . .

With apologies to Dr. Samuel Johnson, the author of the first English dictionary, who told us that "Power is not sufficient evidence of truth."

Attending the recent conventions of our two national beekeeping organizations I was struck with the thought that I was far more likely to be run over by a bad PowerPoint presentation than by a notoriously bad California driver. While some of the speakers at the conventions clearly know how to prepare and use a PowerPoint presentation many were outrageously clueless. I go to these conventions to learn something. Hopefully, something I can use to improve my beekeeping. But, if not that, then at least learn something that increases my understanding of bees, beekeeping and the considerable attendant issues that influence them. Indeed, I pay considerable amounts of time and money to do so. Thus, it was a serious disappointment to be presented with a parade of speakers that lacked the fundamental knowledge to create and present a PowerPoint presentation. At least I hope it was a lack of knowledge.

Assuming that it was a lack of knowledge, I reflected that universities generally have no courses in public speaking with PowerPoint aids. Or at least they do not require many students to take them. Consequently, I judged that many of the speakers simply did not know better. I also reflected that we tend to live in a polite society where very few of us, including me, are likely to approach a speaker and comment that "I think you must have had something to say but I had trouble understanding your slides and I missed many of your points". So I thought that rather than just wander off muttering unkind words I would try to be a positive force in the honey bee universe and offer constructive comments about improving PowerPoint assisted presentations.

The PowerPoint program is indeed powerful. It has more wiz-bang whirligig visual attention grabbing features than the normal

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user will ever employ. Nor should they. The point of a presentation is to aid communication. But many of the more elaborate features of PowerPoint drag attention to themselves rather than the message of the speaker. In this and other regards, overuse of the programs' potentials can be self-defeating. Also, many of the whirligigs are more suitable for a class of grade school children than they are for a large group of adults in a large auditorium. The best advice here is to keep it clean, keep it clear and remember your audience.

Probably the greatest enemy of a good PowerPoint presentation is the computer screen. It is designed to be seen by one person at the distance of two feet or 50. Almost everything is clear, readable and, with a small amount of effort, visually pleasing. But, only if your audience is in a small room will the visual display seen on a small computer screen necessarily be rendered as clear, readable and pleasing to an audience. So, it is essential to consider the audience and meeting room when preparing a talk.

Who is the audience? All of them. Even the lady in the back row who barely managed to pass her last eye exam to get a driver's license. A talk should be optimized to allow her to read and understand the slides. By doing so everyone in the room will benefit. Good readable slides are your best solution for audiences with members in varied places in the hall and having varied visual abilities. National bee association meetings are not scientific meetings. The target audience is composed of

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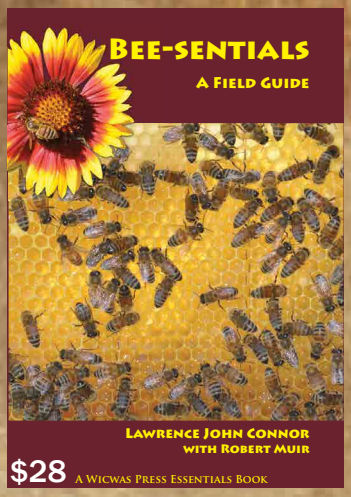

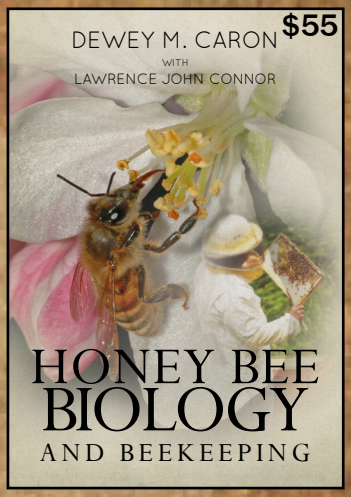

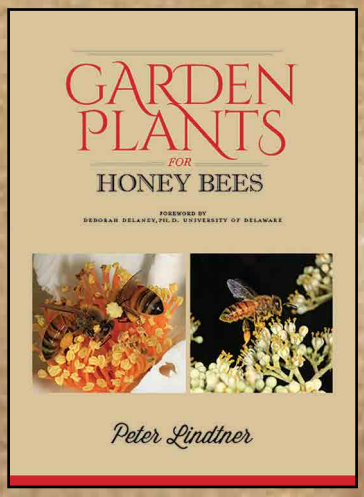

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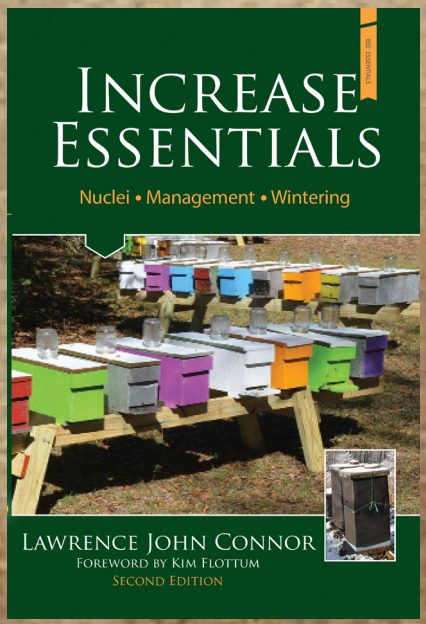

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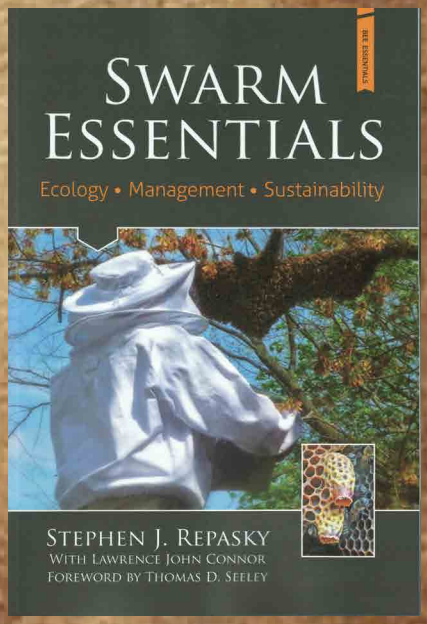

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beekeepers, not scientists even if some in the audience are scientists. Explain your material to them without speaking down to them. By in large they are intelligent (although I worry about one or two of them) merely not as well versed in your subject matter as you.

What is the meeting room like? Usually a speaker will not know this beforehand. But they vary quite a lot. There might be a nice big screen or there might be a rather small portable one. The room might be proportionately too large for the screen. There might be too much light leaking into the room and make the slides hard to see. It might be too dark for the audience to see the speaker leaving only the speakers voice and the slides to carry the talk. (Although, in any case talk to the audience and not the screen). The podium and the screen might be positioned so that the speaker cannot see the slides. The only thing to do is to expect that the worst of conditions will prevail. Attempt to overcome them before you go by preparing very readable slides and practicing the talk so that you know what is on them and can speak about them even if you yourself cannot see them well. You might be able to remove yourself from the podium and speak from a better position but some microphone systems will prevent it. You can also ask members of your audience to move forward but for some reason people are often reluctant to move. Good readable slides are your best defense against a poor room and a lethargic audience.

Several elements of design can enhance the readability of the slides. First the background must be just that, a background. Wallpapers having too much detail obscure visibility. Generally, the darker the background the lighter the lettering should be. Black letters on a white background or white letters on a black background are touchstones. Compare your slide having colors to one that is black and white. The contrast on your slides should be as good. I saw one series of slides at the national meetings that had dark grey lettering on a light grey background. I'm sure it looked very nice on the computer screen but was a near total failure when projected.

Seemingly endless numbers of slides had text that was difficult to read. Think of it as an eye exam that you want everyone in the room to pass. The main title of the slide should have a larger font than the rest of the text on the slide and of course the color of the font should be chosen to produce maximum contrast with the background. To maximize the font size, the title should have very few words, should be on one line and be as big as you can make it and still fit on one line. Also, all text should be in bold face type.

Bullets under the caption should follow similar rules. They should be as short as possible and still make the point. Since you are there speaking you can add the necessary clarifications and elaborations. After all, it is a poor talk when the speaker only reads the slides. The font of bullets should be in a color that strongly

contrasts with the background, be as big as possible and be in bold face type. Unless the bullets are very short, probably only two or three will fit on a slide. Rather than squeeze too many bullets onto one slide, use two or more slides with the same title and additional bullets.

Unfortunately, many speakers at the national conventions seemed to think graphs needed small font in the legends. While this works for a printed graph it fails miserably for a projected slide. The same rule applies; if it is on the slide make it big enough that the audience can see it, even if it offends an aesthetic sense of proportion. Also, the bars on a bar graph need to be clearly distinguished, usually by contrasting colors. Subtle hatching will not work.

Most speakers add pictures onto text slides as a way to add interest and illustrate the information that the bullets contain. They add eye appeal and can increase communication. However, pictures are not the primary element. There should be no sacrifice regarding the size of the text. Adding pictures might mean that bullets need to shift to additional slides, not that the

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Honey bees and blueberry blossoms – a marriage made in Georgia.
photo by Jennifer Berry

font size of bullets should be made smaller.

With the current interest in pesticide analysis many of the speakers presented graphs or tables that contained multiple lines of tabular material or complex arrays of colored bars. Most of the speakers that presented such slides said something like "This is a bit messy but…" or "I know you can't read this but..". It makes little sense to show a slide you know the audience cannot read or understand. If you are compelled to show a complex unreadable slide to illustrate that you have a lot of information then do it, showing the slide briefly and then following it with additional slides that clearly show the important information. Presenting a slide with unintelligible information and then babbling about chemical names and detection levels will not communicate to beekeepers or even most scientists that do not work in toxicology. If you focus on a chemical, speak of its use. If you mention a detection level tell if it is high, low or damaging to bees or not.

Many speakers use their last slide to show an image of all those that helped them. That's fine as the second to last slide. But the last slide should acknowledge and thank the audience. Your talk was really their talk and if there was any productive communication they participated as active listeners.

Speakers can do several things to improve their talks. Find a space to display the slides in a large room and view them from the prospective of the audience. This exercise will probably result in a list of things you need to change. Edit the slides. Unnecessary works, poor grammar and miss-spellings reflect badly on you and your respect for the audience. Practice your talk to become familiar with your slides and what you expect to say. If you don't do so it will be clear that you came unprepared.

This note focuses generally on the PowerPoint aspects of a presentation. Certainly speaking is more than that but it is a beginning. Each suggestion that I have made is supported by having seen the results of not following the suggestions at the recent meetings. Next year I hope to attend the national beekeeper association meetings and find that by planting these seeds in the fertile ground of *Bee Culture* readable slides will have blossomed in many of the talks.

In addition to this note I have written may useful things through the centuries which I hope you also appreciate.

Anonymous

. . . Some Solutions!

More people will probably listen to your scientific talk than will read the paper you may write. Thus the scientific talk has become one of the most important communication forums for the scientific community. As proof, we need only look at the rising attendance at and the proliferation of meetings. In many ways your research reputation will be enhanced (or diminished) by your scientific talk. The scientific talk, like the scientific paper, is part of the scientific communication process. The modern scientist must be able to deliver a well organized, well delivered scientific talk

We have compiled this personal list of "Secrets" from listening to effective and ineffective speakers. We don't pretend that this list is comprehensive – we're sure there are things we've have left out. But, our list probably covers about 90% of what you need to know and do.

Most scientific presentations use visual aids – and almost all scientific presentations are casual and extemporaneous. This "scientific style" places some additional burdens on the speaker because the speaker must both manipulate visual media, project the aura of being at ease with the material, and still have the presence to answer unanticipated questions. No one would argue with the fact that an unprepared, sloppy talk is a waste of both the speaker's and audience's time. We would go further. A poorly prepared talk makes a statement that the speaker does not care about the audience and perhaps does not care much about his subject.

So what are the secrets of a good talk? Here is our list of do's and don'ts.

1) **Prepare your material carefully and logically**. Tell a story. The story should have four parts:

(a)Introduction (b) Method (c) Results (d) Conclusion/Summary.

The *Introduction* should not just be a statement of the problem – but it should indicate your motivation to solve the problem, and you must also motivate the audience to be interested in your problem. In other words, the speaker must try and convince the audience that the problem is important to them as well as the speaker.

The *Method* includes your approach and the caveats. To us, the Method becomes more interesting to the listener if this section is "story like" rather than "text book like." In other words "I did this and then I did that, but that didn't work so I did something else." This Rather than, "The final result was obtained using this approach." This adds the human element to your research which is always interesting.

The *Results* section is a brief summary of your main results. Try and be as clear as possible in explaining your results – include only the most salient details. Less salient details will emerge as people ask questions.

The *Conclusion/Summary* section should condense your results and implications. This should be brief – a bullet or outline form is especially helpful. Be sure to connect your results with the overview statements in the *Introduction*. Don't have too many points – three or four is usually the maximum.

These four items are the core of a good talk. Good speakers often broaden the Introduction to set the problem within a very wide context. Good speakers may also add a fifth item: *Future Research*.

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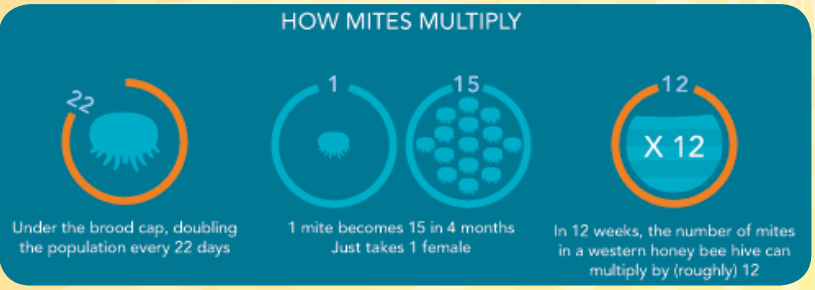


Mite Away Quick Strips® can be purchased through most bee supply outlets across the USA. A full distributor list can be found on our website.

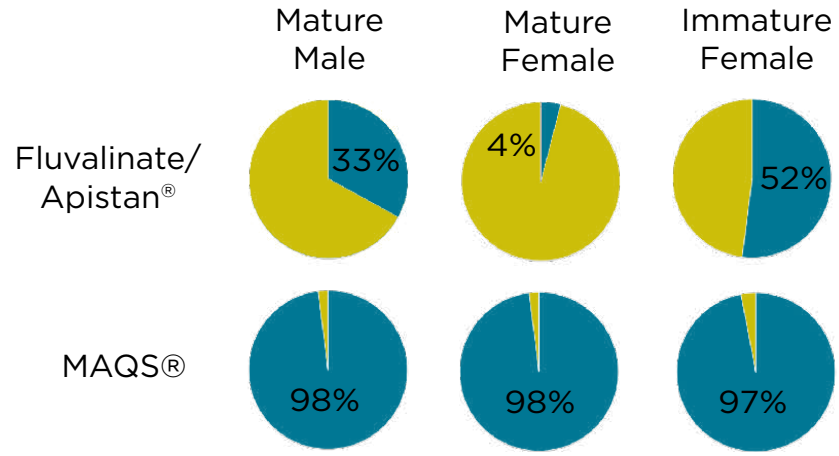
Mite Away Quick Strips® should be used as part of an integrated Pest Management Program (IPM).
The strip's innovation is that the treatment successfully penetrates the brood cap, targeting mites where they reproduce, arresting the transmission of viruses. High mite loads throughout the beekeeping season can result in higher winter losses.

Typically treatments are needed in the spring, to protect the summer bees, and again in the autumn, to protect the bees that will make up the winter cluster.

MAQS® can be applied on single or double brood-chamber standard Langstroth equipment or equivalent. The colony cluster should cover a minimum of 6 frames. Having entrances fully open during the 7 day treatment is essential.

LABEL CHANGES: As of April 2014, our label no longer requires use of respirators for application and the 1/2 Dose treatment is legally approved.

EFFECTIVENESS MAQS vs. FLUVALINATE ON MITES PRESENT IN THE BROOD (% OF MITES KILLED)



This result is incredibly promising for an effective Varroa treatment. Impressively, the treatment was effective at killing 97% to 98% of the Varroa in the capped brood within the first three days of treatment.[2]

1. S. Wendling, Varroa destructor (Anderson et Trueman, 2000), a ectoparasite mites de l'Abeille TAME Apis mellifera Linnaeus, 1758 REVUE bibliographique ETCONTRIBUTION TO L'Etude SA Reproduction. THESE Pour le Doctorat Veterinaire, 2012
2. Winter Colony Health Assessment After Using Mite Away® Quick Strip (MAQS®) as a Control for Varroa Mites in the Fall of 2009 Alison Van Alten, Janet Tam and Melanie Kempers -

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There is a crusty old saying among good speakers that describes a presentation from the communication viewpoint: **"Tell 'em what you are going to tell 'em. Tell 'em. Then tell 'em what you told 'em."** The point of this aphorism is people absorb very little information at first exposure - multiple exposures are the best way for ideas to sink in. Thus, it is ok to state some of your results in the introduction, and then to repeat your main points in the results/conclusion sections.

2) **Practice your talk.** There is no excuse for this lack of preparation. The best way to familiarize yourself with the material and get the talk's timing right is to practice your talk. Many scientists believe that they are such good speakers, or so super-intelligent that practice is beneath them. This is an arrogant attitude. Practice never hurts and even a quick run through will produce a better talk. Even better, practice in front of a small audience.

3) **Don't put in too much material.** Good speakers will have one or two central points and stick to that material. How many talks have you heard where the speaker squanders their time on unessential details and then runs out of time at the end? The point of a talk is to communicate scientific results, not to show people how smart you are (in case they can't figure it out for themselves). *Less is better for a talk.* Here is a good rule of thumb – each viewgraph takes about 1.5-2 minutes to show. Thus a 12-minute talk should only have six to eight viewgraphs. How many "viewgraph movies" have you seen and how effective were those presentations? Furthermore, no one has ever complained if a talk finishes early. Finally, assume most of the audience will know very little about the subject, and will need a clear explanation of what you are doing not just details.

4) **Avoid equations.** Show only very simple equations if you show any at all. Ask yourself – is showing the equation important? Is it central to my talk? The problem is that equations are a dense mathematical notation indicating quantitative relationships. People are used to studying equations, not seeing them flashed on the screen for two minutes. I have seen talks where giant equations are put up – and for no other purpose than to convince the audience that the speaker must be really smart. The fact is, equations are distracting. People stop listening and start studying the equation. If you have to show an equation - simplify it and talk to it very briefly.

5) **Have only a few conclusion points.** People can't remember more than a couple things from a talk especially if they are hearing many talks at large meetings. If a colleague asks you about someone's talk you heard, how do you typically describe it? You say something like "So and so looked at such and such and they found out this and that." You don't say, "I remember all six conclusions points." The fact is, people will only remember one or two things from your talk – you might as well tell them what to remember rather than let them figure it out for themselves.

6) **Talk to the audience not to the screen**. One of the most common problems we see is that the speaker will speak to the viewgraph screen. It is hard to hear the speaker in this case and without eye contact the audience loses interest. Frankly, this is difficult to avoid, but the speaker needs to consciously look at the object on the screen, point to it, and then turn back to the audience to discuss the feature. Here is another suggestion, don't start talking right away when you put up a viewgraph. Let people look at the viewgraph for a few moments – they usually can't concentrate on the material and listen to you at the same time. Speak loudly and slowly. Pick out a few people in the audience and pointedly talk to them as though you were explaining something to them.

7) **Avoid making distracting sounds**. Everyone gets nervous speaking in public. But sometimes the nervousness often comes out as annoying sounds or habits that can be really distracting. Try to avoid "Ummm" or "Ahhh" between sentences. If you put your hands in your pockets, take the keys and change out so you won't jingle them during your talk.

8) **Polish your graphics**. Here is a list of hints for better graphics:

1. **Use large letters (no fonts smaller than 16 pts!!)** To see how your graphics will appear to the audience, place the viewgraph on the floor - can you read it standing up? Special sore points are figure axis and captions - usually unreadable.
2. **Keep the graphic simple.** Don't show graphs you won't need. If there are four graphs on the viewgraph and you only talk to one - cut the others out. Don't crowd the viewgraph, don't use different fonts or type styles - it makes your slide look like a ransom note. Make sure the graph is simple and clear. A little professional effort on graphics can really make a talk impressive. If someone in your group has some artistic talent (and you don't) ask for help or opinions.
3. **Use color.** Color makes the graphic stand out. However avoid red in the text - red is difficult to see from a distance. Also, check your color viewgraph using the projector. Some color schemes look fine on paper, but project poorly.
4. **Use cartoons** I think some of the best talks use little cartoons which explain the science. It is much easier for someone to follow logic if they can see a little diagram of the procedure or thought process that is being described. A Rube-Goldberg sort of cartoon is great for explaining complex ideas.

9) **Use humor if possible.** A joke or two in your presentation spices things up and relaxes the audience. It emphasizes the casual nature of the talk. I am always amazed how even a really lame joke will get a good laugh in a science talk.

10) **Be personable in taking questions.** Questions after your talk can be scary. But questions are very important. If there are no questions after a talk it means that you failed to stimulate the audience, or that they understood nothing of what you said. You failed to communicate. Questions tell you what part of your talk the audience did not understand. Questions may also help you focus your research or help you in the write up. So what is the best way to answer questions?

1. **First, repeat the question.** This gives you time to think, and the rest of the audience may not have heard the question. Also if you heard the question incorrectly, it presents an opportunity for clarification.
2. **If you don't know the answer then say "I don't know, I will have to look into that.**" Don't try to invent an answer on the fly. Be honest and humble. You are only human and you can't have thought of everything.
3. **If the questioner disagrees with you and it looks like there will be an argument then defuse the situation.** A good moderator will usually intervene for you, but if not then you will have to handle this yourself. e.g. "We clearly don't agree on this point, let's go on to other questions and you and I can talk about this later."
4. **Never insult the questioner.** He/she may have friends, and you never need more enemies.

A couple miscellaneous points

Thank you – It is always a good idea to acknowledge people who helped you, and thank the people who invited you to give a talk.

Dress up – People are there to hear your material, but when you dress up you send the message that you care enough about the audience to look nice for them.

If possible, check your talk on the computer you will use. Sometimes fonts don't work, colors don't show, photos don't fit or the software is too new, or too old. A well run meeting will provide this opportunity, but if not, insist before hand which means arriving early and preparing. If your PowerPoint doesn't work your audience will miss the talk and you've missed an opportunity.

But you will be remembered.

Mark Schoeberl and Brian Toon

Books On Organic

In the January 2015 issue of *Bee Culture*, in a discussion of "activist authors," Ross Conrad wrote that "the first book to be published in the U.S. on organic beekeeping, *Natural Beekeeping: Organic Approaches to Modern Apiculture* that I authored, was first released in 2007."

Natural Beekeeping is a fine book, but at least one book on organic beekeeping was published previously – *Toward Saving the Honey Bee*, by Gunther Hauk, appeared in 2002.

Ross continues: "the primary thrust of my book is to rely less on toxic chemicals, antibiotics and artificial diets"; by contrast, Gunther Hauk's book draws on decades of experience successfully keeping bees *completely without* toxic chemicals, antibiotics and artificial diets. He has been practicing and teaching these techniques in the U.S. since 1996: for 10 years as the founding director of the Pfeiffer Center in Chestnut Ridge, NY, and since 2006 at Spikenard Farm Bee Sanctuary in Virginia. The work he started at the Pfeiffer Center continues under the direction of Mac Mead.

If the subject is activism on behalf of bees and the environment, the work of Gunther Hauk and the Pfeiffer Center merit a mention.

Bill Day
Development Coordinator
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MARCH CHECKLIST

- ✓ Check food stores on a warm sunny day
- ✓ Feed winter patties for those colonies critically low on stores
- ✓ Start feeding pollen patties when appropriate for your season
- ✓ Order or make any needed equipment
- ✓ Finalize locations for new hives

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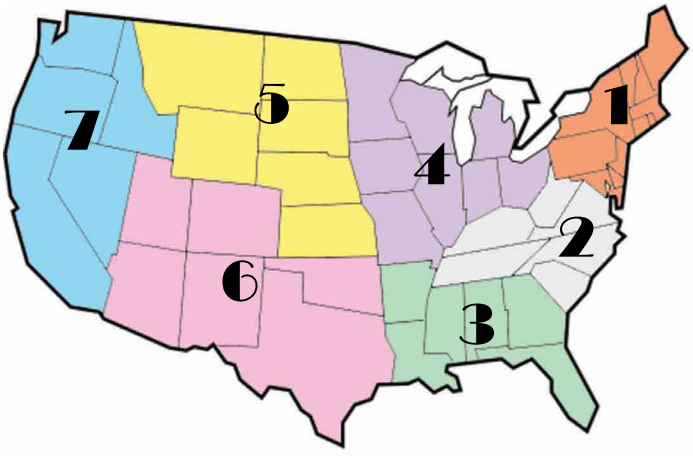
MARCH – REGIONAL HONEY PRICE REPORT



Again this year we polled our reporters on where they sell their honey. We've been doing this for several years, and the pattern is fairly predictable. Our reporters are primarily sidleline or small commercial beekeepers, with a few larger outfits represented that tend to be producer/packers.

If you are interested in expanding your honey (and other hive product) sales, look over this list of possible outlets. There are most likely some you are missing now and could investigate. Price is not the key to more sales so don't undersell your product. *Rather*, increase your exposure by increasing where your honey is sold.

By far the majority – over 80% - of our reporters sell some of their honey from home, either an inside or outside stand. I suspect, but can't prove that this is price driven, because if you look at what venues have done since last year the trends becomes more clear. Farm markets are up some this year…and with farm markets come price increases. Home sales have little investment in time…you're not standing all day talking, but farm markets have the advantage of one on one sales, encouraging repeat sales and meeting lots of new customers, plus a healthy price increase from those at-home sales. If you are just starting out, remember that if you are selling honey from home, your insurance may need tweaking since you are operating a business there. More businesses are requiring beekeepers to have some sort of liability insurance if they wish to sell honey at that outlet. Businesses don't want your problems to become their problems.

Overall, prices have increased since last year with home prices the lowest. But packer prices are up, as are sales.

Where Do They Sell Their Honey?

% of Reporters Selling at these locations						% of Their Honey Sales at these locations						Locations Honey Sold at
2010	2011	2012	2013	2014	2015	2010	2011	2012	2013	2014	2015	
81	71	77	77	72	83	43	51	36	73	31	39	Home (inside or roadside stand)
13	17	16	19	14	24	14	26	19	34	43	32	Local community - sponsored farm market (i.e. Sat. & Sun. sales)
23	19	29	28	26	22	27	31	40	31	29	20	Local Farm Market business that's seasonal (Fall only, for instance)
32	26	29	26	25	28	38	34	33	35	26	30	Local Farm Market business that's year-round
9	8	4	5	6	6	34	24	33	19	10	15	Flea Market
37	35	39	35	83	22	19	18	24	20	22	19	Health Food/Organic store
8	12	10	7	11	13	37	9	8	6	10	14	Gift Store
19	13	16	17	13	11	22	20	21	17	12	19	Bakeries/Food Establishments
13	17	14	5	10	9	13	13	28	5	16	34	Local High-End Retail Outlets (gourmet stores)
37	30	31	27	32	35	19	22	16	27	25	20	Local, Small 'Mom & Pop' Retail Outlets (grocery & gas)
13	14	17	4	7	11	26	32	35	13	28	45	Local Small Packer or Producer/Packer
0	5	2	3	3	4	0	42	100	67	78	83	Huge Packer, they pick up
9	13	11	9	8	11	30	38	41	51	37	45	Wholesale only to larger stores, you deliver to warehouse
11	14	11	5	13	7	3	4	9	5	5	9	Breweries/Beer or Mead makers
4	6	10	6	8	6	8	6	10	5	8	4	Internet, direct retail, mail order
17	29	41	41	33	19	11	20	21	18	13	12	Work, direct retail
8	8	6	16	10	7	25	8	6	16	13	7	Local/State Fair, with club

*Total percentage of sales does not come out to 100% because of multiple outlets.

REPORTING REGIONS								SUMMARY			History	
	1	2	3	4	5	6	7	Range	Avg.	$/lb	Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS												
55 Gal. Drum, Light	2.22	1.89	2.31	2.80	2.23	2.18	2.35	1.89-2.80	2.28	2.28	2.31	2.05
55 Gal. Drum, Ambr	1.95	1.84	2.09	2.68	2.21	2.08	2.30	1.80-2.75	2.14	2.14	2.19	1.99
60# Light (retail)	219.80	209.67	178.75	187.33	171.00	187.50	280.00	136.00-280.00	199.68	3.33	191.11	183.97
60# Amber (retail)	206.29	222.33	177.50	170.50	204.38	173.75	220.00	136.00-295.00	193.25	3.22	190.45	180.58
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	86.39	70.80	60.00	66.67	51.84	79.88	100.00	48.00-114.00	78.76	6.56	76.30	76.36
1# 24/case	130.93	103.20	111.24	98.50	106.32	119.88	136.70	84.00-168.00	118.00	4.92	111.99	108.19
2# 12/case	122.90	108.76	96.18	88.16	97.44	108.76	114.50	76.00-144.00	107.53	4.48	98.08	97.21
12.oz. Plas. 24/cs	104.37	85.33	76.04	72.73	74.40	107.76	99.80	34.80-120.00	87.88	4.88	89.61	85.20
5# 6/case	133.48	114.00	117.93	106.20	102.30	126.01	125.00	84.00-180.00	120.02	4.00	113.95	111.13
Quarts 12/case	172.53	126.13	119.46	148.13	125.64	131.94	136.00	108.00-216.00	141.19	3.92	132.95	131.34
Pints 12/case	98.54	86.33	67.75	98.60	94.33	60.00	89.50	60.00-143.00	87.17	4.84	82.06	80.54
RETAIL SHELF PRICES												
1/2#	4.77	4.32	3.50	3.03	3.80	2.95	6.00	1.89-7.25	4.15	8.31	4.06	4.15
12 oz. Plastic	6.25	4.63	4.63	4.23	4.21	5.43	6.40	3.20-8.25	5.06	6.75	5.15	4.96
1# Glass/Plastic	7.46	6.92	6.79	5.33	5.57	6.17	9.00	3.00-10.00	6.65	6.65	6.70	6.23
2# Glass/Plastic	13.75	11.67	10.50	9.90	8.99	11.05	16.00	7.09-18.00	11.83	5.91	11.08	10.30
Pint	10.99	8.99	7.74	7.11	7.25	6.15	10.20	4.00-14.00	8.65	5.77	9.05	8.95
Quart	17.87	15.00	13.40	17.16	14.53	12.53	17.60	8.00-26.00	15.56	5.19	14.92	14.68
5# Glass/Plastic	28.94	23.92	28.00	25.13	23.89	21.66	30.00	14.99-38.00	26.19	5.24	24.54	22.73
1# Cream	9.99	9.30	9.30	6.53	7.11	7.99	12.00	4.95-15.00	8.63	8.63	7.92	7.21
1# Cut Comb	11.25	10.34	6.00	9.50	8.50	10.34	14.50	4.50-16.00	10.44	10.44	9.62	8.36
Ross Round	8.29	6.00	8.10	9.17	8.10	12.00	8.10	3.50-12.00	8.45	11.27	8.25	7.65
Wholesale Wax (Lt)	7.44	5.25	4.80	6.17	6.00	3.75	4.88	3.00-10.00	5.93	-	5.79	5.30
Wholesale Wax (Dk)	5.66	4.88	3.50	6.26	5.08	2.00	4.25	2.00-8.50	4.91	-	5.01	4.65
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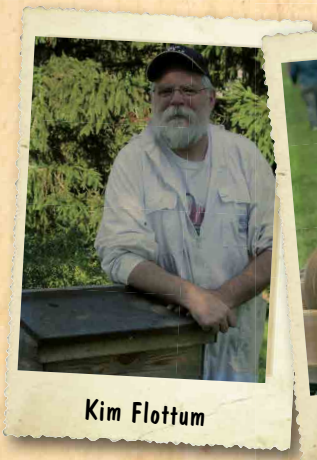
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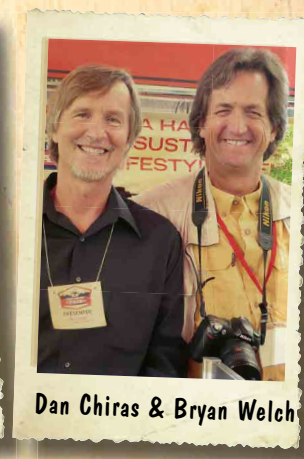
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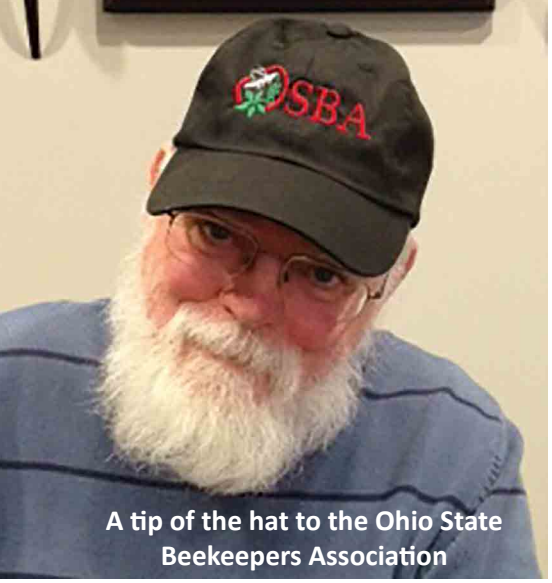


A tip of the hat to the Ohio State Beekeepers Association

INNER COVER

Back in January we reported in the BUZZ that the ERS has sent a Report to the Commissioner of the Food and Drug Administration as Required by the 2014 Farm Bill on "How an Appropriate Federal Standard of Identity for Honey Would be in the Interest of Consumers, the Honey Industry, and U.S. Agriculture".

The report was generated by tallying comments posted to the ERS web site commenting on the Standards FDA had come up with in response to requests by the beekeeping industry since 2006. FDA wanted to know how those standards might affect consumers and the honey industry.

In Summary, AMS found that 1) the preponderance of comments across multiple regions and organizations support the establishment of a standard; and 2) there are divergent opinions on the content and wording of such a standard, and its relationship to existing international standards.

Who is this preponderance of commenters? 85 comments posted. 76 supported the proposed regulations. You can read the entire proposed regulations at **file:///C:/Documents%20and%20Settings/kflottum/My%20Documents/Downloads/AMS-FV-14-0025-0003.pdf**, which are included within the joint comments made by the ABF, AHPA, National Honey and Packers and Dealers, Sioux Honey, and the Western States Packers and Dealers groups. Combined, these groups represent more than 90% of the U.S. Honey Industry. Read their comments – they make good points about a lot of what needs to be said about this subject. And, since they have a loud voice, maybe you should know what they are saying. I'll get back to this in a minute.

Other groups and people make comments too. Here are a few – The Texas Beekeepers Association had a bunch, and Texas in general had 29 comments – they have an active group that supports the Texas Standard of Honey, which, as you probably know, is different than the standards from the other eight states that have them already.

Food and Water Watch, an environmental advocacy group submitted a petition to establish regulations (specifics not listed) signed by every one of their 20,000 members. Monsanto voiced a positive opinion, Vaughn Bryant, the pollen expert from Texas A&M who writes here on occasion had a long and detailed comment on the pollen aspect of what was being said, and Amina Harris, the Director of the Honey and Pollination Center in Davis, CA suggested the Codex Standards be adopted.

There were others of course, mostly all supporting the adoption of some kind of standard, but offering little in the way of guidelines. That, I suspect, is what most of us would do. But not all of us.

This is the Standard people commented on.

Standard for Honey

1. Scope. This standard applies to all honey produced by honey bees and covers all styles of honey presentations which are processed and ultimately intended for direct consumption and to all honeys packed, processed or intended for sale in bulk containers as honey.

2. Description. 2.1.Definition: Honey is the natural sweet substance produced by honey bees from the nectar of plants or from secretions of living parts of plants or excretions of plant sucking insects on the living parts of plants, which the bees collect, transform by combining with specific substances of their own, deposit, dehydrate, store and leave in the honey comb to ripen and mature. 2.1.1. Blossom Honey or Nectar Honey is the honey which comes from the nectars of plants. 2.1.2. Honeydew honey is the honey which comes mainly from excretions of plant sucking insects (Hemiptera) on the living parts of plants or secretions of living parts of plants.

2.2. Description: Honey consists essentially of different sugars, predominantly fructose and glucose as well as other substances naturally derived from the collection of nectar by honey bees for conversion into honey. The color of honey varies from nearly colorless to dark brown: the consistency can be fluid, viscous or partly to entirely crystallized. The flavor and aroma vary, but are derived from the plant origin.

3. Essential Composition and Quality Factors. 3.1. Honey sold as such shall not have added to it any food ingredient, including food additives.

3.1.1. Styles of Honey: 3.1.1.1. Filtered – Filtered honey is honey of any type defined in the United States Standards for Grades of Extracted Honey that has been filtered to the extent that all or most of the fine particles, pollen grains, air bubbles, or other defects normally found in suspension have been removed. 3.1.1.2. Strained – Strained honey is honey of any type defined in the United States Standards for Grades of extracted Honey that has been strained to the extent that most of the particles, including comb, propolis, or other defects normally found in honey have been removed. Grains of pollen, small air bubbles, and very fine particles would not normally be removed. 3.1.1.3. Unfiltered/Unstrained – Unfiltered/Unstrained honey is honey that has not been filtered or strained as described by United States Standards for Grades of Extracted Honey and may include extracted or non-extracted honey and whereas most whereas most of the fine particles, pollen grains, air bubbles, comb, propolis and other defects normally found in suspension may be present.

3.2.Honey shall not be filtered to less than 1.0 microns. 3.3. Chemical or biochemical treatments shall not be used in the packaging or processing of honey. 3.4. Moisture content: Honey Shall not have a moisture content exceeding 23%. 3.5. Sugars Content. 3.5.1. Fructose and Glucose Content (Sum of Both). 3.5.1.1. Honey not listed below – not less than 60g/100g. 3.5.1.2. Honeydew honey, blends

Safely Defining Honey.

of honeydew honey with blossom honey – not less than 45g/100g. 3.5.2. Sucrose Content. 3.5.2.1. Honey not listed below – not more than 10g/100g. 3.5.2.2. Lavendar (Lavandula spp), Borage (Borago officinalis) – not more than 15g/100g 3.6.Water Insoluble Solids Content 3.6.1. Honeys – not more than 0.5/ 100g.

You can probably imagine why some groups would have difficulty adopting this standard. Moreover, when considering there are already nine state standards, none alike, the babble from the regulatory front would be deafening. Utah for instance has a definition that isn't legal in the other eight states with regulations – make that work in a grocery store.

In the U.S. today, food safety oversight is divided among fifteen federal agencies. The USDA's Food Safety and Inspection Service, or FSIS and the FDA, a part of the Department of Health and Human Services are the most important. FSIS inspects meat, poultry and eggs and FDA everything else.

So ERS (a part of USDA) sends FDA (Health and Human Services) a document that has comments from, (considering the one sent from the ABF, AHPA et al), more than 90% of the honey industry, plus many others, that want some kind of oversight regulation on honey, which is under the watchful eye of FDA. Why isn't FDA doing something? Well, consider . . .

Every year contaminated food makes 48 million people sick. Of these 128,000 of them are hospitalized, and 3,000 die. Salmonella alone infects more than a million Americans each year, sending 19,000 to the hospital, and kills more than any other food borne pathogen.

Currently, when the CDC identifies the cause of a food borne illness reported to them by doctors the responsibility to curb the problem points to which ever agency the offending food falls under – meat for FSIS, everything else for FDA. FSIS has a huge army of inspectors, checking meat production everywhere meat is processed. FDA has almost nobody checking and years may go between inspections at food processing plants. However, safety audits do occur at these plants conducted by private inspection services hired by retailers who want to know they are getting safe food. The cantaloupe/listeria outbreak in 2011 fell under the oversight of FDA, but had been inspected by a private agency hired by retailers. Only when the CDC was able to identify the source of the contaminated fruit was something able to be done. Listeria is relatively rare, infecting about 1600 people in the U.S. every year, killing one in five of them. Thirty-three died from the 147 victims of the infected cantaloupe. There are no in-plant contamination limits on infected food, with the exception of *E. coli* in chicken because it is considered an adulterant, not a dangerous bacteria. Officials must use indirect methods to shut down a facility, like posting news of the violation on websites, or announcing it on TV and Radio. This is generally effective, but not always, and not very fast. When it works what you hear is a *voluntary* recall by producers.

Well, all that is supposed to change. The 2010 Farm Bill, now supported by the President's new budget, proposed consolidating the USDA FSIS and HHS FDA into a new department within HHS. This new agency would work closely with state and local health departments, now mostly handled by CDC.

The 2010 Safety Bill gives authority to the current FDA to inspect processing plants for meat and everything else, order recalls, impose strict standards on imported foods and make, and enforce stricter standards on farms and manufacturing facilities. Imported honey will fall under their gaze, and their gaze will be meaningful. But your honey house and packing facility will too, and all three can now be shut down by the Feds if the bill passes.

This budget proposal for even greater government oversight, it is assumed, will meet with significant resistance from the food industry, farmers and manufacturers, especially now in a Republican dominated congress

But the above definition of honey has measurable, positive attributes that will change the labeling of the end product. By the above definition, it's filtered honey if it doesn't have pollen, and strained or unstrained if it does. Sugar and moisture content are both measurable by this definition, and nothing should be added is mentioned. And these new rules were just made to oversee honey's problems with adulteration and tainting and country of origin label laws.

We can't go on with 50 definitions of honey and appear anywhere near professional. And there needs to be some tools to use to stop illegal product from being sold. This new agency will fix the problems with the definition of honey, but it opens the door to your honey house. Will the beekeeping industry support this new agency? Does it want this scrutiny?

•

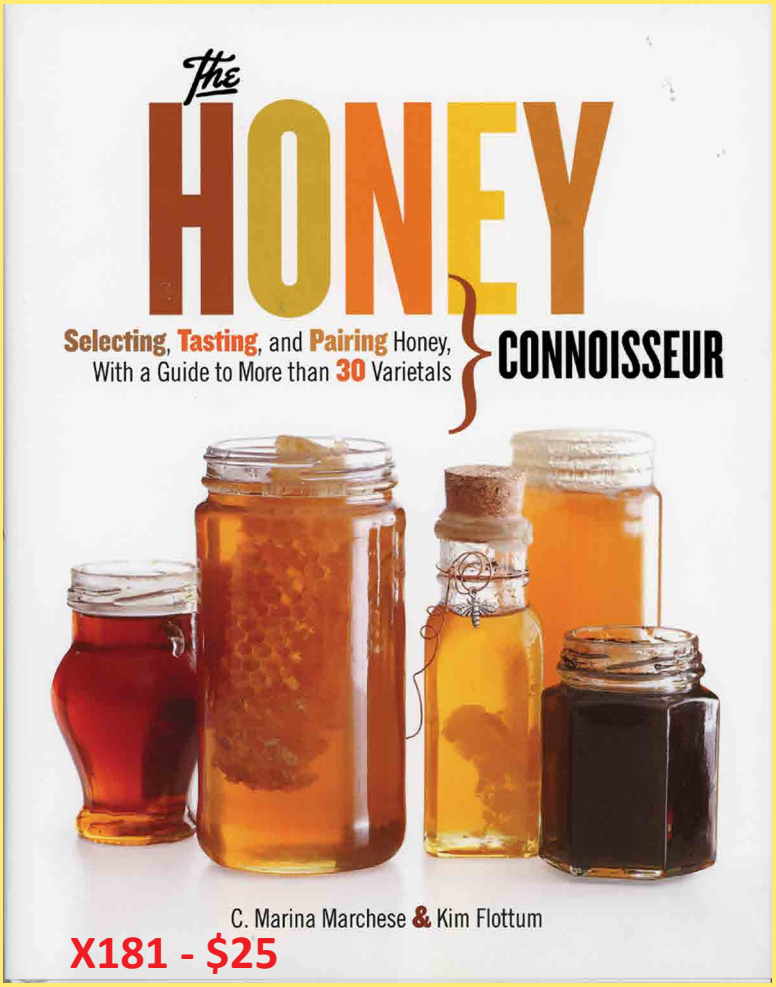
A brief note about the very long letters in the mailbox regarding the meetings in January. Our old friend Anonymous sends along comments about the style of many of the presentations seen at that meeting. He, or she, was not impressed with how some were delivered. I was there. I wasn't either. Good information was given – I didn't hear one talk that didn't have some value – but when you can't read the slide, when the speaker turns and talks to the screen and not you, and when the speaker is obviously not prepared to give the talk – prepared to discuss the research, yes. To give a talk, no – then the whole thing falls apart.

Have I ever made any of these mistakes? Absolutely. I've made them all. Every one. Some several times. And, like most polite audiences, someone close with my better interests at heart had to tell me.

The second letter is full of good advice. It's from a source that is in the business of giving advice about giving talks. It's old. The original article talks about how to use a slide projector (it's been updated to discuss computers). But the rest is good stuff. Whether you teach a beginner's class, give more formal talks to groups, or are a professional researcher, we all can stand some critiquing once in a while from someone who is merely looking out for our best interests. Good information, presented well is its own reward, but when received by an audience that leaves better off than when they came in – it doesn't get any better.

•

March. Gee whiz, where did Winter go? I was actually going to get something done this year – well, it's almost not too late. Get going, and keep your smoker lit, your hive tool sharp and your veil tight. It's bee time.



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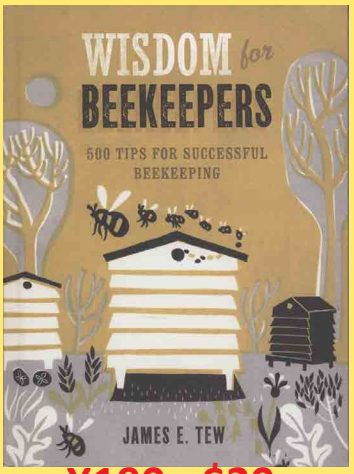

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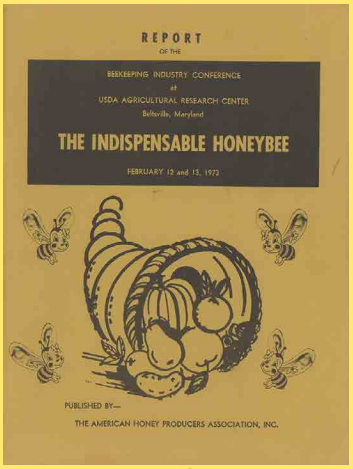

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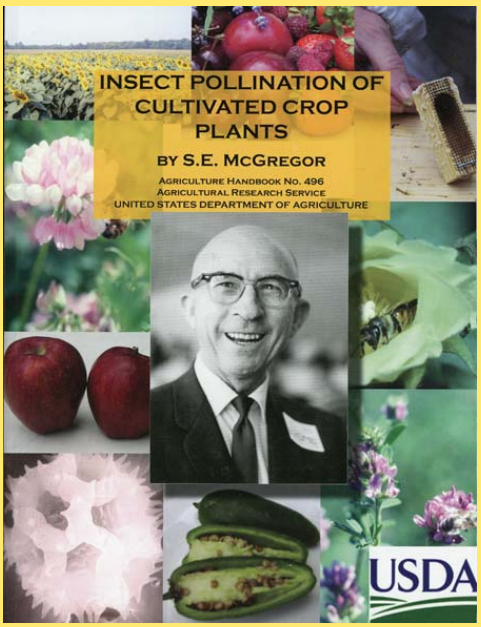

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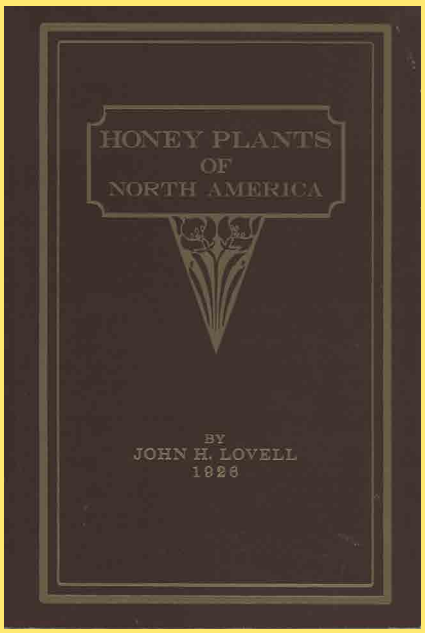

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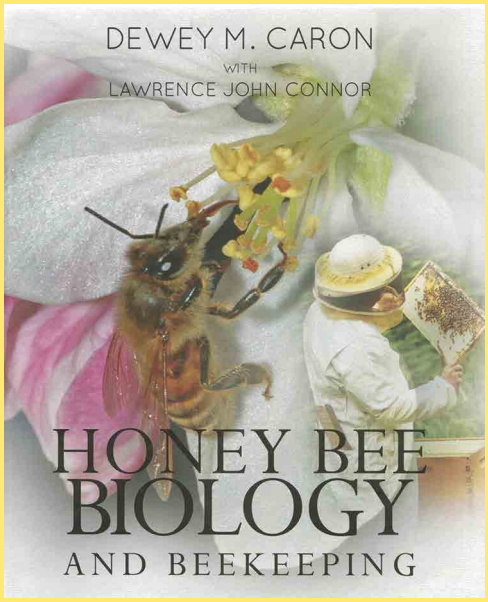

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It's Summers Time –

Winter, The Chickens and Stress

If you live where it's cold and snowy Winter and stress just go together. As I write this we are approaching mid-February – still a long time until Spring. And here in Northeast Ohio even after the calendar says it's Spring, that doesn't always mean it's pleasant outside. In the 30+ years I've lived here we've had some of our biggest blizzards in late March and even early April.

Right about now we're all getting a little cranky. This past weekend it was nice and sunny enough to just start melting the snow and then it turned bitter cold and guess what happens – all that melting snow turns to ice. The roads have been fine to travel on, but everyone's driveways have been a real challenge this week. We live on a nasty curve out in the country so sliding out into the road can be a bit risky. And then there is the walking issue – trying to get to the mailbox, fetch the paper, make it to the chicken coop without falling down and hurting yourself. It's just stressful! It's stressful on us, on our pets, on our outside animals and certainly on those bees way out in the backyard.

Sunday it was actually sunny enough that the hive we have sitting on our front porch had some flying going on. Everyone is anxious to get outside.

Now I'm not trying to make any of you feel sorry for us, because there are folks who have a lot harder Winter than we do. I'm just making some observations.

"There can be as much as a month between the first day of Spring and the first Spring day."
Henry Van Dyke

The chickens are doing pretty well this Winter. They will be three years old in March, so we're heading for our fourth Summer with them. We still have 11 – haven't lost anybody recently. I've told you about our wonderful chicken coop – no drafts, bales of straw all around for insulation, windows covered and yes, warming lights. They seem quite happy in there. The lowest temperature we've seen in there this Winter is right around 20. Now coming up this weekend we have some minus numbers in the forecast, so I'll be keeping a closer eye on them.

I have to thank Kim. He has really taken over a lot of the care of the chickens during the Winter months. He has been giving them a lot of protein – more scratch, meal worms and he's been cutting up the suet blocks that we put in bird feeders. Boy, they love those! We bought some live crickets at the local pet store and thought they would enjoy those, but not so much. The girls just sort of sat there and watched them.

So they're a little spoiled, but not to the point of coming to live in the house with us. We're still getting on average three or four eggs a day which I think is pretty good.

We've tried letting them outside on a sunny day, but they won't go out when there is snow on the ground. It's like watching a cartoon – the leader starts out the door, sees the snow, stops short and everyone following close behind crashes into each other.

Lots of folks ask if these three-year-old chickens are headed for the soup pot this year. I'm keeping a close eye on our older neighbor and my chickens. He grew up on a farm and when chickens got about three years old that's what you did with them. Not these girls, at least not right now.

We're doing things right or we're very lucky with these girls. We have not had any signs of any ailments – mites, illness, injury. They are happy and healthy.

Kim has mentioned getting some meat birds and we have a friend that would do the butchering for us. I'm probably not going to be a part of that project. I'll just deal with chicken when it arrives in the nicely wrapped package.

I'm reading up on ducks this Winter and I'm pretty sure we're going to give that a try. We'll start with just a few.

Kim and I were Monroe, NC for the NC/SC joint state meeting this past weekend. What a great time we had. First of all the weather was beautiful. Thank you very much.

Thank you to Jerry and Libby who picked us up at the airport, hosted us for the first evening, got us to the meeting on time and made sure we were well taken care of.

There were right around 700 people at this meeting. It was a nice facility, good food, good friends, good speakers, vendors – everything you need for a great meeting. It was so good to see several of our friends that we've missed. A great weekend.

Our flight home was on time, uneventful and short. We got the car and headed for a restaurant to get some supper before heading home. We almost made it to Medina County – literally feet from the sign – and the car died. Yes, right there on I71, cars wizzing by, cold outside and we weren't going anywhere. We were safely off on the shoulder so not in any real danger. So call the tow truck, call a good friend to come and rescue us and finally about 9:00 p.m. (about three hours after we landed) we made it home safely. More stress.

Well, it turns out the car is pretty much a goner. Now we've been talking about getting a new vehicle for a couple of years. It looks like we'll finally be making a decision.

As some of you know *Bee Culture* has had a rough few months – stress! You know because you've called or emailed and it has taken us a while to get back to you. I'm going to let you in on some of our reasons – not excuses – just life gettin' in the way.

We had one of our folks fall on that ice I was talking about. We've had another out with some health issues and we're learning a new subscription program and working on a new digital edition and also still improving and working on our new web page. When you only have five people in your department and you lose two of them it makes life exciting. Hopefully by the time you read this everyone will be back in place, we will have learned all the new stuff and caught up. We appreciate you being patient and hope that you will continue to enjoy *Bee Culture* magazine.

Happy Spring!

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A Closer LOOK

BEESWAX, WAX GLANDS

Clarence **Collison**

Beeswax is a complex substance made up of wax esters, fatty acids and hydrocarbons.

Wax is used by honey bees to protect themselves against water loss through the integument and in the construction of combs. The major fractions of the cuticular wax were analyzed by gas-liquid chromatography and were shown to be qualitatively similar to those of comb wax (Blomquist et al. 1980). However, the composition of the cuticular wax of the honey bee is quantitatively different from that of the comb wax. The major component of the cuticular lipids is hydrocarbon, which comprises 58% of this wax. In contrast, hydrocarbon comprises only 13-17% of the comb wax, and monoester is the largest component (Tulloch 1971). Comb wax is produced by four pairs of glands within the abdomen while cuticular wax is likely produced by epidermal cells of the integument.

Beeswax used in comb construction, comb repair, and capping of cells containing either pupae or honey, is secreted by worker bees on paired, smooth, oblong areas, called wax mirrors, located ventrally on abdominal segments four through seven (Figure 1A). On the dorsal side of each wax mirror is a layer of epithelial tissue called the wax gland (Sanford and Dietz 1976). Wax glands are merely specialized parts of the body-wall epidermis, which during the wax forming period in the life of the worker, become greatly thickened and take on a glandular structure (Figure 1C). The wax is discharged as a liquid through the mirrors and hardens to small flakes in the pockets between the mirrors and the long underlapping parts of the preceding sterna. After the wax-forming period the glands degenerate and become a flat layer of cells (Snodgrass and Erickson 1992).

The wax gland complex of the honey bee worker (Figure 2) consists of three cell types, epithelial cells, oenocytes and adipocytes (fat body cells), which act synergistically to secrete wax, a complex mixture of hydrocarbons, fatty acids and proteins (lipophorins) (Cassier and Lensky 1995). Lying over each gland is a large cellular mass composed of fat cells and oenocytes (Figure 1B) (Snodgrass 1956).

In young bees that have just recently emerged from their cells, the cells of the wax gland are nearly square in shape, while in older bees, the cells are either elongated or completely degenerated (Figure 1C). There is a definite correlation between the age of the bee, the size (length) of the cells in the wax glands, and the gland's ability to secrete wax (Turell 1974). In newly emerged bees the wax gland cells have large nuclei and do not have intercellular spaces (an open area between the cells). These cubical cells have an average height of 17 to 19 microns. The production of wax begins in workers that are slightly less than one week old. As secretory activity increases, the cells of the wax gland become tall and slender. Cells from a bee at peak wax production have a height of approximately 50 microns, and have developed large intercellular spaces. Wax glands are best developed and most productive in 12-18 day-old workers. After producing wax for a few days, the wax glands begin to degenerate and by the time the bee is ready to leave the hive to become a field bee, usually when it is about 21 days of age, the glands have completely degenerated. The cellular boundaries, which were distinct in the immature and active glands, have become indistinct, or even lacking, and the height of the gland has fallen to only three microns.

Beeswax used in comb construction, comb repair, and capping of cells containing either pupae or honey, is secreted by worker bees on paired, smooth, oblong areas, called wax mirrors, located ventrally on abdominal segments four through seven.

Beeswax is produced by metabolizing honey in fat cells associated with the wax glands and converting it to beeswax; workers cannot produce beeswax unless there are adequate honey stores in the colony. Workers also need to eat pollen during the first five to six days of their life in order to secrete

wax later on, evidently because the protein in pollen is needed at that time for adequate fat cell development (Winston 1987). Wax is secreted primarily during warm weather when foraging is active. Workers actively engaged in secreting wax engorge themselves with honey and hang in festoons at or near the site of comb building. Drones and queens do not have abdominal wax glands.

To date, the mechanisms associated with wax synthesis and secretion are not fully understood. Piek (1964) showed that acetic acid is likely taken up by the oenocytes and that acetate is used for the synthesis of hydrocarbons. Blomquist et al. (1980) demonstrated that the incorporation of injected radio-labelled acetate into hexane extractable wax (cuticular wax) by worker honey bees not actively producing comb wax resulted in the recovery of much of the radioactivity in the hydrocarbon fraction. In bees actively producing comb wax, a higher percentage of radioactivity was recovered in the monoester fraction. A dramatic effect of age on the distribution of radioactivity from acetate into the various wax fractions from bees studied in the Summer months was observed. In bees from 11 to 18 days following emergence to adults, the major wax component synthesized was monoester, whereas in younger and older bees, hydrocarbon was the major wax component formed. Both *in vivo* and *in vitro* experiments using bees actively producing comb wax showed that the abdomen produced significant amounts of monoester, hydrocarbon, and other esters, whereas the thorax synthesized mostly hydrocarbon. These data show that the epidermal cells and wax glands each produce a wax with a distinct composition, and that the age and seasonal differences observed in wax synthesis are due to presence or absence of active wax glands.

The ultra-structure of the cells of the wax gland complex was studied in relation to the synthesis and secretion of beeswax (Hepburn et al. 1991). The hydrocarbon and fatty acid profiles of epidermal cells and oenocytes were determined in relation to the ages of the bees. Smooth endoplasmic reticulum (SER)** was absent from both epidermal cells and adipocytes (fat cells) in adult

There is a definite correlation between the age of the bee, the size (length) of the cells in the wax glands, and the gland's ability to secrete wax.

workers from the time they emerged until the end of wax secretion. The oenocytes were rich in SER. The hydrocarbon and fatty acid content of the oenocytes, averaged for bee age, closely matched that of newly secreted wax. The oencytes are the probable source of the hydrocarbon fraction of beeswax which is consistent with histochemical and autoradiographic data. The cyclical changes of organelles within the cells and chemical composition of the wax gland complex closely coincided with measured, age-related rates of wax secretion in the workers.

Hepburn et al. (1991) observed that SER is barely discernible in the oenocytes of newly emerged workers, but by the fourth day the volume density of these tightly packed tubules is high.

Similarly, there is a large increase in whole oenocyte volume and the relative volumes of the oenocytes and SER remain elevated throughout the secretory phase. By day 18, both oenocytes and SER begin to decrease with the simultaneous appearance of primary lysosomes (membrane enclosed organelles in the cell that contain an array of digestive enzymes) and autolytic vacuoles (autolytic- cell destruction through the action of its own enzymes and vacuoles are organelles containing debris at various stages of degradation). Lipid and protein droplets were never observed in the oenocytes and cellular organelles showed no evident cyclical changes associated with wax synthesis. The fat cells are characterized by an extensive plasma membrane reticular system, numerous mitochondria (organelles that function in energy production), peroxisomes (organelles that contain enzymes involved in metabolic reactions) and rough endoplasmic reticulum and a few small Golgi bodies. The Golgi bodies or Golgi complex take up and process secretory products from the endoplasmic reticulum and then either releases the finished product into the cell cytoplasm or secretes them outside of the cell. SER is notably absent in fat cells from adult emergence through foraging. Massive lipid droplets occupy approximately 60% of cell's cytoplasm in the young worker but decrease substantially over the next few days. Like the oencytes, the fat cells also increase in volume prior to wax synthesis. During wax synthesis, glycogen stores are notably large and the plasma membrane

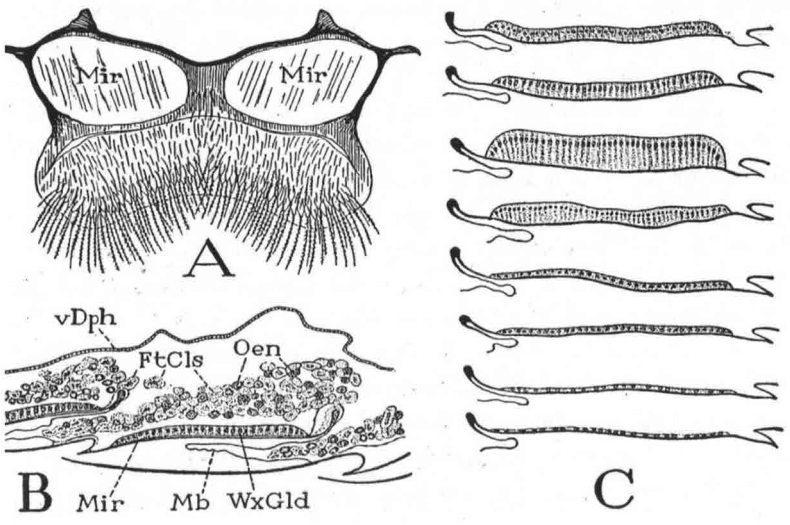

Figure 1.- *The Wax Glands: A = Sternum of segment VI of worker, ventral, showing polished "mirrors" beneath wax glands, B = lengthwise section through two wax glands with overlying masses of fat cells and oenocytes. C = stages in the development and regression of a wax gland. Mir = mirror, WxGld = wax gland, FtCls = fat cells, Oen = oenocytes, vDph = ventral diaphragm, Mb = intersegmental membrane. (Snodgrass 1956).*

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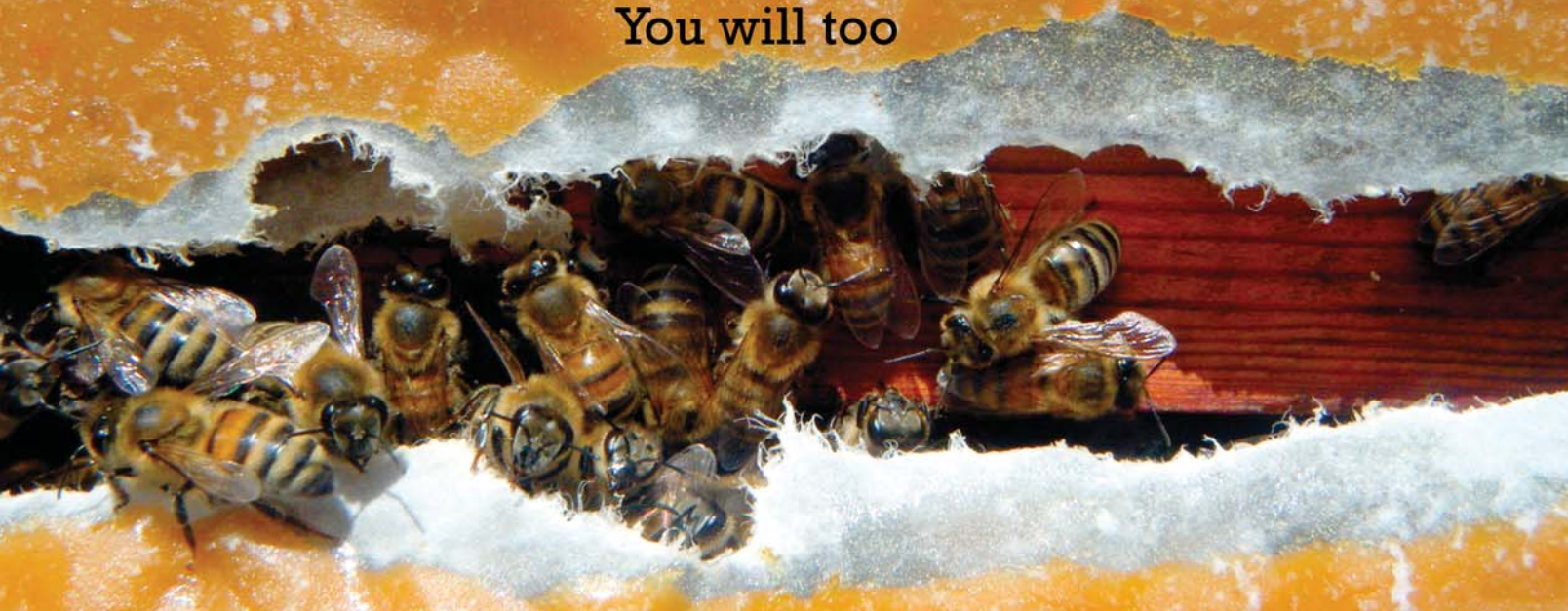

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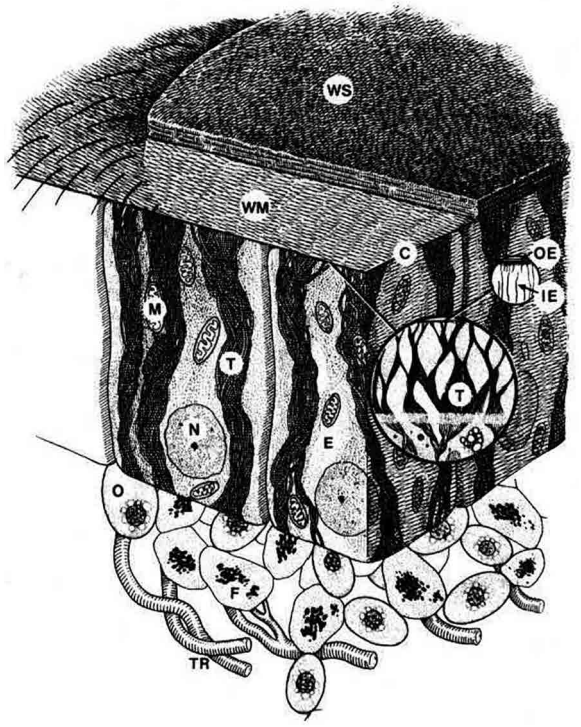

Figure 2. *Diagram of the honey bee wax gland complex (ventral side up). WS = wax scale, WM = wax mirror, C = wax mirror cuticle, OE = outer epicuticle, IE = inner epicuticle, T = wax tubules, E = epidermal cell, N = nucleus, M = mitochondria, O = oenocytes, F = adipocytes and TR = tracheole. (Hepburn et al. 1991).*

reticular system is well developed. As synthesis wanes, lipid droplets increase in size while the other organelles either remain unchanged or show small decreases in size. The notable and dynamic feature of the oenocyte is the abundant SER whose rise and fall are synchronized with measured periods of secretion (Hepburn et al. 1991). The major role of the epidermis in the production of wax appears to be the development of an elaborate system of small transport tubules (Locke 1961).

The structure of the wax mirrors and the different types of cells were studied with scanning and transmission electron microscopy (Cassier and Lensky 1995). The outer face of the wax mirror shows a sub-regular, hexagonal pattern, each unit corresponding to an underlying epithelial cell. On perfectly clean wax mirrors, the covering epicuticle shows numerous holes or depressed areas from which the new biosynthesized wax masses exude, fuse and form irregular puddles. The sternal cuticle is particularly thin at the level of the mirror plates (two to four μm). It is composed of an outer trilaminate epicuticle, an homogeneous inner epicuticle and a two- or four-layered procuticle.

The main characteristic of the wax mirror is the presence of numerous pore canals containing microfilamentous structures or wax canal filaments (Locke 1961).

Beeswax when first secreted by the wax glands appears as a translucent white ellipsoidal flake. Production of beeswax in the honey bee is a process whereby many thin layers of wax are deposited on the wax mirror until a scale results. Dietz and Humphreys (1970) studied the structure of the wax scales with a scanning electron microscope. The customary shape of wax scales is due to the slightly recessed wax mirrors or plates which are situated below the wax glands. Essentially the wax scales produced by the wax glands of segments IV, V, and VI are somewhat similar in size and shape. Those originating with segment VII are not only smaller but also of different shape.

The mechanism by which beeswax penetrates the cuticle to form the layers of the scale has been subject of several investigations (Sanford and Dietz 1976). The extensive system of pore canals filled with filaments, believed to consist of wax extending up into the wax canals, is thought to form part of the transport mechanism which brings wax or its precursors near to the surface of the wax mirrors (Goodman 2003).

The cuticle of the wax mirrors has a stratified structure and the associated fibrous structures and pore canals certainly play a major function during the transit of the wax components from the wax glands to the exterior surface (Locke 1961). It has been hypothesized that the wax components are transported in a protein medium through the gland cells to the outer surface of the mirrors, where the molecules condense to form scales. Kurstjens et al. (1990) electrophoretically detected proteins in the wax scales and in the comb wax.

Cassier and Lensky (1995) with scanning and transmission electron microscopy showed the extrusion of wax droplets through the wax mirrors and for the first time large cisternae (fluid containing sac or cavity) of smooth endoplasmic reticulum in the epidermis. These cisternae are probably involved in the transit of wax from the oenocytes to the pore canal system. The cisternae can also convey apolipophorins from the hemolymph to the wax mirrors.

The elongate epithelial cells of the wax gland form a palisade layer. Intercellular spaces and infoldings of the plasma membrane delimit large spaces where twisted filamentous structures run and connect to those of the pore canals (Cassier and Lensky 1995). Beeswax is a composite mixture of hydrocarbons, esters, fatty acids (Hepburn et al. 1991) and proteins (Kurstjens et al. 1990). Because beeswax is hydrophobic it is probably transported from the wax glands to the mirrors by hemolymph lipophorins via the SER cisternae.

Based on biochemical and structural data, it is possible to suggest the contributions of each cell type to the wax gland complex. Oenocytes are involved in the secretion of the hydrocarbon fraction of the wax (Piek 1964; Blomquist and Ries 1979; Lambremont and Wykle 1979; Hepburn et al. 1991). The epithelial cell provided with ribosomes, polysomes, rough endoplasmic reticulum cisternae and electron-dense granules probably synthesizes a part of the protein fraction of the wax product, the other part coming directly from hemolymph through SER cisternae. Fat body cells provide plastic and energetic products. In contrast to previous workers, Cassier and Lensky (1995) found that the SER is well developed both in oenocytes and epidermal cells. In the epidermal cells, SER forms long cisternae parallel to the major axis, from the basal to the distal pole of the epithelial cells. They seem to be connected to extracellular spaces, thus forming a complete pathway to the wax mirror exterior.

Examination of the fine structure of the wax gland indicates that its function in beeswax secretion is either strictly transport or concentration of substances rather than producing them for release as in the case with many secretory cells (Sanford and Dietz 1976). Piek (1964) showed that the constituents of beeswax are synthesized in the fat cells and oenocytes, which are enzyme activated by an esterase, which could possibly catalyze wax production in the cuticle as well as in the epithelium. Piek concluded that esters are synthesized by fat cells and hydrocarbons and wax acids by the oenocytes. These wax precursors are then discharged into the wax gland (epithelium), concentrated and then pumped into the extracellular space.

The actual site of the final reactions that complete beeswax formation before it is secreted through the pore canals is not known. It may be assumed from its accumulation as a liquid layer on the wax mirrors, and from its solidification rapidly after secretion, that the final reactions that result in hardening of the wax take place after secretion.

Beewax is a complex substance made up of wax esters, fatty acids and hydrocarbons (Piek 1964; Tulloch 1970). Over 300 individual chemical components have been identified from pure beeswax (Tulloch 1980). Beeswax consists primarily of monoesters (35%), hydrocarbons (14%), diesters (14%), triesters (3%), hydroxymonoesters (4%), hydroxypolyesters (8%), free fatty acids (12%), acid esters (1%), acid polyesters (2%), free alcohol (1%) and unidentified (6%). It is this great diversity of composition that gives beeswax many unique properties (Goodman 2003) and keeps us from fully understanding the synthesis and secretion process. BC

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** Endoplasmic reticulum is a membrane system of folded sacs and interconnected channels within the cell's cytoplasm that serve as a site for protein and lipid (fat) synthesis. Rough endoplasmic reticulum (RER) is in the form of flat bands covered with ribosomes that are responsible for the synthesis of many proteins. Smooth endoplasmic reticulum (SER) is tubular in form; serving as the site of lipid synthesis and carbohydrate metabolism.

YOU TOO CAN "COMMENT NOW"

Local, state and federal regulations offer opportunities for public input.

Michele **Colopy**

The January article in *Bee Culture* spoke of the beekeeper's voice, and the importance of communicating to your local, state, and national legislators and regulators about the issues, concerns, and needs of beekeepers, honey bees, and native pollinators. The national bee organizations (American Honey Producers Association, American Beekeeping Federation, National Honey Bee Advisory Board, and the Pollinator Stewardship Council) work together to convey the issues, concerns, and needs of beekeepers to federal regulators and legislators. State beekeeping associations work with their local legislators to affect positive change in their communities. (The Pollinator Stewardship Council has assisted (and is here to assist other beekeeping groups) with communicating local messages to local legislators in support of your local concerns.) The beekeeper's voice cannot be left to just a few leaders, or a few groups. If you are a beekeeper, if you value the pollination services of honey bees and native pollinators, you too must make your voice heard.

Local, State, and federal regulations offer opportunities for public input. These public comments can affect whether the regulation or law is enacted, amended, or denied or voted down. Your individual voice is as important as the State Association's voice, and national bee organizations' voices. One letter from all four of the national bee groups is not enough. The membership of those organizations also needs to follow-up their association letter with a letter of their own. In this age of emails and instant communication, "commenting" has become very easy. The Pollinator Stewardship Council helps you with this process offering a "two click" process to send a comment email to a legislator, or provides an electronic letter you can copy and paste into Regulations.gov so you can make your voice heard.

> *"In October 2002, the eRulemaking Program was established as a cross-agency E-Gov initiative under Section 206 of the 2002 E-Government Act (H.R. 2458/S. 803) and is based within the U.S. Environmental Protection Agency. The eRulemaking Management Office (PMO) leads the eRulemaking Program and is responsible for the development and implementation of the public facing website, Regulations.gov.*
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- ***Increase public access** to federal regulatory materials*
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- ***Improve federal agencies efficiency and effectiveness** in rulemaking development"*[1]

> *"Regulations.gov is an innovative website providing public users ease of access to federal regulatory content and a way to submit comments on agencies' regulatory documents published in the Federal Register (FR). On Regulations.gov, the public can:*

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> *"In the past, if members of the public were interested in commenting on a regulation, they would need to know the sponsoring agency, when it would be published, review it in a reading room, and then struggle through the comment process specific to each agency. Regulations.gov removed the logistical barriers that made it difficult for a citizen to participate in the complex regulatory process, revolutionizing the way the public can participate in and impact Federal rules and regulations. Now the public can conveniently participate in the rulemaking process from anywhere."*[3]

Email and web-based programs make it easy to communicate with regulators and lawmakers. It is a simple, quick, efficient, effective method to make the beekeeper's voice heard.

Regulations.gov describes the process of how to submit a comment:

1. Find a document of interest.
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3. Enter your comment. If you want to attach any files, click the "Choose file(s)" button. Be sure to complete any contact information fields that are required. Once you have completed this information click the "Continue" button.
4. Now you will see the "Your Preview" screen. This shows you how your comment will appear on Regulations.gov. Any contact information you provide that will appear on Regulations.gov is indicated as well as the information that will not appear. Once you have reviewed the information, you can either edit your comment further by clicking the "Edit" button at the bottom of the screen or submit your comment. If you click the "Edit" button you will return

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to the "Your Information" screen, where you can modify the information you provided. When you decide to submit your comment, you must first agree to the disclaimer and check the box. This will enable the "Submit Comment" button.

5. Once you have submitted your comment, "Your Receipt" is viewable. Be sure to save your comment tracking number in case you want to find your comment (i.e., Public Submission) once it is made viewable on Regulations.gov. Additionally, you can receive an emailed copy of your comment receipt by entering your email address in the field and clicking the "Email Receipt" button. When you have successfully emailed the comment receipt you will see the message "Your email receipt was sent successfully".
6. Check your inbox to ensure that you received your comment receipt. [4]

The Pollinator Stewardship Council makes it easy for you when we seek your support of regulations, proposed rules, and legislation. We create a letter you can copy and paste into the comment (with encouragement to add your own words – as Agency reviewers of public comments do note when they get a plethora of "form letters."). Comments need to be fact-based, from your experience, professional, polite, and succinct. One page letters are the best with the lead sentence stating your support or not of the rule, regulation, or legislation. While the written word is a way to vent anger and frustration, vitriol does not give credence to your experience, and often devalues your point of view.

With the busy lives of everyone, not just beekeepers, it is difficult to keep abreast of issues. State and national beekeeping associations can keep you apprised; seeking your support when it is relevant to you and your honey bees. Beekeeping groups must not procrastinate though, waiting until the "12th hour" to seek your support. (The Pollinator Stewardship Council has been guilty of this as we wait for others to confirm the national position, delaying the process to contact individual beekeepers for their support and action.) One letter from the State Association or one letter from a national beekeeping group is not enough: letters from individual beekeepers supports the state and national letter, shows the regulators and legislators, bee club members and others support the state and national letter. It takes all of us to support beekeeping, honey bees, and native pollinators. So, get an email account. Sign-up for our Newsletter (**www.pollinatorstewardship.org**) so you can Take Action for pollinators, and make the beekeeper's voice heard. BC

[1]**http://www.regulations.gov/#!aboutProgram**
[2]**http://www.regulations.gov/#!aboutProgram**
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[4]**http://www.regulations.gov/#!help**

Join *Bee Culture* Magazine's Exploration of the Four Pillars of Honey Bee Management in October, 2015 at the *Bee Culture* Conference Center (on the A.I. Root Co. campus), 640 West Liberty Street, Medina, Ohio.

Follow Randy Oliver's discussion of every aspect of honey bee nutrition from best diets, how, when and how much to feed, and feeding in preparation for pollination events, wintering, dearth and everything inbetween. Nutrition has become the least understood aspect of producing healthy bees. Fix that here.

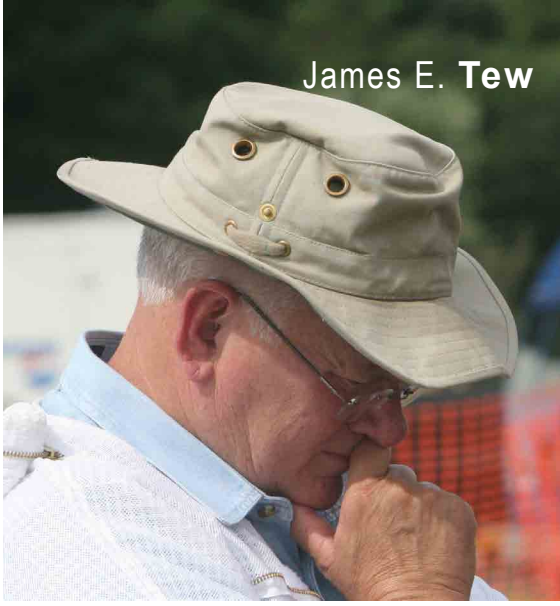
Then follow Jim Tew's arctic, and not-so-arctic adventures in wintering. Everything from as far north as you can get to moving bees south for a kinder, gentler winter. Refresh your Winter biology, then get better at wrapping, moving, feeding, treating and all you need to know to get bees from Fall to Spring.

Next, listen in as John Miller and a select group of commercial beekeepers who are in the business of serious honey production share their secrets, their skills and even their mistakes so that they consistently make as much honey as their bees can, every year. And now so will you.

Finally, Pillar Four. *Varroa.* Listen and learn *Varroa* biology, but most importantly, *Varroa* control from Dennis vanEngelsdorp. Get every detail on every *Varroa* treatment. How, when, why, where. *Varroa* control chemistry needs to be perfectly understood to avoid, or reduce wax issues, and IPM *Varroa* controls need to be understood and used as much as, and as effectively as possible. Space is limited. Register early. Watch for details.

Restocking Winterkilled Hives

A routine aspect of beekeeping



It is a beehive fact of life

Occasional dead bee colonies – at any time of the year – are a honey bee fact of life. In total, the possible reasons for these seasonal die-offs are too many to discuss. In fact, all of the reasons are not even known. In the wild, the bees seem to have a system to address this routine die-off phenomenon – if at all possible, a wild colony will cast swarms as often as possible. Somewhere, someway, some of these many swarms will survive the cold season and live long enough to . . . *(you guessed it!)* cast many smallish swarms the next season – and so it goes.

Natural colonies also do many other things to help with its constant struggle to survive. They have a well-known defensive system – the sting – that is used to defend food supplies (honey and pollen) that have been stored for dearth seasons. They use propolis to guard against bacterial invaders and other insects. They have internal nest structures that limit invasion by pests and predators (e.g. bee space), and, if possible, they put the nest in a sheltered location with a defendable entrance. Ironically, a colony even has ways (foreign odors and behavior perceptions) to defend against one of its most common invaders – robber honey bees from other colonies.

To survive genetically, a colony seems to have two cards to play – (1) newly mated queens leading new swarms, and (2) the occasional drone that is successful in passing the colony's genetic characteristics along to a new queen during the mating process. In any way possible, the struggling colony fights to survive. Many times they fail. Make no mistake – it's hard out there for a wild bee colony.

Enter the beekeeper

At the most fundamental level, all that any beekeeper is trying to accomplish is to assist with these wintering problems or even eliminate the challenges that a colony faces. We provide housing, food, protection from the elements, and we try to help them stay healthy through chemical or behavioral means (e.g. screen bottom boards). We try to reduce the risks of swarming by taking over the genetic future survival of the colony. Beekeepers install selected queens that are well suited for this type of assisted existence. Many times both beekeepers and their bees fail. Make no mistake – it's hard out there for a beekeeper and his/her bees.

Anticipate it – sometimes colonies die

In the wild or in my hives, sometimes colonies die. I don't like the occurrence in either wild locations or in my managed hive boxes. In managed beehives, it is a discouraging, messy task to clean the residue. The heavy odor of decay makes the situation just a bit worse.

I do the best I can to forestall any colony's death, but when one goes, I can, at least, truthfully tell myself that the colony would not have fared much better on it's own. The beekeeper's prime Winter goal is to address as many challenges as possible, and then wish the bees good luck. We hope that most – if not all – will survive the season. Sometimes they don't. What then?

The dead colony's autopsy

Depending on your location, various procedures are required to recoup losses. In warm climates, the wax moth is a relentless taskmaster. The combs are often destroyed before the colony is completely dead. Warm climate beekeepers must be doubly alert or their problem is compounded – they have lost bees and comb.

In cooler climates, the situation is still bad, but not so urgent. The first thing with winterkilled equipment is to determine what caused the colony to die. The obvious concern is that spore-forming American foulbrood (AFB) may have been the problem. If foulbrood has been a problem in the past, contact the state apiary inspector and have a competent assessment made. At times, Nosema is a problem. Unfortunately, Nosema is difficult to diagnose, and the remedy is somewhat expensive. Increasingly, Nosema treatment is simply queen replacement. Excessive defecation spotting is an indication of this type of dysentery.

Mites and their viruses

And there are always mites in the mix. *Varroa* is probably the most serious problem that a colony faces. It appears that even a small population of *Varroa* mites can vector viruses that are perfectly able to kill or maim bees on their own. As scientists and beekeepers grow in their understanding of the full effects of these viral invaders, our respect for the damage that they cause is increasing. At this point in our hive management recommendations, our best control of invasive viruses is to vigorously suppress *Varroa* populations. A hive killed by mites can be safely reused. *(But stay tuned. While this looks like a solid recommendation, viruses and other microscopic invaders might change this recommendation. I have no science to suggest that this is happening and will continue to re-use such equipment. I am only suggesting that we stay alert.)*

Starvation

Starvation has distinct characteristics. The cluster will be in a tight (and dead) group, probably near the center of the colony with single dead bees scattered about. Frequently, the dead cluster is right at the top of the colony. Upon removing frames from the colony, many bees will be seen in cells with their heads toward the center of the comb. Meager amounts of honey,

While it may look alive this colony was winterkilled. the queen is to the left.

if any are usually all that remains. Occasionally, patches of honey can be found scattered throughout the hive, but bees were unable to get to it before chilling.

Once the reason for the winterkill has been determined, you need to decide what to do with the equipment. Diseased equipment should be destroyed or sterilized depending on the disease pathogen. Colonies that starved should have dead bees shaken from the equipment and comb as much as possible. True, new bees will remove all the dead bees from the frames, but assisting the bees with the task can save critical time.

Even after most of the dead bees are removed, a stench will be noticeable and unpleasant. Many bees will have filled cells with their bodies. If the humidity is high, their dead bodies will fill cells and become soggy. Bang the frames on the side to jar as many out as possible. Rarely are all of the bees removed, but do what you can.

If possible, don't give the new colony only frames that need clearing. Let the new bees become established, and as they grow, add the occasional frame of dead bee combs. I stack such obnoxious equipment outside on a solid board, and soundly close the top. If cracks remain, I use tape to cover these holes. Mold will grow on the combs, and they will look unusable. Keep mice out of the stacked equipment. Stacking outside keeps the stench outside.

Reestablishing winterkilled hives

Spring colony splits

Unless you've had extremely bad luck, some of the colonies probably survived the Winter. Depending on the strength of the surviving colonies, bees and brood can be taken from surviving colonies, along with a new queen, and put in refurbished winterkilled equipment. The strength of the split is an arbitrary decision you'll have to make. The stronger the split, the more likely the colony will survive. However, the stronger the split, the more likely you'll not get a honey crop from the original colony.

Provide mated queens

I usually suggest placing a mated queen in the reestablished colony as opposed to letting the bees produce their own. If winterkills have been a problem, you should do everything possible to improve your chances for the next Winter. If bees are required to produce their queens, too much time is lost during the nectar flow. Brood and bees from several colonies can be mixed to form a new colony. Smoke or some other disruptive agent (air freshener or newspaper barriers) should be used to mix bees from different colonies and minimize fighting.

Buying package bees

Book your package bees as early as you can. Increasingly, package bees are expensive but readily available if you book early. Package bee installation is a simple and proven procedure for getting hive equipment back into operation. Package producers, listed in the bee journals, should be contracted as soon as possible in order to book the arrival dates most convenient for your location (around dandelion and apple bloom time.) Check with you local bee club. They sometimes buy in bulk.

If bees are all that's needed, queenless packages can be purchased. Colonies that survived the Winter in weakened conditions, but alive, can be boosted with the addition of a few pounds of healthy adult bees. Contact individual package producers for the details on queen right or queenless packages purchases. They may or may not be available.

Buying colony splits

Colony splits have the advantage of not having the *"post package population slump."* After a package of bees is installed, the adult population declines until the colony's queen produces new bees. Since brood is included in a colony split, adult population decline is not as great, and the colony builds up faster and is better prepared to face the cold weather.

To the best of my knowledge, there is not a "standard" split. Contact beekeepers who are selling splits. Ask how many frames, how many adult bees, and how much brood will make up the splits. Determine if frame replacement is expected. It would probably be a good idea to check with the state inspector to be sure the individual has a good record of disease control. Occasionally special deals may be worked out with another beekeeper for you to provide some of the manual labor required to make the splits. Prices range from$100-$150 per split depending on the size of the split in brood, adult bees and number of frames. It makes sense that on-site pickup of the splits is required. Shipping splits would be difficult.

Swarms

I seriously doubt that there's a beekeeper in the world who doesn't have a slight rise in blood pressure at the mention of a six-pound swarm. In fact, swarms are an excellent way to restock winterkilled hives. The only problem is that they are so unpredictable and, due to mite predation, they have become somewhat uncommon. They are also inaccessible at times – requiring great feats of strength, bravery, and agility (maybe other descriptive terms would have been more appropriate here). I must confess that they are sometimes simply not worth the risk. Another confession? Sometimes I hold some winterkill equipment for the swarms

that come my way. If of course, such swarms are never from my hives.

The "Dead-Outs"

"Dead-Outs" are simply colonies that die during the Winter – for whatever reason. There are few reasons to wish for colony winterkills, but if it happens, you have a window to perform routine hive maintenance and late season busy work.

Fix and Repair Old or Busted Frames

Increasingly, I am agreeing with those people, who years ago, were recommending the disposal of old, dark combs. Use common sense. If the frame is still perfectly useable, then use it, but if it needs extensive repair, is distorted, or has a lot of drone brood, toss it. (Actually, they make great kindling for a fire to keep you warm while working.) The reason for my change-of-heart is the possibility that pesticides are accumulating in the old wax and the increased concerns about old combs harboring viral and bacterial pathogens. My general recommendation . . . use old comb, but don't become attached to it. Toss it when necessary.

Scrape Propolis and Burr Comb

Bees busily apply propolis in the spring; you busily remove it. While the frames are out, scrape propolis and burr comb so the frame fits more easily within the hive body. I'm not sure why, but always save the propolis scrapings. I've never sold any, but I confess that I do like the smell of fresh propolis. Use a heat gun to soften propolis before scraping. It makes the hardened propolis much easier to remove.

A sad mess. This situation smells just as bad as it looks.

Repair and Paint

There will never be a better time to scrap, repair, and paint the hive equipment. It's cathartic. From a dead hive, you remodel, restore, and reinstall a new colony. I feel frugal, but a radio and a warm fire help prevent boredom during this task. If you mark or brand your equipment, do it now, just before repainting.

From the ashes

From the bleak disappointing death of a colony arises the birth of a new, refurbished colony in a clean hive. High colony losses are indicative of management procedures that need to be improved. But clearly, you should be prepared for some colony deaths each year. Take it in stride and prepare the equipment for the re-establishment of a new colony the next Spring. Thoughts of Spring can make the coldest Winter day more tolerable. BC

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Nervous Neighbors

Andrea **Quigley**

Two months ago, we looked at the woes of Calabrian beekeepers facing bankruptcy as their apiaries were burned if the Small hive beetle (Aethina tumida, 'the beetle') was detected. This month we ask why it didn't arrive in Europe sooner, what some neighboring countries are doing to protect themselves and the latest position in Italy.

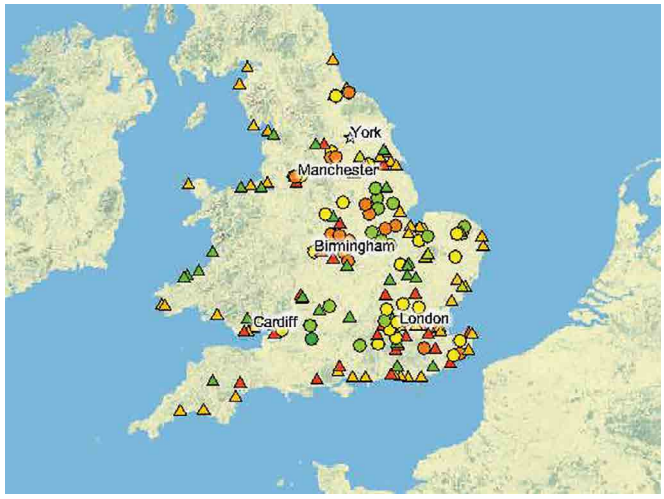
Small Hive Beetle is indigenous to sub Saharan Africa, that is the land lying south of the Saharan desert including Southern Sudan[1]. There it co-exists with local strains of honey bee that have adapted to live alongside it. The beetle was first found in Egypt during Summer 2000 and was likely introduced by humans. The beetle's range now includes the Nile delta[2] but, unsuited to arid climates, the dry soils and desert prevent it infesting a larger area of Egypt. Neither has it spread from Egypt to Israel, mostly due to the local geography. A large expanse of desert, some of it mountainous, spans across the region forming a natural barrier. Human activities that might have introduced the beetle to neighboring Israel have been restricted due to the political tensions between those countries. Had the beetle reached Israel, it is possible the beetle would have spread around the Mediterranean countries.

European countries observed the experiences of the United States and Australia, and planned accordingly. For example, in 2010, the UK made a formal analysis[3] to consider how the beetle might arrive in the UK. The report concluded the key risks are:

- "Movement of honey bees: queens and package bees (workers) for the purposes of trade.
- Movement of alternative hosts e.g. bumble bees for pollination purposes.
- Trade in hive products – e.g. raw beeswax and honey in drums.
- Soil or compost associated with the plant trade.
- Fruit imports – in particular avocado, bananas, grapes, grapefruit, kiwi, apples, mango, melons and pineapples – Small hive beetle may oviposit (lay eggs) on fruit.
- Movement on beekeeping clothing/equipment.
- Movement on freight containers and transport vehicles themselves.
- Natural spread of the pest itself by flight, on its own or possibly in association with a host swarm."

The 2013 European Food Safety Authority (EFSA)[4] report analyzed the risks and likelihood of the beetle arriving in Europe. Clear knowledge gaps were noted. The review concluded "[more] research is needed to ascertain the risk of SHB entry via products such as ripe fruits and soil associated with plants." This was compounded by the warning that "Accidental bee import (unintended presence of bees in a non-bee consignment) is associated with a high risk of entry . . . since an infested consignment might not be detected." All too late now, given the belief is that the beetle arrived on ripe fruit in Gioia Tauro, Italy.

Most countries have their own means of monitoring and dealing with "exotic" pests and diseases; "exotic" meaning those pests and diseases alien to a country. Within the EU, the member countries agree upon the appropriate control measures that each member must enforce. In the UK, this is done by the National Bee Unit ("NBU"), part of the Animal and Plant Health Agency. Teams of bee inspectors operate through the UK, although the Scottish and Northern Ireland inspectors



report to the agricultural departments within their home governments. The inspectors and the NBU identify risk areas and place bait or sentinel hives nearby which are routinely checked. Likely places include airports, e.g. London Heathrow, ports and harbors, e.g. Dover, Liverpool and Southampton (Figure 1). If a small hive beetle were found then a rapid assessment would follow to uncover the extent and spread of any infestation under emergency measures. Steps would then be taken to eradicate or to contain and control the beetle depending on the degree of infestation.

With the discovery of the beetle in Italy, neighboring countries fear it will cross their borders and infest their colonies. Figure 2 shows relative distances as the crow flies from Calabria to locations in other European countries. These distances indicate the potential spread across Europe of this pest could take years and suggest infestation (at least in the short term) is not inevitable. Yet, the small islands of Malta and Gozo, with their own race of honey bees *Apis mellifera Ruttneri*, are closer to the outbreak than is the Italian capital of Rome. Understandably, the Maltese are really concerned. The ancient Greeks and Romans first named Malta as *Melite* (Μελίτη) and Melita respectively. These names mean "the land of honey." To protect their land of honey, the Maltese issued an immediate and outright ban on movement of bees from Southern Italy, effective from 19 November 2014. A spokesman for the Maltese Plant Health Directorate said, "This beetle poses a serious threat to bees in Malta. For this reason, it has been decided to prohibit the importation in Malta of live bees from these affected areas, including bees used for the purpose of pollination."

In the UK, beekeepers have watched recent developments with alarm. To a certain extent, the British Isles are protected since they are separate from the European mainland. Moreover London, UK, is some 1,202miles (1,938km) from Calabria; roughly the distance between New York City and New Orleans. However, fruit and plants (in soil) are regularly imported into the UK from Italy. One barrier to simply blocking movements of these products is a key EU principle "the freedom of movement of goods". This means no EU state may block routing of goods into their country unless there is a clear threat to human health or the environment. Whilst beekeepers would argue that is the case, the UK government has not yet intervened to protect British bees. Many petitions have been raised, including one from the Scottish Beekeepers' Association ("SBA"). On 2 December, the SBA wrote to the Scottish government to urge that "all possible measures are taken to prevent the introduction of small hive beetle into the UK. These should include a cessation of trade in live bees from the rest of Europe for 2015 until the true spread of the beetle is known.

Deep concerns have been raised by the British Beekeepers' Association ("BBKA") and others at the UK Bee Health Advisory Forum, a group of leading beekeeping groups and scientists working with government policy makers and bee experts. The BBKA says "[we have] urged restriction of the trade in plants, fruit and vegetables from the SHB exclusion zone in Italy, into the UK." The BBKA is unhappy that plant health authorities, after consultation with bee health policy officials, state that "they do NOT have legal powers to stop the entry of plants, fruit and vegetables from Italy under plant health legislation." The BBKA has urged them to "reconsider this aspect under the terms of animal health provisions".

The BBKA also says that the additional measures taken are inadequate. These include (1) supply of a National Bee Unit advisory leaflet to the Fresh Produce Consortium who will pass on copies of this leaflet and inform their members of the risk of importing the beetle in their goods; and (2) HM Customs and Excise will monitor all arrivals to the UK together with the Plant Health and Seeds Inspectorate which inspects plants, fruit and vegetables on importation; they have been given information on how identify the beetle.

Until this outbreak, it was possible to freely move bees across borders within the EU provided a certificate of good health was available. With the current restrictions, the movement of bees is blocked from the affected region. The UK has almost no queen producers and the market for package bees is small. In 2014, UK beekeepers bought from Italy 1,767 queens (18% of all queens imported from the EU) and 1,202 package bees (85% of all packages imported from the EU). For many years, neither colonies nor package bees could be imported into the UK from countries outside the EU. EU law is similarly strict but also permits imports of bees from New Zealand. Given the Italian outbreak, UK bee inspectors re-inspected all bees imported from Italy during 2014. No beetles were found.

Some Swiss, German and Austria beekeepers move their bees to Italy each fall to avoid Winter colony losses and to build strong colonies for the Spring. Calabria is often chosen because good supplies of pollen and nectar are available for most of the Winter; with citrus trees flowering in January. During fall 2014, Swiss and

Figure 1. *The risk areas for apiaries should an exotic pest arrive in England and Wales. Source: Beebase, Crown copyright.*

German[16] beekeepers were advised if they have not taken their bees to Italy already then they should not do so. Uwe Büchner, spokesman for the Thuringen Ministry responsible for veterinary affairs, has asked beekeepers to leave their bees in Italy. In Austria, beekeepers are reminded that throughout Europe the beetle must by law be reported to the authorities. Beine Österreich (Austria Bee) advises its members that, in line with EU law, bees may not be moved from the "standstill" or red zone in Calabria and Sicily. Simply put, any bees migrated to Calabria for the Winter must remain there for fear of bringing the beetle home. On 12 December, the EU formally banned any movement of honey bees, bumble bees, bee equipment and hive products from Calabria and Sicily to anywhere in the EU or the European Economic Area ("EEA"). The EEA is free trade zone comprising 31 countries, including 28 EU member states and three members of the European Free Trade Association (Iceland, Liechtenstein and Norway). The ban permits movement of refined and processed beeswax together with honey intended for human consumption (but not comb honey). It expires on 31 May 2015 when it will be reviewed.

Both beekeepers and the officials in the affected area feel misunderstood. The beekeepers state they are doing everything they can to find the beetle and to comply with current measures but are fearful they will lose their livelihoods. In contrast, the inspectors have been accused of being too ready to burn everything and not doing enough to control the beetle. Both sides seem to be working hard and recent meetings may have helped ease tensions. New laws have been introduced to cover the beetle and its control. For example, penalties exist for failure to report presence of an apiary in the surveillance zone.

In Italy on 1 December, beleaguered beekeepers received some good news that they will receive compensation for the loss of their hives should they be destroyed to control the beetle. They may also receive compensation also for "loss of trade" and the "possible effects through loss of pollination." Moreover since December 11, only one new case has been confirmed; the number of cases is now 60 infested apiaries. Over 3,500 colonies have been destroyed. On 11 December, Dr. Silvio Borrello, managing director for animal health, the Italian Ministry of Health, met with beekeeping groups and experts when beekeepers asked again for a switch to managing rather than eradicating the beetle. The Ministry of Health will reconsider its approach to incineration on 19 February which, coincidentally is the day when COLOSS's new Small Hive Beetle task force will meet in Bologna. For now, the Ministry has reconfirmed that the existing crisis measures would remain in force. They remain hopeful that the outbreak will be eradicated. Yet it remains to be seen as the pollination season gets underway whether truly the beetle has been eradicated from Italy. BC

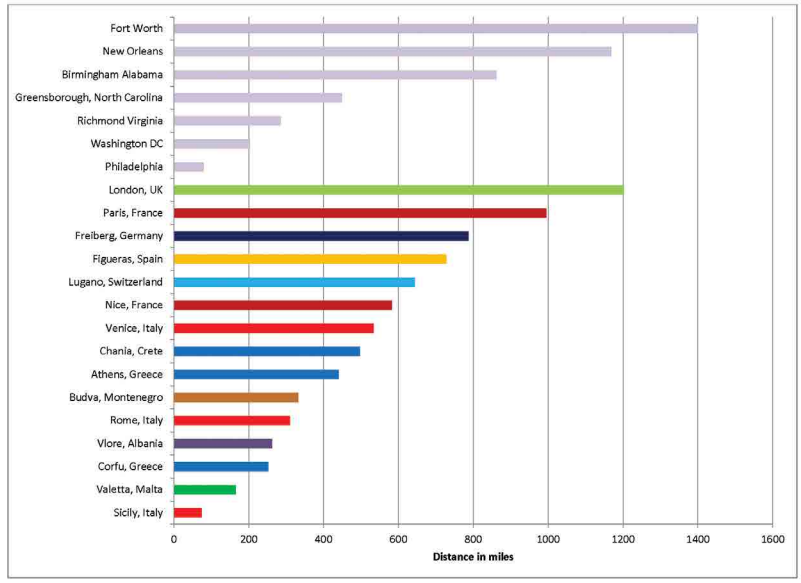


Figure 2.

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Pest Or Predator
SMALL HIVE BEETLES
Much of what you've heard is wrong!

Charles **Linder**

This is intended to question the way you look at small hive beetle. Most experts will tell you SHB don't harm strong hives. Some have even claimed that only queenless or sick or unhygienic hives are susceptible.

None of this is new. A quick study will show you that Jamie Ellis has done some great work, and there's a really nice paper from Clemson available online also. The only thing I add to the discussion is I believe the beetles are much more aggressive than usually mentioned. I found "The handbook of small hive beetle IPM" by Michael Hood. He also notes that at times the beetles will take over strong hives.

Small hive beetles (*Aethina tumida*) were found in the U.S. in 1996 and Australia in 2002. From the initial reports, they have been moving rapidly northwards. It seems cold weather is a small hindrance, soil types that allow the larva to pupate is the main requirement. They have made rapid progress spreading across the U.S. SHB tend to travel at night, and so far seem to use only beehives as a breeding area. The females lay eggs in the hive and three to eight days later hatch. The larva feed for a few days then drop to the ground to pupate. Adult females can lay up to 2000 eggs. Generally in clusters around the hive, but are also known to chew into the sides of capped cells and deposit eggs. (more on this later) The beetle larva normally matures in about 13 days, but has been reported to mature as fast as five days under good conditions.

SHB is fairly new in my area. I first noticed them around four years ago. Almost everything I read said the same thing, strong hives, full sun and no problems. Normal good practices and healthy hives and you would not have issues. Around 2010 I started seeing them. Little buggers hiding on inner covers and running. A quick squish or two and they are gone. Very few of them to start with and not every hive or yard. I bought some beetle traps but I decided they were more trouble than they were worth, as long as hives were strong, no worries is what the experts said.

The next season was a little worse. Not terrible mind you but a weak hive or two were what we call "slimed" that's when beetle larva hatch in your supers and ruin the honey. It seems to be a combination of an excrement with a yeast that creates fermented honey. The bees avoid it. In those cases the bees were gone. Empty hives taken over I told myself the bees absconded, or were robbed out and the beetles moved it.

The next two years were a lot the same, an occasional hive wiped out, and beetles taken over, but not a lot of beetles in general. One or two in several hives, once in a while a weak hive with more than a dozen. Quick find and squash and try to get the hive back up to strength. Win a few lose a few. Most hives get inspected every two weeks. Strong ones supers added, weak ones inspected and tried to nurse up.

Then comes 2014, things changed. Late May freeze killed a lot of brood and weakened hives. Two yards in particular were having a lot of problems. If I remember correctly I lost seven hives in June. All were full of SHB larva but I racked the loss up to weak hives getting robbed out. Somehow several hives in kind of shady wet areas never seemed to bounce back.

Then comes the game changer. My pumpkin client calls and asks for more hives. His other bee supplier has called and has no bees (bad Winter and Spring I am told) so he needs another 30 hives. Well drat, that means moving honey hives into pumpkins. Normally a loosing situation, pumpkins don't make honey. But I pick four pallets of strong doubles with supers, from the yards I lost hives in. It seemed smart, close out the yards that had few hives, and cut down my travel time. So right after the 4th of July I

Lots of bees, but lots of beetles.

The first sign – dead bee larva on the ground.

move double deeps out of honey yards and into pumpkin patches.

One thing you need to know about early season pumpkin yards. The ground is clean. Little to no weeds and the pumpkins have not yet spread out. So its kind of like a hardwood floor. When I went back the next day to remove supers, I find a large amount of exoskeletons out in front of the pallets. Bright white larva skeletons show up real well on bare dirt. My mid runs thru the possibilities, Pesticides? Nay just got to the field. Capped larva was not yet exposed. Moving damage? Robbing? Ants? Quick rundown makes no sense. These are two or three deep hives with a good cupful of chewed empty exoskeletons. Some almost complete, others vivisected. But just the exoskeleton of the pupa. Normal activity at the hive entrance, thousands coming and going, no sick bees, guards on duty, some bees clustered. All looks good. Time to dig.

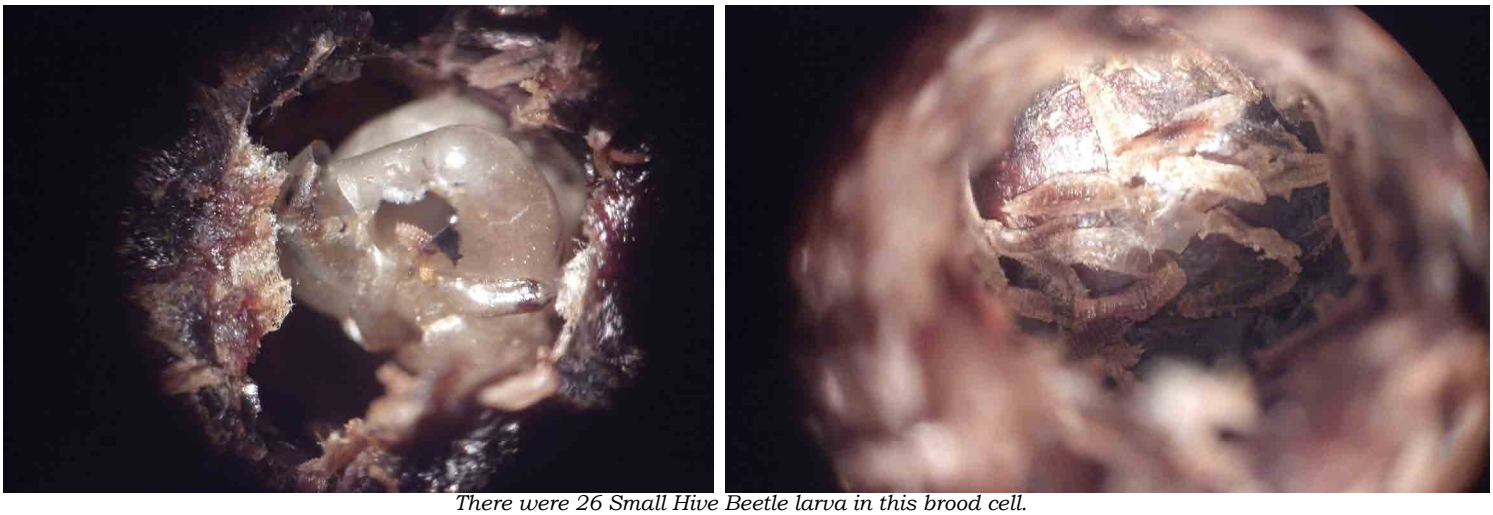
So I opened hives. And what I found was not good. Top supers were not terrible. A few beetles and some honey, lots of bees. But then the brood nest. The first hive I picked looked like a war zone, with little hand grenades going off. Open cells with pieces of bee larva hanging out, and SHB larva everywhere. Three or four frames of it. SHB larva not in the super, but in the brood nest. Center of the hive, and the bottom board, holly heck literally thousands of beetles somewhere around two cups of the buggers. Squash kill thousands at a time. Quick search shows the queen and plenty of bees. Clean up as best I can and close the hive to regroup. Infected frames to the freezer.

I check the other hives on the pallet and SHB problems but nothing like the first. The other pallets with problems showed the same issue, SHB in the brood nest! I think there were five that were heavily infected with SHB larva and beetles. All queen right and full of bees. Probably in the 40k plus count for bees. Defiantly not weak hives that I missed! All had some viable brood. This doesn't match. So I head home to plan and study. About that time I recall a post on the net, it mentioned finding a lot of exoskeletons of pupa in hives taken over by SHB seemed odd at the time.

Looking and researching – 'strong hives' that's all you need. But then I find two *Scientific* articles that make a lot of sense. The first is Jamie Ellis' work that shows clearly that hives will abscond when beetle levels get high. He tested inserting beetles into nucs. I also find tidbits from Michael Hood and Jamie Ellis – one is a paper that shows that beetles will lay eggs in capped cells. All I had read so far showed beetles laid on the honey and strong populations policed the areas and clean up the eggs. According to this the SHB lay eggs all over and try to put them in areas the bees can't reach. His work shows that a good percentage of them are not cleaned up. He also shows evidence the beetles will use the ovipositor to place the eggs thru the sides of capped cells. When these hatch they feed on larva! Up until now I had believed pollen to be the beetles preference. Turns out they don't much care, pollen, (I suspect an egg in pollen is hard to find) honey and now larva. In fact the honey supers in these hives seem to be infected last!

One other little tidbit of data, which matched what I had observed. *Apis Melifera* will chase, harass, and corral adult SHB but will totally ignore the larva. This is in slight contrast to Africanized bees which reportedly also remove larva. I suspect that is the key to the beetle's survival that is creating more problems for us. It's also reported that Africanized bees open up capped worker cells which contain beetle larva, something I don't think European bees are doing. It sure appears that European bees are less defensive in general. I suspect European bee's lower number of guard bees and guards around the periphery allow more egress for SHB than other species.

Now I had some stronger suspicions. Eyes open I started looking closer. And sure enough close observation on hives with lots of beetles (more than eight to 10 a hive) shows larva starting in the pollen band and or brood and moving thru the brood nest. Hatched larva is ignored. They don't slime the brood like the honey which to me confirms a chemical reaction from the SHB and honey. Adult beetles are still harassed. At some point the queen stops trying to lay brood and the bees retreat. They move up into the super or upper hive until the number of bees dwindles, and at some point most abscond, usually by that time it's a very small number of bees left. I actually watched this happen in eight hives. Watching closely over a period of two weeks, close inspection of capped bee pupae showed severe problems. Many capped cells were full of beetle larva. Pulling a larva and cutting it open shows many SHB larva feeding. One I cut open had 16 in one cell. I have counted as many as 25 in one cell. The catch is, its not every cell so it can be hard to find. They are very hard to notice until its a huge problem. Note you can see 19 dead SHB larva. There were 26 total in that capped cell.



There were 26 Small Hive Beetle larva in this brood cell.

In retrospect, I realize that beetles have been successfully breeding in bee pupae all along. Just tiny numbers. A hive with three or four beetles may be dropping a 100 or so larva a week untouched by bees. If you assume say 10 SHB larva per bee pupa, that's only 10 contaminated bee pupa in a hive! If they were not succeeding already, the older ones would soon be gone, and no one I have ever talked to has seen them disappear.

I think what we are missing is noticing a few pupae here and there that are literally being consumed by SHB. If the infected pupa is removed by the bees the SHB may be pupating from that point. If you look close you will see a few larva on the bottom boards, and one thing for sure SHB larva are extremely mobile. Moving 30-40 feet across a concrete floor is not uncommon.

Of course this makes me ponder the conventional wisdom and what's changed? First off, I am not convinced it has changed. One thing to note is that SHB takeover happens quickly. Beetles hatch in three days. Most of us don't do full inspections that often. Another factor that I ponder in retrospect, 2012, and 2013 were very dry years. Drought conditions for my area most of the year. This year was wet, very wet. And the hives with issues were on wet low ground, and shaded.

What I suspect is this wet weather has allowed the larva to successfully pupate at a very high ratio, so small populations of beetles turned into large populations very quickly. Hives that were strong were not inspected real close, and the bees allowed the early season beetle larva to escape and pupate. Suddenly there is an invasion, exceeding an economic threshold. The beetles then lay in the brood nest and pollen band at a rate the bees cannot keep up with. And suddenly literally within a five day window the brood nest is totally destroyed. Total collapse is shortly following.

What I am sure of is that SHB turn from parasite to predator when the conditions are right. And that is not just weak hives. What does this mean? Well in the end the only difference is Beekeeper attitude. Instead of ignoring them it's time to start being active in prevention.

So what to do? First where did they come from? Hives moved in the area and Nucs seem to be the main sources. A.I. Root touted packages back in the day as a way to get clean bees. No disease from the comb. Still viable but I can promise you beetles get shaken into packages also. There is a product called the Beebus which is for packages designed to let SHB out of the cluster. Many suppliers are using them. I personally noticed them in packages, hiding behind the center bars and in the corners. Prevention of getting them in the first place is a good start. Typically packages that come from dry sandy soil also should be clean. Any nucs should be THOROUGHLY inspected.

Look closely at the soil conditions where you place hives. Dry soil in full sun will slow down beetle growth. Wet, damp shaded or irrigated soils, favor the beetles.

Treatment

After learning what I did, it was time to go on offense. Gardstar ground drench was used everywhere. Normally I shun pesticides, but this time was different. I needed to stop the larva. A few of oil trays were ordered and placed under the worst hives. 200 beetle barns were installed, at least two in each hive. I started with Checkmite. Coumaphos in the Checkmite seems to work very well, Beetle jails with vinegar in the middle section oil in the outsides also work, but can be a pain to handle.

This Winter I will be doing powder sugar treatments, not for mites, but for SHB. Put the hive on an oil tray and dust it. The sugar seems to agitate the bees into harassing the beetles more than usual. You will see a huge drop of beetles in the first five to 10 minutes.

Screened bottom boards are a thing of the past for me. I think it is too easy for that Larva to drop to the ground, I have also used this as another reason to switch to top entrances. The bottoms of my hives are pretty well sealed, in the hopes of stopping the larva from reaching the ground. Pollen patties must be watched closely, and beetles will successfully hatch and grow in division board feeders. I am currently testing on weather or not they escape the feeders to pupate or eventually drown.

I also notice in my area around September 1 the beetles stop laying eggs. Around the same time I noticed less harassment by the bees in general. Beetles moving around frames pretty much at will, little to no harassment. Not sure why, but I am sure there is less harassment than there was in the summer months.

This allows the beetles to Winter well inside the cluster.

One key is don't wait. Once you spot a beetle, be proactive, another note to consider, your location. Beetles need soft moist soil to pupate. Many areas of the country will never have issues. Most of the southwest will remain beetle free I suspect. Those in the southeast however know better. I suspect that is why hives in full sun don't seem to get bothered as much.

I also suspect that weather will be an issue. Wet weather favors the beetles. Don't think cold bothers them. Adults Winter in the cluster with the bees. Normally several of them in a cell I have found many in dead outs this way, and several small Spring cluster full of beetles, before any real pollen flows. For those of you without beetle problems, stay vigilant and thankful, but when those with problems tell you they lost a hive, don't assume it was their beekeeping skills. Understand that at times it doesn't matter, the beetles can and do take down good hives. BC

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Bee Trees For Warm Climates

Connie **Krochmal**

Beekeepers in warm climates can choose from a number of bee trees. Choices include the native red bay and the common banana as well as flowering trees, such as Chinese hibiscus. These plants are great sources of nectar and pollen for bees.

Banana (*Musa sapientum or Musa x paradisiaca)*

About 40 species of banana are grown for food or as ornamentals. They apparently originated in tropical Asia.

Hardiness varies according to the species. Some ornamental types are hardy to zone five. The common banana is root hardy to zone seven, although a mild short freeze can kill the top of the plant. Bee gardeners in cold climates should dig the plants and bring them indoors into an unheated space for the Winter.

The common banana is five to 25 feet in height. Some other species can be almost 40 feet tall. Instead of a trunk, bananas produce a column of compressed leaf sheaths.

The thick stems form a clump. The large, tropical looking, drooping or arching leaves can be eight feet in length. The foliage is sometimes damaged by strong winds.

Blooming sporadically throughout the year, the main flowering period is from Fall through Winter. Opening on a terminal erect or pendant flower spike, the colorful yellow blooms feature vivid purple and red bracts. The blossoms usually hang downward from the top of the plant. The female flowers are located at the base of the flower spikes, while the males emerge near the tips. Flowering usually begins when the plant is about one to 1½ years of age, depending on growing conditions.

Bananas bear fruits in the Lower South. The fruit clumps arise from the flower stalks and turn upwards. Once that occurs, the corresponding stem and foliage begins withering and will be replaced by a new sucker or stem.

Dwarf Cavendish is a highly recommended cultivar. This reaches six to eight feet in height and bears edible, eight-inch-long fruits.

Banana.

Related species that are cultivated include the **Red banana** (*Musa coccinea)*, which reaches four to five feet in height. This also bears edible fruits. **Rose banana** (*Musa ornata)* grows eight to 10 feet tall.

Most bananas are propagated by root divisions or suckers, which should be planted 1½ feet deep. Although the common banana is seedless, the ornamental species can be grown from seeds. Space the plants about 12 to 15 feet apart, depending on their mature size and the climate. These should be fertilized several times a year in warm areas.

Banana plants prefer full sun or partial shade. They thrive in well drained, porous, rich, moist soils high in organic matter.

These species are excellent nectar plants. They provide a steady and reliable nectar flow over a long period. Good rains and damp soils increase the flow. The fair quality honey varies from light to dark. This can taste slightly astringent, somewhat like tamarind pods. The blossoms also provide lots of pollen.

Chinese hibiscus (*Hibiscus rosa-sinensis)*

Also known as China rose, and Chinese hibiscus, this is hardy to zone ten. It was once called shoeflower because Jamaicans used the crushed blossoms to shine shoes. Chinese hibiscus is sometimes grown as a herbaceous perennial in colder areas where it dies to the ground over the Winter and comes back from the roots in the following Spring. Thriving in sub-tropical and tropical regions, it is commonly cultivated in Florida and Hawaii.

Chinese hibiscus is generally a small, dense tree, around eight to 15 feet in height and five feet across. However, it can grow to 30 feet tall under good growing conditions. This erect, fast growing, branching plant features shiny, evergreen, edible foliage. Deep green and toothed, the oval leaves are six inches in length.

The flowers appear from Summer through Winter on new wood. The solitary blossoms are up to eight inches across. They can be red, yellow, pink, salmon, orange, white, or various color combinations. These flowers contain six to nine petals. Double-flowered varieties are unsuitable for bees.

At least a hundred cultivars of Chinese hibiscus are available. The plants tend to naturally hybridize. Often grown as a hedge, this drought tolerant, easy to grow species needs full sun. It grows in most any moist, well drained soil, but prefers a rich one. Fertilize this regularly to keep the plant vigorous. Prune when it quits blooming.

Other cultivated species include *Hibiscus coccineus,* which is native to Florida and Georgia and hardy in zones seven through 11. Another species known as **roselle** (*Hibiscus sabduriffa*) is grown in the Caribbean and Florida for culinary purposes.

Rose-of-Sharon (*Hibiscus syriacus*) is hardy to zone

Chinese hibiscus.

five. Reaching 15 feet, this commonly grown shrub has smaller flowers than Chinese hibiscus. They're usually pinkish-blue or pinkish-purple. These open from May through September.

Chinese hibiscus and its relatives are good bee plants. They yield nectar and pollen. Bees are very fond of the blossoms. The abundant nectar is easily accessible to bees. In tropical regions, the plants are major sources of a water-white honey that tends to granulates rapidly.

Ehretia (*Ehretia dicksonii)*

This is marginally hardy in zone seven and tolerates temperatures slightly below freezing. Introduced from Asia in 1923, it is named for Dionysius Georg Ehret, a renowned German botanical illustrator. Ehretia is generally a small, deciduous, flowering tree when cultivated. In its native homeland, this can reach 50 feet in height. It features a broad, spreading crown. The glossy, elliptic to oval, hairy foliage is eight inches long.

The blooms resemble those of viburnums. They're in flat terminal clusters, two to four inches wide. The small, scented, light yellow to white, bell-like to tubular blossoms open from Spring into Summer, usually beginning in May.

This bears small drupes, about ½ inch in length. Typically black, they're sometimes yellow.

In Asia, this species is found in open forests and on moist hillsides up to 7500 feet elevation. It adapts to a range of growing conditions, including drought. Grown from cuttings, this prefers a well drained soil in full sun. Allow the soil to dry out slightly between waterings.

Ehretia and the related species are great sources of nectar and pollen partly because they bloom for a very long period. They yield a moderate honey surplus. The amber to white honey has a characteristic flavor and a sweet aroma.

Flamboyan (*Delonix regia)*

Also known as flame of the forest, flame tree, royal poinciana, and poinciana, this is considered one of the most beautiful flowering tropical trees. Native to Madagascar, it is widely grown in warm regions, particularly Hawaii and Florida.

About 30 to 40 feet in height, flamboyan is a low growing tree that is much wider than tall. This has feathery, vivid green, doubly compound leaves, which drop before the blossoms open. Up to two feet in length, the fine textured, dense foliage makes this species a good shade tree. The large, flat pods are up to two feet long.

The large, exotic-looking, scarlet-orange or yellow-scarlet blooms open in clusters from the ends of the branches. Although flowering can be somewhat erratic, this is heaviest during the Spring and whenever there is adequate moisture.

Hardy to zone 10, this fast growing plant prefers full sun. Adapted to most soils, flamboyan prefers a moist, sandy loam. Avoid planting this tree near paved areas for the surface roots can damage pavement.

Bees visit the flowers frequently. Flamboyan blossoms, which yield considerable nectar and pollen, are considered beneficial for brood rearing.

Red bay (*Persea borbonia)*

This is also known as tisswood, laurel-tree, sweet-bay, Florida mahogany, and red bay persea. Hardy to zone seven, red bay is native to the southeastern coastal plain. Its range extends from Delaware through Florida westward to Texas. This typically inhabits swamps, flooded areas, and other spots with standing water.

Usually 20 to 40 feet in height, this tree can reach 50 feet under good growing conditions. A broadleaf evergreen, it features alternate, medium green, leathery, lance-like leaves, two to six inches long. These are sometimes disfigured by a common gall. The fresh and dried leaves are used as a flavoring in gumbo and other Creole foods.

Red bay blossoms open in small panicles. The small, greenish-yellow flowers emerge from late Spring into early Summer.

The fruits are drupes, which come in various colors. Resembling grapes, these ripen in October.

Although the plants typically occur in damp soils, they also adapt well to dry soils. Requiring full sun, red bay is considered an excellent choice for difficult spots where other plants won't grow. Preferring a sheltered spot, the tree rarely needs routine pruning once it is established. The plants are propagated from seeds and cuttings.

Red bay can bring a heavy nectar flow in some regions. It gives a good honey yield. This is considered a reliable honey plant in certain locations, including Texas.

The very dark honey, usually deep amber, is quite thick and syrup-like. This rarely granulates. At times the flavor can be strong. A fairly good quality honey, it is often used for baking or fed to bees.

Red bay is related to the avocado, which is grown in California and Florida. Avocado is also an excellent honey plant. The honey is similar to that of red bay.

Pepper tree (*Schinus* spp.)

About 30 species of pepper tree occur worldwide. Members of the sumac family, these broadleaf evergreens vary in size from one species to another. The trees get their common name from the berries, which are sometimes used as spice. Some people are allergic to the fruits and/or pollen. Occasionally, individuals have experienced upset stomachs after consuming the berries.

The compound, alternate leaves, about eight inches long, are composed of two-inch-long, stalkless leaflets in pairs except for the odd terminal one.

The small, inconspicuous blossoms form clusters that can contain hundreds of blooms, which feature five petals.

Two species were widely planted in the Southwest, California, and Florida until it became apparent that they're quite invasive. These were used along highways, in parks, and home landscapes.

Pepper trees are successful because they adapt to most soils in sun to partial shade. The only serious pests are spider mites and scale. These tolerate heat, drought, and poor soils.

The most common species in America are the following. **Brazilian pepper tree** (*Schinus terebinthifolius)*, also known as Florida holly and Christmasberry tree, was widely planted in parts of Florida. It is most common around Palm Beach, Miami, and the southern peninsula. Commonly found along waterways, this particularly loves salt spray. The species also occurs in the Southwest and Hawaii.

Hardy in zones nine through 11, this vigorous, globe-like, dense plant can be a shrub or tree. It is typically 15 to 22 feet tall and ten to 15 feet across. The compound leaves feature three to 13 leaflets.

Male and female flowers occur on separate plants. These emerge in long, feathery, axillary panicles from Spring through Fall with the heaviest blooming occurring in late Summer. The female blossoms are yellow green.

Pepper tree (*Schinus molle)* occurs in California along the coast and in the southern part of the state as far north as the Bay area.

Hardy in zones eight to 11, this species resembles Brazilian pepper tree, but is slightly taller and wider with drooping, slender shoots. This broad headed tree develops a contorted, thick trunk and wide spreading branches. It features delicate-looking foliage that is smaller and features a greater number of leaflets. In addition, its flower panicles are less dense.

Brazillian pepper tree.

The tiny yellow or white blooms can appear several times a year from Spring through Fall with the main blooming period between May and July.

Both of these species are excellent, reliable, consistent, major honey plants in Florida and California. Yielding lots of nectar, the flowers are much loved by bees. The flow is heaviest when temperatures are elevated. These can bring 50 pounds of honey per colony.

The honey is rather dark, usually some shade of amber. It has a strong, somewhat spicy flavor and spicy aroma. In Florida, the honey is popular among local consumers. BC

Connie Krochmal is a writer and beekeeper in Black Mountain, North Carolina.

Bad Weather!

Jim **Thompson**

There are several ways that beekeepers install packages of bees into their hives. Some hives will have an entrance ramp and the bees are shook on the ramp and march into the hive. I used to like shaking the bees into a three frame open space in the first super and then replace the frames. However when one opens a package and starts shaking bees there can be a hazard of flying bees that a person may be unaccustomed. Sometimes package bees arrive when the weather is cold or rainy and you would prefer to have them walk from the package onto the frames within the hive. I helped another beekeeper install 60 packages that were in close proximity to each other and we didn't want the bees flying around the other hives.

The hive should be placed on your property exactly where you want it to be located. If you make a mistake and decide to relocate it from a front yard to the backyard, the bees will have their homing instincts set for the front yard. Thus you should have a secondary site approximately two miles away. The permanent hive should be raised about 16 inches off the ground to discourage skunks from eating bees. Hive stands made of metal should not be used as there can be electrical storms and kindling can be made quickly from hive parts.

The method described requires more equipment initially, but there are very few airborne bees and the transfer can be done in *horrible* weather. Some people have even started the bees in their hives in a garage or barn and then moved them to the outside location when the weather improved. The key is to have plenty of inside hive space and all the entrances blocked off and plenty of feed.

I like to set the hive on four 8" concrete blocks flat side down. I have two blocks in front and two in back. Make sure that the entrance is placed in the direction that you want the bees to fly. Usually east is selected as the cold winds usually come from of the west and north. If you have wind breaks any direction is okay. Put the bottom board on the blocks and an empty deep super on it. You will notice that when you put a package on the bottom board that the top of the package is recessed from the top of the super. You will need to put about 1½" of wood under the package to make it almost flush with the top of the super. If the bees have been in the package for several days, spray the sides of the package with sugar water to feed the bees. Remove the cover of the package and quickly rap the package on the ground. When the bees fall away from the center, quickly remove the feed can and the queen in her cage and place the package cover back over the existing hole. Place the package on the wood shims in the bottom super. Take another super with frames and place the queen in her cage between the frames over the hole.

It is more beneficial if you have drawn combs for the queen to lay eggs in and two or three frames of honey for feed. If you have one or two hives you may want to keep the queen cage cork in place for three days. If you have many hives, you should remove the cork from the candy end while you put in the cages. Lower the second super over the package and with a stick, brush the cover off the package into the empty super and lower the second hive. If you accomplish this in a garage or barn, you may want an entrance screen to be in place to keep the bees in the hive. The inner cover is placed on top of the second super and the full feed can or other feeder is placed over the inner cover hole. The feeder is protected by a third super and the telescoping cover. If you are feeding clean honey frames (honey without foulbrood spores), you may eliminate the third super.

When you purchase a package of bees the bees in the package were shaken from one hive and the queen in the cage was raised in a miniature hive elsewhere. The bees are unaccustomed to the new queen. The bees need time to realize that their old queen is no longer with them. A matter of three or four days seems to be about the right amount of time but it may be more. Some beekeepers will remove the cork from the candy end of the queen cage







and let the bees release the queen. Other beekeepers open the hive after three or four days and release the queen by removing the plain cork end of the queen cage. Remember to keep your hands over the cage to force the queen to walk out and down into the hive. If you don't cover the airborne route, she might fly away.

After three days you need to remove the bottom super shell, empty package, and wood shims. Then place the second super on the bottom board. This is also a good time to remove the queen cage and check to see if she has been released. If she is still in the cage, release her and close up the hive. Continue to feed sugar syrup to the hive.

In four days go into the hive again to check if the queen is laying eggs. The eggs will appear as miniature grains of rice in the cells. If you don't have drawn comb you won't have eggs so you will have to continue to feed the colony and check again in a week. You need to be convinced that the queen is laying eggs.

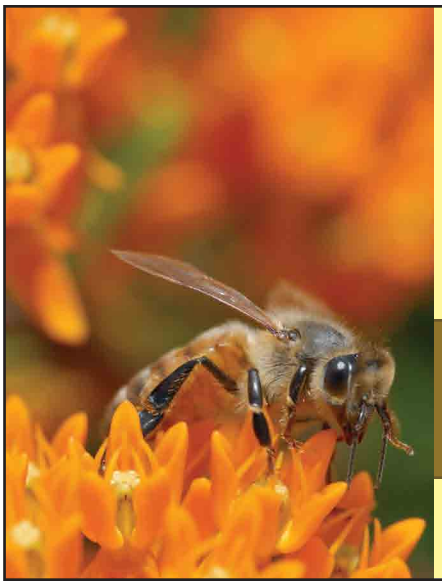
The next inspection will be to reverse and rotate frames to assure that every frame is being used before you add the "second" super. Some beekeepers will tell you to feed the bees until they have completed the first super while others will encourage you to feed until the second super is full. Either thought is okay remembering that there are several ways of doing things. When you talk to many beekeepers you will see some of these methods, so you need to develop your own system. The best way to feed the colony is by the use of a top feeder with plenty of bee access.

If supers are added too soon to a hive the bees will use the center frames and avoid the outside frames. To eliminate this towering effect the frames needed to be manipulated. When it is right to add the next super, the bees will add specks of white wax indiscriminately around the super. When you see the "whiting of the combs" add the next super.

Some bee supply companies push the idea of using plastic foundation. Bees do not like the plastic foundation as well as the natural wax foundation. If you choose to add a super to the bees with both types of foundation, you will find that the bees will make the beeswax foundation extra wide. Therefore you should try not to mix types of foundation within a super. Once the frames have been drawn out you can do all kinds of mixing. To get the bees to work the plastic foundation quicker, spray the foundation with sugar water when inserting into the hive. You can also paint a thin coat of beeswax on the plastic foundation using a sponge paint brush.

Hold off trying to medicate the bees for mites and beetles until you are sure that the bees are the progeny of the new queen. It seems that the chemicals used for pests may interfere with the pheromone levels. As a safety precaution, remember that no insecticides should be used in the hive when the honey supers are in use. This precaution is to keep chemicals out of the honey. BC

Jim Thompson collects everything bees and stores them everywhere inside in his home in Smithville, Ohio.



Tree Hive Colonies: Increased Quantity Of Beneficial Fungi In Bee Bread From The Trees And Its Antifungal Propeties Against Chalkbrood

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Summary: We report the fungus profile of bee bread from honey bee colonies (*Apis mellifera*) placed in trees in order to explore this novel approach to beekeeping. Bee bread from tree colonies had approximately twice the amount of fungi, *Aspergillus*/*Penicillium*, and *A. niger*, as ground colonies (due to undetermined factors). A total fungus inoculum of all culturable fungi slowed or inhibited growth of chalkbrood fungus *Ascosphaera apis* in laboratory cultures, thus confirming the beneficial role of these fungi. *Aspergillus niger* alone was particularly effective at overgrowing *A. apis* and chemical antagonism. Two randomly selected *Penicillium* spp. were also growth deterrents to *A. apis*. Remarkably, bee bread fungi completely grew over *A. apis* and killed it. With more concentrated fungi from tree colonies, takeover of *A. apis* was more rapid. This suggests that bee bread fungi from tree colonies are more efficient at handling chalkbrood. Adding more beneficial fungi (i.e., *A. niger*) to bee colonies should not be expected to increase protection, and, in fact, could be detrimental by causing an imbalance of fungal components that are regulated naturally.

Background: Placement of colonies of the honey bee (*Apis mellifera*) in trees returns the bees to their native home environment of tree hollows. Tree colonies are advantageous because they are treatment-free and alleviate many problems of maintaining standard beekeeping equipment on the ground (Royce, L. **http://treehivebees.com**). Mounting bee colonies eight to 12 feet (2.4-3.7 m) above the ground on a metal stand is the basis for this novel beekeeping approach (Fig. 1). This also appears to be the optimal height for attracting a swarm into an empty hive. A natural tree hollow habitat for the bees is simulated by a bio box filled with decayed woody debris placed at the base of the colony, small box design, and elevation above the ground (Fig. 2). The placement of bee colonies in the trees raises the bee's flight path, effectively removing them from the high-risk people and pet environment on the ground. One implication of the higher flight path is broadening the conditions of the bee's foraging habitat. Presumably, this provides access to a greater diversity of food and exposure to a different subset of symbiotic non-bee organisms that help to keep the bees healthy (Naug, 2009). Information presented in this article concerns the fungi that play a role in protecting the colony against disease and also in processing food in the form of bee bread (fungal fermentation product of stored pollen) for the developing bee larvae (Gilliam et al., 1988). Fungi are very numerous in the environment and produce copious amounts of spores, called conidia, which coat the surface of pollen grains and get trapped in nectar. Fungi in bee bread therefore originate from fungi in the bee's foraging habitat.

The bee colonies for this study are in Oregon: the tree colonies are located 13 miles (21 km) SW Corvallis and the ground colonies are five miles (eight km) SW Corvallis. Their flight ranges (i.e., foraging habitats) could overlap to some extent (two to four miles, but as far as seven miles; Morse, 1984), if need be. The tree hives are south west of the colonies on the ground. They are at a slightly higher elevation than the ground colonies, and are surrounded by Christmas tree fields and timber lands. The bee colonies on the ground are on the edge of the coast range surrounded by agriculture, bordering on a dairy, with mostly grass seed fields and grain fields. At the time of this study, there are three colonies in the trees. This seems to be a sustainable number for this area, as no recent robbing has been observed. None of these colonies are treated, so there is the possibility of always having to replace bees. Of the tree hives, the first was a swarm that was hived this spring (2014), the second was hived last Summer and overwintered, and the third is in its third Summer. The third and oldest colony is in two nucleus colony boxes. The nucleus box is about twice the length of

Figure 1. *(A,B) Beekeepers on ladders about to inspect a tree colony of* Apis mellifera *in ponderosa pine.* David Lytle photo.

Figure 2. *(A,B) Close up of a top entrance to a tree colony. An extra bottom entrance is now used. In Summer, bottom and top entrances are both open to allow for better heat elimination on hot days. In Winter, the top entrance is closed. Frames are 1/2 length of a standard deep frame.* David Lytle photo.

one of the tree hive bee boxes. There are two such boxes of that colony, and the other two tree hive colonies have three boxes. All three colonies take up approximately the same volume and have the bio box underneath.

Some benefits associated with the tree colonies have been seen, even within the first year. There seem to be fewer predators bothering the tree colonies; i.e., no yellow jackets, raccoons, or skunks. In past years bears have also taken out colonies on the ground; however, it is not known if bears could take out the tree colonies. Tree colonies have also overwintered more successfully than colonies on the ground and needed less in the way of stored food, but this may be due to the fact that they are smaller colonies. Culturing bee colonies on the ground has changed nearly every parameter that the bees have evolved after hundreds of years of living in the trees. These parameters include size of the colony, height above the ground, unlimited diversity of food sources at any one time, and probably many other factors. It seems reasonable to suggest that the bees would be less stressed in tree colonies than on the ground.

Objectives: To test the hypothesis that exposure to tree habitats may expose bees to a greater diversity of symbiotic fungi compared to ground colonies, we determined the kinds and quantities of fungi present in bee bread. The beneficial nature of bee bread fungi was evaluated based on their ability to suppress growth of *Ascosphaera apis* (chalkbrood fungus) as a gauge of infection.

Results: More bee bread fungi were recovered from tree colonies than ground colonies (Table 1; $P < 0.05$). Figure 3 shows some representative culture plates. There was little to no fungi on the water-treated control plates (Table 1), indicating minimal contamination during the experimental manipulation of bee bread samples. Culturing on Sabouraud agar, another standard mycological growth medium, yielded nearly identical results as potato dextrose agar (Table 1). Similar numbers of fungal isolates were obtained from portions of the core of bee bread corresponding to the lower, middle, and upper third of the honeycomb cell (data not presented). This implies that the distribution of conidia is fairly uniform throughout the bee bread from top to bottom. There was no difference in bee bread fungus quantity between bee colonies from the same yard ($P > 0.05$; Table 1).

Mean percentage of bee bread fungal components are in the pie chart (Fig. 3). The trend is that most of the fungi are *Aspergillus*, followed by *Penicillium*, then *Cladosporium* and *Mucor*, with several variable components being present in smaller amounts ($P < 0.05$; Table 1). Total *Aspergillus* was greater from tree colonies than ground colonies ($P < 0.05$; Table 1), with *A. niger* appearing most frequently from tree colonies ($P < 0.05$). This is not always true for the ground colonies, where sometimes a mixture of unidentified *Aspergillus* spp. dominates over *A. niger* (Table 1; $P < 0.05$). Amounts of *Penicillium* were consistent between tree and ground colonies ($P > 0.05$; Table 1). Ground and tree colonies had similar amounts of *Cladosporium* ($P > 0.05$), but amounts of *Mucor* varied ($P < 0.05$; Table 1). There was twice the *Cladosporium*, and nearly triple the *Mucor*, in tree colony TH3 compared to TH2 ($P < 0.05$; Table 1). Among ground colonies, C175 had two-times the *Mucor* as *Cladosporium* ($P < 0.05$), these two fungi were in similar amounts in C207 ($P > 0.05$), and neither of these fungi was recovered in C126 (Table 1).

Fungal diversity was greater for ground colonies compared to tree colonies (Simpson's reciprocal index; $P < 0.05$; Table 1). Using data in Fig. 3, Simpson's reciprocal index is 1.5 ± 0.08 for tree colonies (Fig. 3B) and this is lower than 2.6 ± 0.11 for ground colonies (Fig. 3D) ($P < 0.05$). One trend across all colonies is that as the percentage of *Aspergillus* increases, the Simpson's reciprocal index decreases ($y = -19.7x$, $R = 0.98$). There are low correlations between Simpson's reciprocal index with amounts of *Penicillium* ($y = 6.5x$, $R = 0.33$), *Cladosporium* ($y = -3.4x$, $R = 0.08$), and *Mucor* ($y = -1.5x$, $R = 0.01$). Thus, differences in diversity as reflected by the Simpson's reciprocal index between tree versus ground colonies have more to do with the amount of *Aspergillus*. The high Simpson's reciprocal index indicates that there is a greater probability that when selecting two fungi at random from the mixture that the two fungi will be different (Simpson, 1949). Mycoflora of tree colonies is less diverse (lower Simpson's), because when selecting two fungi at random from the pool there is greater probability that both will be *Aspergillus* as a consequence of the *Aspergillus* fraction being so large (Fig. 3B and D).

When pitted against chalkbrood fungus *A. apis* in a culture plate, a total fungus inoculum of bee bread from tree colonies suppressed growth of *A. apis* by 48% (Table 2). Similarly, there was a 53% reduction in the growth of *A. apis* by a total fungus inoculum prepared from ground colonies even though it is less concentrated ($P > 0.05$; Table 2). One of the *Penicillium* isolates (sp. A) resulted in an approximate 40% reduction of *A. apis* growth, *Penicillium* isolate sp. B an approximate 20% reduction, and *A. niger* about a 24% reduction (Table 2). There was greater inhibition of *A. apis* growth by the total fungus inoculum than *A. niger*, *Penicillium* sp. A and B individually ($P < 0.05$ in each pairwise comparison; Table 2). Upon contact, fungi from the total inoculum (both tree and ground colony preparations), as well as *A. niger*,

Penicillium sp. A and B, aggressively overgrew *A. apis*, resulting in no growth of *A. apis* (K_r = 0.00 mm/h; Table 2).

Conclusions: The most pronounced effect observed in this research was the capacity by bee bread fungi to completely dominate and overgrow an existing mycelium of *A. apis*, stopping its growth. *Aspergillus niger* is especially antagonistic toward *A. apis* as a secondary colonizer in this regard. There is also evidence for production of antifungal compounds as a form of chemical antagonism. For example, there is inhibitory action on the growth of *A. apis* before physical contact is made by bee bread fungi and its components, alone (*A. niger*, *Penicillium* sp. A and sp. B) and in combination (total fungus inoculum). The fact that the growth-inhibitory activity to individual fungal components (*A. niger*, *Penicillium* sp. A and B) is lower than that of the total fungus inoculum indicates that bee bread is a multicomponent system of beneficial fungi that protects against chalkbrood. This indicates that there are other fungal components in the bee bread that make its antifungal activity more potent.

None of the fungi that we recovered are unusual in bee colonies (Gilliam et al., 1988; Wood, 1998; Aronstein and Murray, 2010). Many healthy bee colonies feature *Aspergillus* as the dominant fungus group (Osintseva and Chekryga, 2008; Yoder et al., 2013; Foley et al., 2014). In the event of colony stress, the colony is at risk of opportunistic infection by these regular bee bread fungal inhabitants; i.e., chalkbrood by *A. apis* (Gilliam et al., 1988) and stonebrood by *A. flavus*, as well as *A. niger*, *A. fumigatus* and other *Aspergillus* spp. that can be associated with stonebrood disease (Foley et al., 2014 and references therein). From this study it is clear that healthy bees are capable of tolerating a high *Aspergillus* load in bee bread, and the bees can use *Aspergillus* to their advantage by exploitative competition against chalkbrood fungus, *A. apis*.

Larger amount of *A. niger* stands out for bee bread from tree colonies. Whether this is due to their placement in trees, differences in fungi abundance where bees forage, small size of the colony confining spores that circulate within the colony, and/or exposure to extra spores from decaying woody debris in the bio box are not known. Given the landscape of Christmas tree farms (tree colonies) and agriculture (ground colonies), it is interesting that kinds of bee bread fungi are rather consistent. These are mostly mitosporic (asexual) fungi and less zymgomycete (sexual) fungi, which could be a product of our culturing methods. Undoubtedly other kinds of fungi exist in bee bread that we did not detect. The Simpson's reciprocal index approaching 1 for tree colonies simply points out that bee bread from tree colonies is essentially a single fungus community of *Aspergillus*. This is not the case for the bee bread mycoflora of ground colonies, where the higher Simpson's reciprocal index is indicative of a more diverse fungus community that is not dominated by a single, large component. Colonies having low amounts of beneficial bee bread fungi typically show chalkbrood symptoms (Yoder et al., 2013). There is apparently no problem with the lesser amount of fungi associated with the bee bread of ground colonies, because these colonies are active, healthy, treatment-free colonies, with no sign of disease or failure. As healthy, thriving colonies, there is also no apparent problem of effective turnover of pollen into viable bee bread for proper development. Besides the large *Aspergillus*/*Penicillium* fraction, there are individual colony-to-colony differences whether the bees are using the same foraging habitat. This indicates that subtle variations in fungal composition can occur in spite of where colonies are set up.

Table 1. Fungus profile of bee bread from colonies of *Apis mellifera*. Number of isolates on potato dextrose agar (PDA), dilution factor = 10. An isolate is a portion of an individual fungus colony, thus only one kind of fungus (Fig. 3 A and C, a culture plate showing fungal colonies), that was subsequently subcultured and identified.

	Tree colony		Ground colony			
Fungi	TH2	TH3	C126	C175	C207	Water control
No. isolates (± SE ≤ 2.2)	24	19	8	8	11	1
% Composition (± SE ≤ 0.9)						
Alternaria	0	0	13	0	0	0
Aspergillus	8	0	0	25	18	0
Aspergillus flavus	8	0	0	0	0	0
Aspergillus fumigatus	0	11	13	0	0	0
Aspergillus niger	33	42	25	13	9	0
Aureobasidium	4	0	0	0	0	0
Bipolaris	4	0	0	0	9	0
Cladosporium	8	16	0	13	9	0
Fusarium	0	0	13	0	9	0
Geotrichum	4	0	0	13	0	0
Mucor	4	11	0	25	9	0
Penicillium	21	16	25	13	27	0
Rhizopus	0	0	13	0	0	0
Scopulariopsis	4	0	0	0	0	0
Trichoderma	0	5	0	0	9	100
Simpson's reciprocal index	1.6	1.5	2.1	2.1	2.8	-
SE	0.03	0.03	0.07	0.09	0.06	-

This research on tree colonies is in early stages, and there is still a lot to learn. The coring technique we used is a convenient way to sample bee bread and stored pollen (subsequently bee bread) with plastic pipettes, pipette tips, or prepackaged, clean soda straws that can then be taken back to the laboratory, or sent off for fungus analysis. We conclude: (1) each bee colony location is different pertaining to the amounts and kinds of beneficial fungi in bee bread that are sustained by healthy bees; (2) the growth rate of an potential fungal pathogen *A. apis* does not continue to drop by addition of more beneficial fungi; and (3) every bee colony has a distinct fungus profile although coming from the same yard. This places a priority on regular monitoring of bee health in connection with bee bread fungus levels, events in foraging habitats (i.e., fungicide spraying), and behavior of the bees pertaining to what they are actually doing in the field at the individual colony level.

The take-home message for beekeepers is that what works best for bees in the trees is different from what works best for bees on the ground pertaining to amounts and kinds of bee bread fungi. We were able to definitively show the role of *Aspergillus* (particularly *A. niger*) as defensive against chalkbrood, and this was the largest fraction of fungi in bee bread from both tree and ground

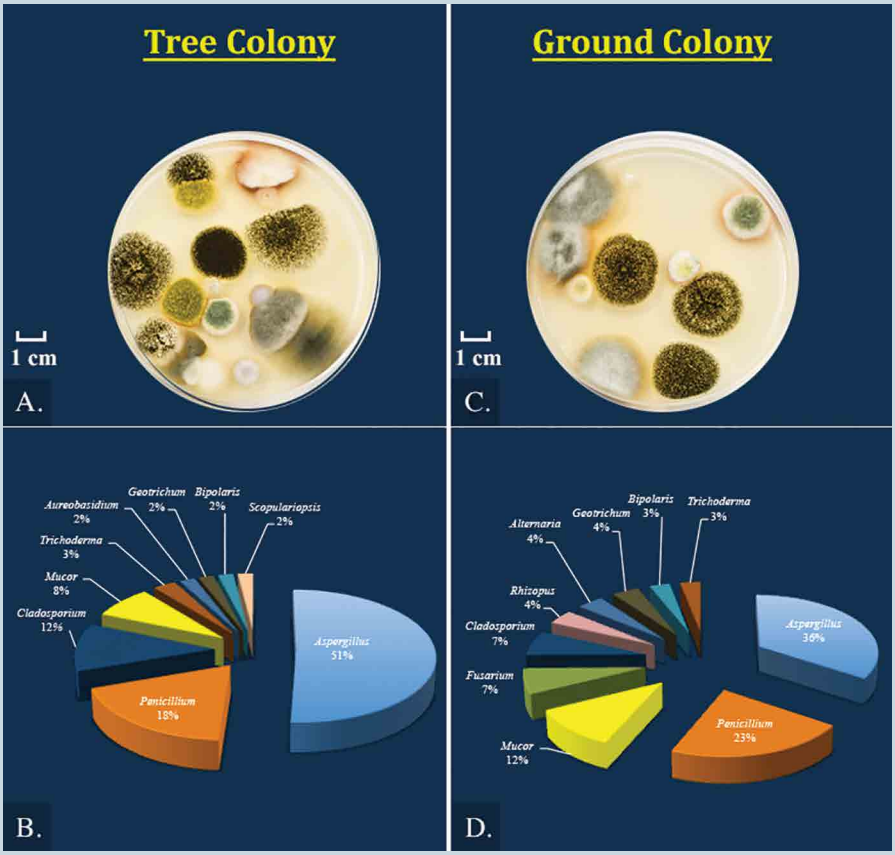

Figure 3. *(A,C) Culture plates of bee bread fungi from tree colonies and ground colonies of* Apis mellifera. *(B,D) Corresponding mean percentage of fungal components from data in Table 1. Plates were chosen at random, neither selecting for best or worst examples. Conditions: potato dextrose agar, dilution factor = 10, two days incubation, 32°C, darknes.* Blake Nelson photo.

colonies in this region. We would have anticipated further lowering of growth rates of *A. apis* from more concentrated growth-inhibiting compounds with the higher amount of bee bread fungi in tree colonies, but this was not observed. Chemical antagonism against *A. apis* is not improved by more concentrated preparations of *Aspergillus*. We did notice that the more concentrated bee bread fungi from tree colonies were overwhelmingly more aggressive and grew over *A. apis* at a much faster rate than the less concentrated fungi prepared from ground colonies. This implies that bee bread from tree colonies is more effective at dispatching chalkbrood because of its greater beneficial fungi quantity.

Methods: Bee bread was collected by taking core samples from different honeycomb cells by inserting a disposable, sterile, polyethylene 1 cc pipette tip (Fisher Scientific, Pittsburgh, PA) directly into the bee bread. Each pipette tip containing bee bread was placed into separate 50 ml sterile polyethylene centrifuge tube (Fisher) and enclosed within a Whirl-Pak bag (Nasco, Salida, CA) for overnight shipping. For apiary records, the tree hive colonies that were sampled were TH2 (N = 5 samples collected), TH3 (N = 6 samples collected) and ground colonies were C126 (N = 8 samples collected), C175 (N = 8 samples collected) and C207 (N = 10 samples collected). Samples were collected during the day between 10:30-16:00 in late August 2014 and were analyzed by fungus culture within one to two days after collection.

The core sample was removed from the pipette tip with a sterile forceps and a scalpel, weighed to 10 mg (within ± SE ≤ 0.11 mg) with a microbalance (Cahn Ventron Instruments, Cerritos, CA, precision of SD ± 0.2 µg, accuracy of ± 6.0 µg accuracy at 1 mg), and placed into a sterile 1.5 ml microcentrifuge tube (Fisher). One milliliter of sterile, deionized, double-distilled (DI) water was added to the tube, then the sample was mixed with a vortex (Scientific Industries, Bohemia, NY), and diluted serially with DI water to 0.1, 0.01, 0.001. One milliliter and 0.1 ml of each dilution was plated on potato dextrose agar (PDA; Difco, Fisher) in a 100 x 15 mm Petri plate (Fisher) using a glass micropipette (accuracy ± 0.25%, precision CV < 0.6%; Fisher) as described for enumeration (Brown 2007). Plates were incubated in programmable incubators (< ± 0.5°C; Fisher) in darkness at 32 ± 1°C, the average temperature of the brood area within the colony environment (Cooper, 1980). Fungal colonies were counted with an automatic colony counter (Bantex Co., Burlingame, CA). A 1 cm^3 agar block from the edge of a colony (= isolate) was removed with a sterile scalpel and placed onto a fresh plate of PDA for subculturing. Fungi from subcultures were identified using colony, conidia, and phialide characteristics by light microscopy at 1000x under oil (Barnett and Hunter, 1998) and pure culture comparison. Mycelia sterilia was used for sterile fungi that did not produce identifiable reproductive structures. A 0.1 ml DI water rinse of a pipette tip that contained no bee bread was analyzed as a control. Aseptic technique was followed throughout, using materials that were autoclave-sterilized or purchased sterile from the manufacturer. All of the work was done in a disinfected laminar flow hood (Cole-Parmer, Vernon Hills, IL). Each core sample of bee bread was analyzed in triplicate; i.e., three separate 10 mg portions from the same core sample. Fungus diversity was evaluated by the Simpson's reciprocal index (Simpson, 1949); i.e., if there is only one species, then Simpson's reciprocal index = 1, and the larger the number > 1, the greater the diversity.

To prepare a fungus inoculum, a five mm diameter agar plug was taken from the center of a fungus colony, mixed in five ml DI water with a vortex, and 1 ml of the fungus extract was spread over a PDA plate. After 10 days at 32°C, the fungus-covered plate was cut into 0.5cm^3 blocks for testing. Similarly, 0.5cm^3 blocks of chalkbrood fungus *Ascosphaera apis* were prepared from ground mummies (Johnson et al., 2005; Aronstein and Murray, 2010). The 0.5cm^3 fungus blocks were placed onto the surface of non-nutritive agar (Fisher) containing crushed bee larvae as a mock infection, then incubated at 32°C. A 0.5cm^3 block of agar containing no fungi served as a control. Radial growth rate (K_r) of *A. apis* was measured using the equation: $K_r = (R_1-R_0)/(t_1-t_0)$, where R_0 and R_1 are colony radii at beginning of linear, t_0, and stationary, t_1, phases of growth (Baldrian and Gabriel, 2002) based on measurements of growth of the fungus mycelium as it spread over the agar surface. To test for production of antifungal compounds (primary resource capture), two blocks of fungi were placed on the agar plate: *A. apis* at one side versus test fungus on the opposite side. To test for the capacity of overgrowth (secondary resource capture), the block of *A. apis* was placed directly on top of a block of the test fungus.

Data (the mean ± SE of three replicates) were analyzed by an analysis of covariance (Duncan; ANCOVA, P = 0.05) using an arcsin transformation in the case of percentages (SPSS 14.0 for Windows, Microsoft Excel and Minitab; Chicago, IL; Sokal and Rohlf, 1995). A digital camera (Diagnostic Systems Laboratories, Webster, TX) and photoshop (Adobe Systems, San Jose, CA) were used to construct figures. BC

Table 2. Growth inhibition of *Ascosphaera apis* by presence of a 1cm^3 block of fungi that originated from tree and ground colony fungi. 'Total' is an inoculum that was prepared from all fungus colonies on a plate; '*A. niger*' is an inoculum from all *A. niger* colonies; 'Pen. sp. A', and 'Pen. sp. B', are inocula from all *Penicillium* sp. A and B colonies, respectively. K_r, radial growth rate; NG, no growth, K_r = 0.00 mm/h. Data followed by the same superscript letter within a column are not significantly different (P < 0.05).

	Growth rate (mean K_r ± SE ≤ 0.011) of *A. apis* when:			
Bee colony	Blocks placed opposite each other:		Blocks placed on top each other:	
Competitor	Fungus vs.	*A. apis*	Fungus vs.	*A. apis*
Tree (≈ 2x more fungi than ground colonies)	Total fungi	0.21	Total fungi	NG (0.00^a)
	A. *niger*	0.29^b	*A. niger*	NG (0.00^a)
	Pen. sp. A	0.24^c	Pen. sp. A	NG (0.00^a)
	Pen. sp. B	0.31^b	Pen. sp. B	NG (0.00^a)
Ground	Total fungi	0.18^a	Total fungi	NG (0.00^a)
	A. *niger*	0.25^c	*A. niger*	NG (0.00^a)
	Pen. sp. A	0.27^b	Pen. sp. A	NG (0.00^a)
	Pen. sp. B	0.27^b	Pen. sp. B	NG (0.00^a)
Water control	Plain agar block	0.38^c	Plain agar block	0.33^b

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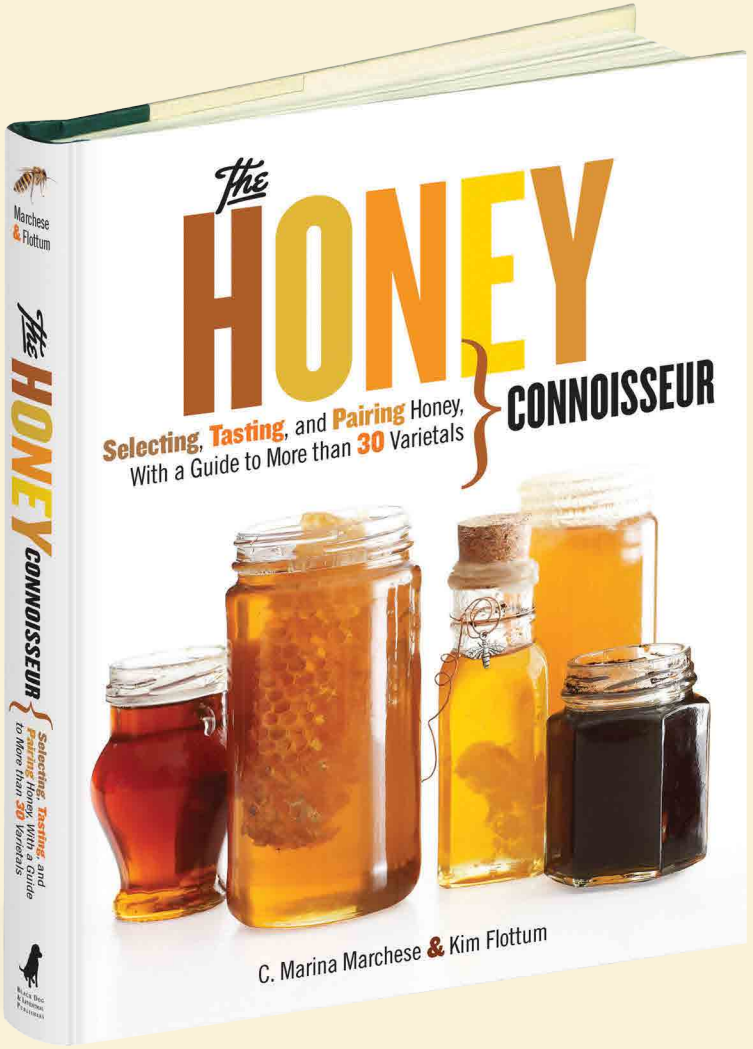

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Duct Tape Is Like The Force: It Has A Light Side, A Dark Side, And It Holds The Universe Together

Is It Feeding Time In Your Apiary?

Ross **Conrad**

There are various ways to feed and each option has benefits and drawbacks for you and your bees.

The month of March can be a difficult month for many in the Northeast, especially those of us in the northern-most areas. We can sense that Spring is just around the corner, and yet Winter still has a strong icy grip on most of the states in this corner of the country. Trees remain bare of leaves, the world around us is mostly brown and grey unless it snows, and at this point most of us have had our fill of snow for the season. The temperatures through much of the region are still too low to enable the bees to get out and fly with any regularity. March is the month that cabin fever can really take hold and cause even the hardiest among us to leave on a trip to warmer climes, where a beach and the sun feel so good, and we can luxuriate in the feeling of being able to go outside without being bundled up from head to toe.

March is also one of the most critical times of the year for visiting beeyards in the northeast to be sure colonies have enough honey. The honey in the hives must last them until the earliest of the blooming plants begin to offer the first nectar and pollen sources of the year in the hopes that the weather will be favorable enough for pollinators to visit and pollinate their flowers. Experienced beekeepers will have undoubtedly learned this lesson the hard way, and beekeeping classes will always cover the need to check food levels in late Winter/early Spring, but there seems to be no end to the new beekeepers who "thought there would be enough honey since nothing was removed last year" and experience hive losses due to starvation at this time of year.

One of the big problems at this time of year is that we humans get just as excited over a warm sunny day as the bees do. Those February or March thaws allow us to get outside, clean up the yard from the fallen branches that have collected during the Winter, perhaps start poking around in the garden, or simply go for a walk and enjoy the balmy weather. If we were on the ball and did everything we were supposed to in Autumn, we have been able to ignore the bees for the last several months and it is easy to continue to forget them now, just when they may be needing us the most.

Depending on your geographical location, all hives should probably have at least two full frames of capped honey located adjacent to the cluster during these late Winter/early Spring days, and the more the better. This is why it is so much better to feed colonies liberally in Autumn making sure that all supers are full and there are no partially filled frames or undrawn foundation at the start of Winter, so that hives don't need feeding before the spring flowers bloom. Hives that are treated this way tend to be much stronger in Spring than hives that need to be fed during the Winter or early Spring. If the capped frames of honey left in the hive are located on the side of the hive opposite the clustering bees, then the frames of honey should be moved so that they are adjacent to the bees, sandwiching the cluster. If there is little, or no capped honey left in the hive, then the beekeeper misjudged feeding requirements in the Fall and the colony now requires feeding as soon as possible.

From my perspective, the best way to feed a colony in need is to slap a full shallow or medium super of capped honey on top of the hive. Unfortunately, full supers are likely to be in short supply at this time of year, unless you have colonies that died over the Winter and have not had their honey robbed out yet. Sometimes, full frames of capped honey can be taken from several dead colonies in order to fill a super that can be used for feeding a colony in need. The biggest danger in this approach however is that diseases can be spread between colonies this way, so it is extremely important that the dead colonies that are providing the frames of honey for feeding are thoroughly inspected to be sure they did not die from something that may be contagious, such as American foulbrood or nosema. If there is any question as to the reason the hives died, then feeding syrup instead of honey is a safer approach.

The challenge with late Winter/early Spring feeding is that the cold temperatures tend to make it difficult for colonies to access the feed. Research has established that colonies will begin to form a cluster when ambient temperatures drop down to around 57°F. As outside temperatures drop, the cluster contracts and once temperatures reach around 55°F, the cluster will have formed an outer shell of relatively quiet bees, and a warm inner core where the queen and workers are more active. Much depends on a colonies genetic tolerance to the cold, but generally speaking, when temperatures drop much below 50°F, most colonies are loath to break cluster and do so only under relatively severe circumstances. This is why entrance feeders (sometimes also called Boardman entrance feeders), that position the syrup on the bottom board by the hive entrance are fairly worthless at this time of year. A cluster of bees located

Blue Sky pail feeder.

Quart mason jar feeder behind a follower board in a top bar hive.

up against the inner cover will not break the cluster in order to reach the feeder by the bottom board except on those relatively rare warm days. It is a gamble to feed bees this way with the hope that the colony will process enough of the syrup during warm weather to be able to survive the cold snaps that are still sure to come. A more reliable approach is to use a feeding method that positions the syrup close, if not adjacent to, the cluster.

Hive top feeders that resemble supers in size and shape and are placed under the inner cover on top of the hive, are a bit better than entrance feeders. They will position the syrup closer to the cluster, however the bees will still need to travel a significant distance from the cluster, up the side of the top feeder, over the top of the feeder and down to the syrup reservoir. This also does not work very well in cold weather, though the temperature range at which the bees will be able to reach the top feeder will likely be a few degrees lower than with the entrance feeder, since some heat rising from the cluster may help to warm the space above. Another drawback to the top hive feeder is that many designs on the market seem to result in at least some bees drowning in the sugar syrup.

The division board feeder takes the place of a frame within the hive body, and is a much better option since it can be positioned adjacent to the cluster making it easier for the bees to gain access to the feed despite the persisting cold temperatures. Small pieces of wood are often placed in the feeder to float in the syrup and provide the bees with a life raft should they fall in. Despite this precaution, inevitably some bees are likely to drown in the syrup anyway. The biggest drawback to using the division board feeder is that the hive must be opened up in order to insert/remove the feeder, check feed levels and refill the feeder with syrup when necessary. This may require you to sacrifice additional time on those rare warm days in order to care for your bees.

Some beekeepers place a plastic zip-lock sandwich bag filled with syrup on the top bars of the hive body containing clustering bees. Wooden shims or a small super, about 1/3 the depth of a shallow super, is added to provide room for the bees and bags. A slit is sliced into the top layer of the bag so that bees can access the syrup. The feed bag can be placed directly above the cluster making access relatively easy, though some bees may also drown in the feed and the hive still has to be opened when inserting/removing and checking feed levels in the bag. While the feed baggie is the least expensive option initially, regular use will theoretically eventually add up to a greater cost than the one-time expense of purchasing a more permanent feeder. This is also the only feeding option that results in the regular generation of landfill waste (the empty plastic baggie with a hole sliced in it).

My preferred method of feeding if I have failed to feed appropriately in Autumn, or do not have full supers of capped honey available, is to use a pail feeder. Pail feeders come in various sizes from about a half-gallon to over a gallon. The lid of the pail often has a hole cut into it that is covered with a fine screen. When a full bucket is filled and the lid placed tightly on so the syrup won't leak out the edges, syrup will begin to run out of the hole through the screening but fairly quickly builds up a vacuum inside the bucket. The vacuum along with the surface tension of the syrup causes the syrup to stop dripping out of the bucket within about 30 seconds or so. The syrup will only drip down if something touches the surface of the liquid such as bees that

come up through the inner cover and suck down the syrup once these pails are placed over the hole of the hive's inner cover. Typically an empty deep super or a couple empty shallow or medium supers are placed around the bucket on top of the inner cover and the outer cover is placed on top of the shell created by the empty super(s) in order to protect the feeder from the elements and potential robbers and keep in the warmth of the cluster.

Feed buckets allow the beekeeper to feed colonies without having to open up the hive when feeding or checking syrup levels in the feeder. This system also places the feed directly over the cluster of bees where it is relatively easy for the colony to maintain warmth and reach the feed. There is no danger of bee drowning as long as the lid is on tight and no syrup is allowed to leak out the sides of the lid. One does have to be careful to allow the syrup to stop dripping from the inverted feeder before placing it over the inner cover hole, or syrup will drip down on the bees making them wet and vulnerable should the colony be exposed to cold temperatures before they have a chance to clean themselves up and dry off. Mason jars with nail holes punched into their metal lids are often used in place of plastic buckets even though the lids will rust over time and the glass may break if dropped or knocked too hard.

For years beekeepers have been encouraged to feed thin syrup consisting of one part sugar to one part water in the Spring in order to stimulate early brood rearing. Recently research looked at gene activity in response to diet and found significant differences occur depending on what the bees eat. This research suggests that a colony's immune response may be weaker when fed an artificial diet as opposed to naturally collected forage. It appears that in both bees and humans, sugar is not simply sugar and various carbohydrate sources can and do have a different impact in the body.

Given the increased annual die-off of honey bees in the last decade and the widely held suspicion that nutrition plays a key role in honey bee declines, the wisdom of spring feeding of syrup becomes questionable when compared to ensuring that wintering hives are extra heavy with honey instead.

If for some reason I have miscalculated and a colony needs feeding in late Winter/early Spring, I will provide hives with a thick feed syrup made up of about two parts sugar to one part water in order to get as much food into the colony as fast as possible to prevent the possibility of starvation. But I will only supply feed until the bees are able to get out and successfully gather forage on their own.

While some beekeepers may enjoy taking the time to measure out the sugar and water while mixing up their bee feed, there is a way to mix up 2:1 syrup without having to do any measuring. First fill the bucket or feeder with granulated sugar up to the level where you want the level of syrup to come to once the feeder is full. Then add liquid and mix, dissolving the sugar until the level in the feeder once again comes up the where you want it. It turns out that this process results in syrup that is just about two parts sugar and one part liquid.

If you have colonies that require feeding and it will take longer than you would like before you will have a chance to get a feeder installed in the hive, the emergency feeding of granulated sugar sprinkled around the hole in the inner cover can help. The bees will come up through the inner cover hole and use any moisture they find in the hive to dissolve the sugar crystals. It is a slow process and will not work well in cold weather, but it can sometimes buy the beekeeper some much needed time when necessary.

Fondant (sometimes referred to as sugar candy) can be fed to hives by either placing the fondant on the top bars over the cluster or in a candy board on the hive. Fondant tends to be fairly soft and pliable so it is easy to place in the hive and for the bees to consume as long as it is within their reach. It may even absorb excess moisture in the hive, however like granulated sugar, it is more of an emergency feed since little if any tends to be stored in the combs. It can be preferable to syrup though when temperatures are consistently cold, since the moisture in syrup is difficult to evaporate in cold weather making liquid feed hard for the bees to process and store properly.

As colonies first emerge from Winter, they are typically in their most vulnerable condition of the year. Adult bee population numbers are low, food stores are low, and brood levels are still being built up. By ensuring that the bees have adequate food reserves to hold them over until fresh forage becomes abundant we help the colony avoid starvation and assist the colony in building up its strength in time to take advantage of the first major nectar flow of the year which, in the northeast, is just around the corner. BC

Ross Conrad authored the revised and expanded 2nd edition of Natural Beekeeping published in 2013

BIGGER PICTURE

Jessica **Louque**

The North American Beekeepers Conference

The North American Beekeepers Conference was held in Disneyland this year, making it a prime target for family beekeepers (or so I thought). Since I was presenting, my registration was free and work paid my hotel, flight, food, and rental car. Bobby and I decided we would take the kids out, have some bee experience with them, and get a little bit of everything in with a day in the park, some conference time, a drive over to the Aquarium of the Pacific, and a day at the San Diego Zoo.

We spent our Tuesday in Disneyland, and for the most part, had a good time. The magic hour gave us more ride time than any other three hours combined, which was nice. The food poisoning I received with my chicken crepes from the Café Orleans was not so fun, and we had to take an early exit from the park on Tuesday night, just as we had sat down for our dinner reservations. This was slightly more traumatic because I had my presentation the next day. We had breakfast at Goofy's Kitchen since there wasn't a lot of character interaction in the park the day before, but I'm not sure we had our money's worth of food at almost $250 for the six of us to eat.

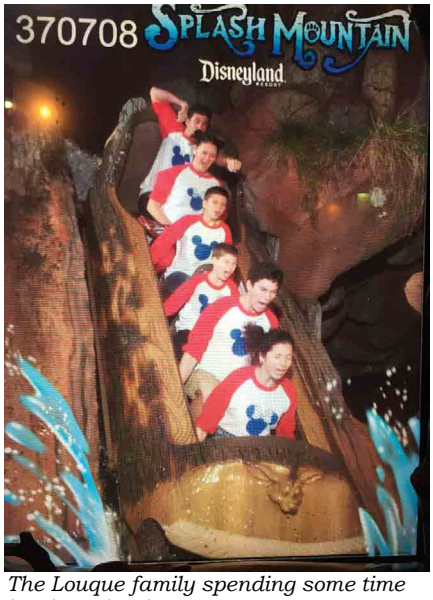
For various reasons, our oldest two did not come with us to the conference itself. One turned 13 that morning and perhaps was trying on some newly minted teenage angst for the day. Our two youngest had a blast running through the booths, talking to people (their favorite pastime, I think), and getting "free stuff" from the booths. Dadant gave them a handful of honey candy that is now their favorite, and they were given "drawing books" from Lebermuth that smelled like honeysuckle after an oil sample. We stopped in to say hi to Solution Bee, who is one of our vendors at work. The boys were a little bored when we stopped to talk about sugar pumps. Our attempts at shoveling 500 gallons of syrup through a pump produced a few burnouts this year, and maybe we have found a solution to that problem. We relied on the free candy and a bouncy ball to keep the boys occupied while we conversed. Lastly, we stopped to pick up one of Kodua's calendars from the California Beekeepers booth. The tradeshow by far was their favorite.

During my session, David Tarpy replaced the original speaker with a presentation on their queen program at NC State. I was slightly chagrined that I didn't already know about their program since it wasn't a new topic, but I think it's something that would be an advantage in some of our testing, so it was fortuitous timing for my own personal information. George, who just turned eight in the past week, fell asleep during this presentation and didn't wake up until mine was over. Obviously none of us were riveting enough in our demonstrative skills to keep a child engaged – although Charles, our almost-11 year old, paid attention through most of the presentations that we watched.

Charles and George enjoying the tradeshow.

There were only four presentations in my session, one of which was an election to replace a director. There were a lot of recognizable faces in the room, but no one wanted to serve in the position and the person who previously held the seat ended up keeping it (this was my perception, at least). Now, it does occur to me that these other people were familiar faces to me because they've paid their dues in serving for ABF, but as an occasional attendee to the meetings, a lot of the information is foreign to me. I point this out only because it was not clear to me what specifically this position entailed, what it was, or what was expected. I'm not sure there would have been any more volunteers if the information was more apparent, but just some sort of description would have been nice to have prior to the event, like a newsletter to attendees with positions open, job duties and requirements, and if someone was interested in a position to attend at which session. Perhaps this was clear to other people in a way that it wasn't to me. Wrangling four kids in Disneyland is probably around the same difficulty level as herding cats, so it's likely that Bobby and I did miss a few glaringly obvious things.

I did see some things that I would like to mention. My observations are slightly different that another year that I might have attended due to the familial additions to the roster for the trip. Honestly, I expected a lot more kids to be in attendance. There were some kids, and I would definitely say there were more than I've noticed in the past. However, I do tend to normally go out of my way to avoid children when I don't have my own with me, so perhaps this is not a fair statement. My point is that I don't think there were nearly as many kids and there should have



The Louque family spending some time in Disneyland.

been for a conference of any kind that was held in the Magic Kingdom. Why weren't there more kids? From our perspective, everyone was very friendly to the kids, or at least they passively ignored them when they weren't on their greatest behavior, but the conference itself was not kid friendly. It's really hard to have a kid sit still for long periods of time. Having sessions with more than two presentations back to back with no bathroom breaks or at least a couple minutes between the presentations makes it a lot harder to get them to sit still. If they wanted a drink in the tradeshow, at least there were plastic and paper abounding in the area, but in the presentations, the water was available in glass, which is a disaster waiting to happen.

Our oldest two could not fathom anything in the conference that would interest them. Truth be told, I didn't know anything to tell them that would entice them to come (besides, hey, let's go to Disney) and I'm still not sure there's anything they would have enjoyed. Some of this could be our fault, because we make our living in honey bees, albeit not at our house specifically, but not one of our children have ever been in the bees, nor do they want to. I can't seem to convey the enjoyment I have with beekeeping to that generation. If someone wanted to give a talk on how to engage kids in beekeeping or make it more relevant, I would go see that. I do know there was a "Kids and Bees" four hour session, but with no description, this was a bit too hazy. Is this an engaging activity for the kids? Is it how we should involve kids, but maybe kids won't actually want to be at the session? To plan in this family, it takes a lot of background information to make an informed decision.

Some of the difficulty lies in the trip itself. I know in our state meetings, we have competitions for food as well as the honey and wax sections. With the national meeting, I am sure that there are several people with some amazing baking and cooking skills, but it's nearly impossible to transport food or prepare food with the traveling required for these meetings. I know at least two of our kids would be interested in a honey cooking session, or cooking with kids and honey, or just being taste testers. There's also a possibility of a crafts section for a slightly different track. I know Eastern Apiculture Society had a pysanky (Ukranian) egg session once that was extremely popular and I enjoyed it, and I know at least two of our kids would enjoy that as well. They would also enjoy more child-oriented hand-outs at the booths, but it would be a bit costly to include coloring books and beeswax candles when only five kids show up and you planned for 20.

In the end, I know the conference can't cater to the children or young teens, especially when they aren't in attendance. My worry is where is the future of beekeeping if we can't keep the kids interested in the first place? I don't know what the answer would be to fix this, other than perhaps send out a survey to people who attended this year or people who have attended in recent years, and ask them about what it would take for them to bring their kids or grandkids with them to a meeting, and what would their kids like to see?

For us, the trip was incredibly expensive. I don't think we paid less than $150 for a meal the entire stay in Disney, and I *might* have cried at the cost per night of a two-bedroom suite to house six people. There were tantrums and breakdowns that come with traveling with kids, but I tried to keep those to a minimum (when it was me having the tantrum, at least) and everybody had a mostly good time. I only consider the trip a marginal success because two of the four didn't participate at all in the reason for the trip, and I think this was an educational experience on many levels that was missed by them. My hope for the future of the North American Beekeepers Conference is to find a way to incorporate the children and young adults into the meeting in a way that makes them want to be involved and come to the meetings. I'm sure there will be times when they get bored or fussy, because I get bored and fussy sometimes too. I hope that there were a lot more children at this meeting than I passively observed, and that the meeting will be considered a success. Most of all, I'm waiting on a "Bee Our Guest: Disney World" in the future, with a meeting planned that can include our whole family in the Mickey world and in the beekeeping world. BC

Got A Question?

Ask Phil

Phil **Craft**

He Knows!

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

A beekeeper in Nevada writes:

I took this picture today 12/22/2014. Am I making a mistake giving my bees dry pollen (I'm actually feeding a protein supplement) this time of year? I have two of these hanging in the trees by my hives and they are, as you can see, going crazy over the pollen.

I have to refill these every night. I started giving them pollen because I was concerned about them making it through the winter.

It has been really mild here about five to 10° above normal (well up in the 60s) and the bees have been flying every day. I also have sugar syrup two to one mix on all eight of my hives.

Will they buildup too fast? Things don't start blooming here in Southern Nevada till about the mid- March.

Phil replies:

Feeding your colonies a protein supplement, as a replacement for or a supplement to natural pollen, can be a good idea, but you're also right to be cautious.

Honey bees require both honey and pollen to fulfill their nutritional needs. Basically, honey provides the carbohydrate portion of their diet, and pollen the protein, but of course, it's more complicated than that. As I discussed in an answer in my January 2015 column, honey contains minerals and other compounds necessary to honey bee health as well as carbohydrates. Similarly, pollen is more than just protein, containing important dietary ingredients such as lipids, sterols, vitamins, and minerals. Pollen is an essential part of the diet of adult bees, both during their early development after emergence, and later when their role in the hive is to produce food for larvae – brood food for workers and drones, and royal jelly for queens. Some pollen is also fed, in its original form, directly to larvae. Honey bees store pollen just as they do honey, and shortages in Winter and early Spring can be detrimental to the health of the colony.

Here in Kentucky, honey bees have ample pollen sources most of the year (as my friends who suffer from hay fever will attest), but periods of dry weather can hinder flowering, causing shortages of both nectar and pollen. One remedy is to collect pollen in the Spring, or other times of good natural forage, in hive mounted pollen traps. It stores well in the freezer until it is needed for feeding back to colonies, either in patties, or by open outside feeding as you have done. Frames of stored pollen may also be moved between colonies, but this should only be done with strong, healthy colonies as the source, to prevent the possible transmission of disease. Most beekeepers, myself included, who do not collect pollen, supplement natural sources with protein patties. These can either be purchased ready made from beekeeping suppliers or made up from a powder, also available from suppliers. I find it easier to store the powdered version, and make my own patties as needed. Instructions on making patties should be included with the powdered supplements, but it's really as simple as combining it with thick syrup (either high fructose corn syrup or two parts table sugar to one part water) until the mixture is about the stiffness of cookie dough. Place an amount approximately the size of a hamburger patty (this is why we call them patties) inside a folded sheet of wax paper, and they are ready to use. Extras can be stored in the refrigerator or freezer. Just make sure to label them. My then-teenage son once tried to fry a very unusual hamburger! To feed them to the bees, place a patty, wax paper and all (it's simpler, and the bees will remove the paper from the hive), on the top bars of the brood box, directly over the bees. Normally, patties are put in the top brood box, but if all the bees are in the bottom, the patty should go between the boxes.

Early in the Spring – say February – I often insert a small patty, or half of one, while it's still too cold to conduct extensive inspections of my hives. I consider these *just in case patties*, since I'm unsure about the pollen stores inside the hive at that time. I check a few days later, and if the patty has been consumed, I offer

Pollen feeder made from pipe. Larry Shreffler photo.

them more, and so on, until normal Spring flowering begins and I see the bees bringing in quantities of pollen. I also routinely feed protein supplements to new nucs and to newly installed package bees. Beekeepers rearing queens use them as part of their supplemental feeding of cell builder and finishing colonies. Pollen patties placed in hives in early Fall also aid in brood rearing whenever the Fall bloom is late or inadequate, or colonies lack stored pollen. Feeding with pollen or pollen substitutes can be beneficial in all these situations but, as your intuition suggests, even a good thing can be overdone.

Excessive early feeding can cause colony populations to build up too rapidly and result in early swarming. Some beekeepers intentionally encourage early brood production by stimulant feeding with pollen and a thin syrup (one part sugar to one part water) early in the Spring. Their goal is to increase honey production by having a strong population of mature workers ready to forage when nectar flows begin. However, other beekeepers discourage this practice, especially for novice beekeepers. The downside of very early feeding can be a large, healthy colony of bees – clustered in a tree and on its way to a new home. I recommend feeding early, with thick syrup and pollen patties, when a hive is extremely low in food resources and possibly at risk of starvation. Thick syrup (two parts sugar to one part water) is less likely to encourage brood growth than the thinner version. I only stimulant feed weak colonies with just a few frames of bees and lots of room to grow. Such colonies are much less likely to swarm.

Another reason to be cautious about supplemental feeding is the small hive beetle (SHB). Protein patties in the hive in early Spring (or Winter, in warmer areas) can stimulate egg laying in the beetles and result in the emergence of SHB larvae earlier than would otherwise be expected. It's a good idea to monitor the hives for the presence of SHB larvae and, if any are observed, remove the patties.

You seem to be doing a lot of things right. Using thick syrup instead of thin is definitely smart. Feeding protein powder in external pipe feeders instead of as patties in the hive is also a good idea. Honey bees are more likely to store the protein supplement when collected as dry powder than when it is offered as patties. In fact, they will often remove excess protein patties from a hive if given more than they can consume. Also, the dry supplement is less likely than patties to cause a problem with SHB. (As a bonus, pipe feeders are easy for the beekeeper to refill compared to making patties and opening hives to insert them.) Still, I'm concerned about your feeding powder and syrup continuously throughout the Winter. Though it's normal in areas as warm as southern Nevada for some brood rearing to occur during Winter, with constant feeding your hive populations could peak long before the Spring nectar flow begins. You could end up losing a lot of the bees you've fed all Winter to swarming, and end up with weakened colonies just as honey production is starting. The only way to be sure what is happening inside the hives is to open them up and do a thorough inspection. I suggest this only because temperatures in your area are regularly in the 60s. (In colder climates like Kentucky, it's OK to open a hive on a warm day, but beekeepers should not be pulling frames until temperatures are consistently warm.) If the hives are really low on food stores, then of course you should continue feeding. In your part of the country, 25 pounds of nectar or syrup and several frames with some cells of pollen should be enough to last until Spring. If they have at least that much, stop feeding and start again about a month before the start of the nectar flow.

Thanks for the picture of your pipe feeder. I had read and heard about them, but never seen one. I like the simplicity: a piece of PVC drainage pipe, an end cap, and a downspout adapter. I would like to try a 90 or 45 degree pipe fitting at the open end, instead of the downspout adapter, angled down to prevent rain from entering the feeder. I like paint job too, though I would probably use University of Kentucky Blue.

A beekeeper in Indiana writes:

I really enjoy your column in Bee Culture and the excellent advice. I have been having unexplained queen loss the past few years. It happens mostly when I transfer nucs into a 10-frame hive body. A few weeks later, and no queen. I breed my own and mark. I recently bought a microscope, and other needed equipment, actually all on ebay, and started doing my own nosema screenings. I purchased a Spencer 1036 microscope, cost $120. Other equipment totaled less than $20. I learned how to do the testing by watching a video on you-tube, by Dr. Jamie Ellis, from the University Florida's web site.

My testing revealed my bees' spore counts were over two million. I treat according to Fumagillin's recommendation, but am starting to believe it is no longer effective. Do you know of any new method or treatment?

Phil replies:

The antibiotic fumagillin is the only registered medication for the treatment of nosema in honey bees. It has been a reliable tool and the only one we needed until recently, but the recognition in the last few years of a new strain of Nosema has created many questions about impact, diagnosis, and treatment. The effectiveness of fumagillin is just one. Unfortunately, it's a complicated issue with no clear answers.

Nosema apis (*N. apis*) was first identified as a honey bee pathogen by a German scientist in 1909, however, its symptoms have been observed in bees since the mid-19th century. Nosema is a common disease of insects, fish crustaceans, and even people. It comprises numerous species, each specific to a certain insect or animal. Officially, it is classified as a microsporidian – a type of fungus – essentially a spore forming, single cell micro-parasitic organism. Spore forming means that when the pathogen dies, it releases numerous single cell spores, each of which can develop into copies of the original organism. Think of spores as seeds. Spores can be very resistant to heat and cold, but fortunately, nosema spores are not as hardy as those of that other destructive spore forming honey bee disease, American foulbrood. N. apis infects cells in a honey bee's mid gut, and spreads principally through an oral/fecal route as a result of the hive cleaning and food transfer activities of young bees. The invaded cells are responsible for nutritional uptake, and are essentially hijacked by the nosema organisms causing the host to become malnourished and weak even as it takes in ample food.

Honey bees infected with *N. apis* typically exhibit

symptoms of dysentery, with older bees exhibiting higher levels of infection than younger ones. *N. apis* was traditionally considered to be a greater problem in northern climates where consistently cold temperatures prevented bees from making defecation flights during the winter. Infected bees were forced to expel feces within the hive, causing a more rapid spread of the disease. Levels of *N. apis* reached a peak in the early spring when most bees were older and all had been confined in the hive for extended periods. In the spring, bees capable of exiting the hive, but weakened by disease and unable to fly, would often defecate on the outside of the hive, resulting in the staining usually associated with the disease. Numerous bees, too sick to fly, crawling in front of the hive was also indicative of *N. apis*. Honey bees infected by nosema had reduced life spans – by as much as about 80% – resulting in fewer foragers, weaker colonies in Spring, and reduced honey production. Workers, drones, and queens could all be infected, but workers exhibited much higher levels due to their cleaning and foraging duties. That is Nosema as it has been understood and described for almost a hundred years: a minor disease, one which weakened colonies in the Winter and Spring, but from which most would recover by Summer as brood production increased faster than infection rate, and one which could be effectively treated with fumagillin.

Everything changed in 2007 when we learned that *Nosema ceranae* (*N. ceranae*) was present in the U.S. honey bee population. It is a separate species of Nosema, formerly found only in Asia in non-European honey bees, including *Apis ceranae* (hence the name *Nosema ceranae*). Subsequent testing of honey bee samples preserved at USDA bee labs showed that *N. ceranae* has actually been here since the mid-1990s, and seems to have essentially displaced *N. apis*. Today, if your bees are infected with nosema, it is almost certainly *N. ceranae*, and much of what we thought we knew about Nosema no longer holds true. *N. ceranae* is thought to be a more virulent disease, and with its discovery came a suspicion that it might be the cause or contributing cause of colony collapse disorder (CCD). That is still controversial. Researchers studying CCD and increased colony loss in recent years

Nosema tracking on hive. Jon Maybriar photo.

have described nosema, along with *Varroa* mites, viruses, pesticides, and poor nutrition, as being possible culprits, likely working in some combination.

In addition to being a more aggressive parasite, *N. ceranae* differs from *N. apis* in symptoms, pattern, and perhaps transmission. Though both affect the digestive tracts of honeybees, *N. ceranae* does not always produce the heavy defecation within hives and the staining on the fronts which are the characteristic signs of *N. apis*. Heavily infected hives can even appear healthy, displaying no overt indications. On the other hand, in some colonies infected with *N. ceranae*, the dysentery symptoms are even more pronounced. Whereas *N. apis* operates on a definite cycle, peaking in the spring and abating in the Summer, *N. ceranae* is considered a year round disease. Some recent studies have indicated that one reason for its persistence is that it is transmitted in more ways than N. apis. In addition to spreading through direct contact with contaminated fecal matter, it may also be transmitted through food to larvae. It is found in drones and queens as well as in workers, and even affects more organs in the bees' bodies. Though concentrated in the gut, *N. ceranae*

cells are also found in other body tissues, including the ovaries of queens. *N. ceranae* has rapidly become a worldwide problem. It now exists on every continent where beekeeping is practiced. In Spain, it has been directly implicated in extremely high colony losses. So far, in North America, it is being viewed with increasing concern, but has not reached the crises level it has achieved in Spain. There are some indications that it thrives better in hotter climates. It has also been suggested that there is more than one genetic variation of the disease, some more virulent than others. In addition, variation in the genetics of honey bee sub-species may cause some to be more susceptible than others.

Diagnosis of *N. ceranae* in infected colonies can be difficult, not only because they may not display any obvious signs, but also because symptoms they might display can also indicate different problems. Dysentery, weakened colonies, and crawling bees may point to Nosema, but can also have other causes such as *Varroa* mites, viruses, poor nutrition, or poisoning. Laboratory testing, including microscopic examination of the contents of digestive tracts of a sample of bees, provides the only definitive diagnosis. The level of infection is determined by estimating the number of spores present. Counts are described in millions per bee, with fewer than one million indicating a low level, one to 10 million moderate, and over ten million high. Some individual bees have been found to contain over 100 million spores, but that is considered extreme. I congratulate you on taking the initiative to get a microscope and learn how to perform the test. Most beekeepers don't own one, or are not comfortable using one. I have often thought this could be a good project for a beekeeping association, with the group buying the equipment, and several members learning how to do the testing and either training others or performing tests for them. Those without such resources can send samples to state bee labs, or to the USDA bee lab in Beltsville, Maryland, for testing. Your spore count of around two million per bee indicates a moderate level of infection, and could be related to your supersedure problem. Evidence suggests that infected queens, those not succumbing to *N. ceranae*, may still suffer impaired function.

When we first became aware of *N. ceranae*, it was felt that the antibiotic fumagillin, then used for the control of *N. apis*, could successfully be used to control both varieties. Many experts even recommended prophylactic treatments, in other words, routinely using fumagillin to prevent Nosema without regular testing to determine whether or not it was present. This has now changed. Recent research at the University of Illinois indicates that fumagillin may not be effective in controlling *N. ceranae*, and may even further damage the health of the colony. At this time, researchers in Canada still find it to effective there, and recommend treating with it. Here in the U.S., many commercial beekeepers use it regularly and believe that it helps. Others, like you, have tried it without positive result.

My recommendations to beekeepers is to test - either by doing it themselves, or by sending a sample to a bee lab. Do not treat prophylacticly. When collecting bees for samples, it's best to take them from the entrance where older, more severely infected bees are most likely to be found. Include some crawling bees if you see any. If the test reveals high nosema spore counts, consult about treatment with the experts at the lab doing the testing. I'm not trying to dodge the question of treatment, but I hesitate to give general advice on fumagillin. Seven or eight years is only a blink of an eye in terms of research on a new disease. Studies are being carried out constantly, and many pose as many questions as they answer. If fumagillin doesn't seem to be working for you, then it's not working for you. In the absence of any other registered treatment, there are a few things you can do. Keep a close watch on the health of your hives. Help them nutritionally by feeding sugar syrup and protein supplements when their stores are low. Monitor and treat for mites if necessary; any colony is more susceptible to Nosema when it is already weakened by another parasite. Pay special attention to the presence and productivity of your queens. There is some evidence that frequent re-queening can be helpful in reducing or containing Nosema levels. Also, keep reading these pages and others. A lot of good minds are at work on the problem, so try to stay informed of developments. BC

Sustainable Apiary Breeding

To maintain a sustainable apiary the beekeeper must be well trained, the colonies must be on a management plan of continuous renewal and rebuilding, and the beekeeper must adapt a program of bringing in mite and disease tolerant stock.

Larry **Connor**

One hopes that there is general agreement that the concept of sustainable beekeeping incorporates the minimum use of chemicals in and around bee colonies. As beekeepers attempt to set up and maintain a sustainable apiary, they will want it to employ as few miticides, insecticides and antibiotics as possible, using the framework of integrated pest management (IPM). There are a few critics of the sustainable concept that argue that going pesticide- and drug-free means that the beekeeper is simply condemning her or his colonies to death. I disagree. The entire concept of a sustainable beekeeping operation is to keep the bees alive and healthy.

To maintain a sustainable apiary, several factors need to be in alignment. First, the beekeeper must be well trained and mentored in concepts slightly beyond the beginner stage. This will ensure the knowledge base considered necessary to keep the entire operation going successfully. Second, the colonies must be on a management plan of continuous renewal and rebuilding, either through an intensive program of making increase nuclei or using systems like the Doolittle Increase method we have discussed in other articles (July 2014, *American Bee Journal* and *Increase Essentials* Second Edition) as a means of making new colonies within the apiary location, and eliminating the need to move bees to a distant location. Third, the beekeeper must adapt a program of bringing in mite and disease tolerant or resistant stock into the apiary, and making every effort to keep these stocks present and full functioning.

Keeping an apiary up and running will depend upon the constant replacement of lost colonies – from Winter starvation, requeening and supersedure failure or part of a constant culling and removal of poor performing colonies – by the rebuilding of colonies and having desired queens on hand at all times to form a system of maintaining backup nuclei.

Here is where I part ways with a few beekeepers who preach about sustainable beekeeping requiring minimum beekeeper involvement and a hands-off approach to apiary management. For a successful sustainable operation to exist, the beekeeper must be proactive as well as fully able to recognize problems and deal with them when first noticed. For example, a beekeeper may find a colony that clearly is in trouble due to routine events that happen to bee colonies, like drone-laying worker bees. Once this is discovered, it should be dealt with quickly and effectively. Either combine the bees with another colony or combine the hive with nucleus with a strong, vigorous queen from a mite-tolerant stock that you have prepared for such an event. Instead of lamenting the loss of the colony, adapt a plan and follow it through. This is the key to long-term sustainable beekeeping using good practices of animal husbandry.

Sustainable Breeding

There are bee stocks available that do not require mite controls. I recently had and email exchange with Dr. John Harbo about the *Varroa* Sensitive Hygienic (VSH) stock he produces in Baton Rouge, LA. Harbo is retired from a life-time career with USDA in bee breeding. He and his wife Carol run the Harbo Bee Company. Here is what he wrote:

Dear Larry,

As you probably know, we can breed the VSH trait into any stock. Except for the expression of the VSH trait, my stocks of bees are genetically variable. I like to keep them that way to avoid inbreeding. Some colonies with 100% of the VSH alleles look very good and some do not, so we still need to cull some of the breeder queens that we produce. VSH queens that are free-mated to unselected drones usually produce more productive colonies (while retaining an adequate level of resistance that is sometimes equal to that of colonies known to have all of the VSH alleles). Therefore, a beekeeper can get adequate mite resistance without having 100% of the VSH alleles in each of his colonies. Because of this additive affect of the VSH alleles, a beekeeper can get mite resistance without using controlled mating and without discarding his existing bee population. Therefore, beekeepers are able to retain many of the beekeeping qualities that may be adaptive to his area, and our national bee population retains its genetic diversity.

You asked about improvements or modifications that I have made in the past seven years. The VSH trait has not changed. However, I have learned that one can produce colonies with 100% of the VSH trait that are very good colonies, but I haven't been able to completely avoid the poor ones. This shows that the VSH trait is not necessarily linked with susceptibility to EFB or poor brood production. Secondly, I have defined the VSH trait as two measurable components: (1) VSH hygienic behavior; the removal of mite infested cells, and (2) non removal of infested cells if the mite has not laid eggs. Because VSH hygienic behavior is only expressed on cells that are aged four to six days post capping, I evaluate cells that are aged at least seven days post capping. By comparing the number of infested cells with reproductive vs. non reproductive cells in worker

brood, one can estimate the level of VSH that is expressed by the worker bees. Not counting the time required to collect a frame of capped brood, a VSH evaluation takes about 20 minutes.

Best regards,
John
John Harbo
http://www.harbobeeco.com

Looking at Harbo's website, we read this:

The objective of our company is to perfect *Varroa* Sensitive Hygiene (**VSH trait**) of the honey bee through selective breeding. This mite-resistant trait has proven to be desirable in every way *except* that full expression of the trait (VSH x VSH) often was accompanied by poor brood production. At Harbo Bee Company this problem has been solved through selective breeding. Our artificially inseminated VSH x VSH queens produce colonies with excellent brood and honey production.

I want to discuss two concepts Harbo has included in these quotes:

Because of this additive affect of the VSH alleles, a beekeeper can get mite resistance without using controlled mating and without discarding his existing bee population.

This seems to be a key feature of establishing a sustainable apiary. If we are able to obtain VSH breeder stock (aka grafting mothers) from Harbo and other like-minded breeders, we will be able to graft daughters to mate with our local drone population (remember, we are talking about all the drones in a several mile radius around your apiary). Genes the drones have that contribute to mite tolerance, and any other characteristic of this nature, will be ADDED to the genes of the VSH stock. It would be the goal of every sustainable apiary operator to seek to saturate the area around the apiary with colonies that produce these queens. More on that in a minute.

Second, Harbo states:

Our artificially inseminated VSH x VSH queens produce colonies with excellent brood and honey production.

Every bee breeding program has critics, and the VSH stock has been criticized for several weaknesses.

John and Carol Harbo in their apiary in Baton Rouge.

It appears that Harbo has been working on this since his retirement from USDA to correct some deficiencies. Likewise, I hear criticisms of Russian, Minnesota Hygienic and other queen families.

Using An Old Concept

The Starline and Midnite hybrid bees were the state of the bee breeding art from the late 1940s to the early 1980s. Developed by Dr. G.H. Bud Cale Jr of Dadant and Sons, Inc. the hybrids were based on a simple bee production and breeding scheme called the crisscross mating system. During my four-year involvement with that program, we would produce two different breeder queens for cooperators to use as grafting mothers. The first, we will call A x B, where A line virgins are instrumentally inseminated mated to B line drones. Once they were ready to be shipped, they were sent to the cooperators throughout the United States who produced tens of thousands of daughter queens to be used in mating yards and in the production of increase nuclei. As one of the wonderful benefits of the haploid-diploid genetics of the honey bee, this means that all the drones produced by these daughter queens (that were open mated with whatever drones were in the neighborhood), would still produce pure AB drones unless they had been superseded.

The second year all the colonies in the operation were producing AB drones. In that year we produced grafting mothers from two other unrelated lines, C x D. When these queens were used to produce daughters and mated to the AB drones, the resulting bee hive contained bees that were the combination of four different genetic lines: CD x AB. The next year the breeder queens went back to the original A x B breeder, and all the resulting hives were AB x CD hybrids.

Now, about 35 years later, I want to go back to this system on a community-wide basis by using two different breeder stocks in an annual rotation so that the queens in the mating area are replaced with new queens every year and will be available to produce drones the next season. Putting it into a table, it will look something like this:

Year/Grafting Stock	Grafting Mother	Drone Stock	Resulting Cross
2015	Harbo VSH	Local Stock	VSH x Local
2016	Purdue Grooming behavior stock	Harbo VSH	GB x VSH
2017	Harbo VSH	Purdue Grooming behavior stock	VSH x GB

This program will be in its third year for the grafting stock to repeat itself. I have selected the second stock to be the Purdue University Grooming Behavior stock called Mite Chewers and Ankle Biters (cute name, but mites do not have ankles). This line incorporated different behaviors of mite tolerance, and, hoping these attributes are all additive, they should provide excellent results. The resulting hives could have several features:

All the local colonies will be involved in the first cross with local drones entering into the cross. These may be evaluated and some kept aside for further evaluation.

Because young queens and drones from the same apiary are less likely to mate as an inbreeding prevention mechanism, some effort will be needed the second year

to saturate the area with the desired target drones – in this model, the VSH stock. Take a map and draw a two or three mile radius around your apiary and try to find all the beekeepers within that circle. Then offer a ripe queen cell or virgin queen from the VSH stock to all the beekeepers within that area to use to requeen their colonies. Unless you are within three miles of a large commercial beekeeper, this will provide you with an inexpensive method of obtaining some drone saturation around your area. Repeat annually with the new drone line.

Because the Harbo VSH stock is based on bees from Louisiana and elsewhere, and the Purdue stock is based on bees from around the Midwest, keep an eye on the local adaptability of the resulting hives, especially in the second and third years.

Should one of these stocks not work out (for any reason), you are free to replace the next year's grafting mother with another queen family. There are many stocks available, and I would try to obtain instrumentally inseminated breeders wherever possible in order to speed the impact of the genes on the local mating area.

Test colonies for mite levels, using a system you know you will use. If you are looking at grooming behavior, do some research on the nature of this stock, or stocks like it, and learn to test colonies for *Varroa* mite removal. Some of these mite chewers are known to chew on the small hive beetles as well. BC

The second edition of Increase Essentials *is available from your local bee supply dealer and at* ***www.wicwas.com****. Also check out the new book by G. and N. Koeniger, Jamie Ellis and Lawrence Connor on* Mating Biology of Honey bees. *Watch for the new second edition of* Queen Rearing Essentials *by Lawrence Connor.*

Highly toxic pesticides to honey bees

abamectin
acephate
avemectin
azinphos
bifenthrin
carvaryl
carbofuran
chlorpyrifos
clothiandin
cyfluthrin
cyhalothrin
cypermethrin
chlorantraniliprole
chlorethoxyfos
clofentezine

from "**PROTECTING HONEY BEES FROM PESTICIDES,**" *Christian H. Krupke, Gregory Hunt and Rick E. Foster, Extension Entomologists, 4-2012, E-53-W.*

Dead honey bees due to a tank mix of pesticides
March 2014

DOWNTOWN

Investing In Forage For The Future

Though many of us came to urban apiculture as almost a "call to arms" on behalf of pollinators in general and honey bees in particular, with Spring arriving I'd like to encourage city beekeepers nationwide to undertake a reinvigorated "call to blooms" (if you can possibly forgive that turn of phrase!) There just couldn't be(e) a better time!

Just think about it: one of the reasons we often see a double take from people when we tell them about being an urban beekeeper is simple: most folks just don't think of the city as a flowering place. Though in an earlier article or two (*Bee Culture*, October 2013) we showed that most North American cities feature adequate tree cover to support existing and additional beekeepers for quite a while, we don't think this is any time for us to (ahem) rest on our Laurels.

Reason number one: they are what they eat

Even though there's good stuff for pollinators to eat in the city, it is nonetheless completely reasonable to keep taking a look at the health and strength of the green spaces available to your bees, and to continue to improve the habitat in which we place our hives. More so than country bees, city colonies make up their diet from a wider range of smaller sources and may benefit from superior nutrition in many cases, compared to rural or suburban near monocultures. We can continue to expand the buffet on offer. The Spring (i.e. now) is absolutely the best time to make plans to boost the green cover and forage potential of your downtown landscape, and maybe to enlist many of folks who could not get into your short courses and other cool allies in the effort.

Reason number two: they aren't the only ones in town

Also, the jury is still out, among native pollinator advocates, about whether the introduction of managed bee colonies to cities does not place additional competitive pressure on feral species. In an interview with renowned native pollinator expert Sam Droege of the USGS Patuxent Research Refuge (*Bee Culture*, December 2013) of the message for a beekeeping environmentalist can be hard to hear, but with some inspiration nonetheless: "...[T]he presence of honey bees is either going to be negative or neutral for native bees, and not a positive. It could be a neutral impact, but if resources are constrained, there is competition. When there are superabundant resources, the case gets murky, especially at different times of the year." So let's work on that abundance thing.

Reason number three: most of us are already teaching about forage anyway

Almost every short course has one (or a half-) lecture, kind of close to the end, where basic information on the key contributors to the local nectar flow is presented, along with a month-by-month overview of the local blooms. If you have gardeners in your club, you may be expanding that to even more information about bee-friendly wildflowers and landscapes. Sometimes a helpful list is distributed. This is all good, but it would be even cooler to see this sharing of information turned into a call to action.

The London Beekeepers Association offers custom seed mixes to promote pollinator forage in the city. (photo by Tara Moore with permission of LBKA)

It can really help. Back in 2013, beekeepers in London (England) went public with how the amazing growth of city beekeeping might be outstripping the capability of their Plane tree-based, pollinator-

A Call To Blooms

unfriendly street plantings to support all those colonies. They made this problem known *not* to dissuade people from making room for bees in the city, but to basically make *more* room. The London Beekeepers' Association, which now has a Chief Forage Officer, Mark Patterson, in addition to the usual board members, started suggesting that people who wanted to add a hive to the cityscape needed to consider adding a chunk of pollinator friendly planting, too, and included bee forage gardening in their short course instruction along with packs of seeds and substantial planting guidance on their website (**www.lbka.org.uk/forage.html**).

This is a winning idea for all of us. When potential corporate sponsors who wanted to do something for the bees approached the association for hives, the latter were asked instead for places to plant, funds for seeds, volunteers to get those plantings done, and support for academic research into useful plant mixes, potentially usable by towns and cities to replace comparatively useless municipal displays of bedding plants and grass.

Reason four: you can box it up and take it home

Here in DC, we are working with the folks at the USDA's Peoples Garden on an idea about planting window boxes for pollinators, because almost everyone has a window, though the same approach can be used for container or "square foot" gardens of all sorts. Clearly, a single window box won't make much of a dent in the estimated 100 pounds of pollen and 500 pounds of nectar consumed by a typical colony in a year, but a few thousand of them sprinkled across a variety of urban neighborhoods can bias the habitat in a helpful direction. We talked to Sam, above, as well as other bee nutrition sources to develop some helpful guidelines in planning a pro-pollinator window box:Use "real," preferably native plants for your region. Hybridized nursery plants often have sterile or nutrient-free flowers.

- If you opt for non-natives, take a look at plants that bloom during times of dearth or stress for your bees. Anything you can do to reduce robbing and build stores is good for your neighbors.
- If you are avoiding neo-nics, you might want to start from seed.
- Use several different kinds. Bees get nectar for energy and pollen for protein from flowers, but each bloom offers only a portion of what they need.

•Use plants that bees can "see." The

Winter Project: Make Your Own Bee Hotel

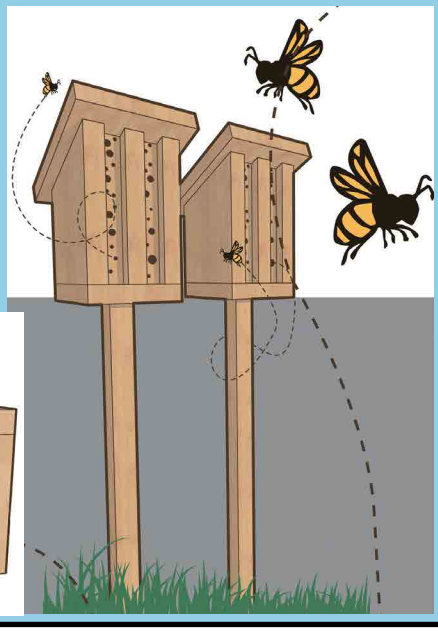
The architects at Sustainable.TO in Toronto recognized that the problem of urban sprawl could create an opportunity to build habitat for pollinators. They therefore used their design skill to come up with the concept of Bee Hotels, architecturally awesome sustainable resting and nesting space for solitary bees that ended up winning the NAPPC 2014 Advocate for Canada Award. The firm emphasizes that these species make up more than 90% of the bees we find around us in North America. Another bonus: these "resting places" for bees are not considered hives, and are therefore not regulated under strict city beekeeping rules!

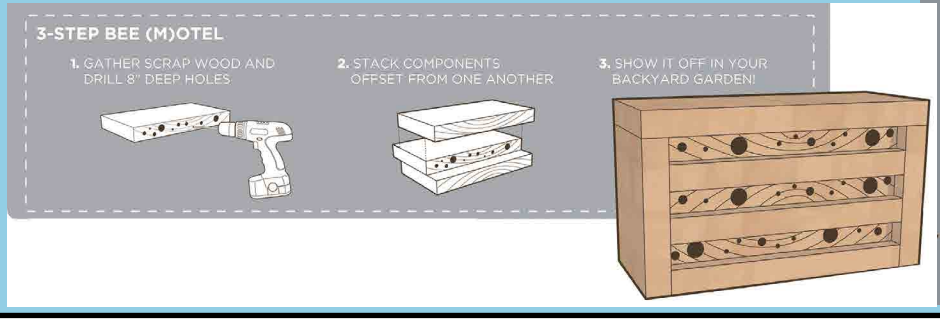
The firm designed several different kinds of bee hotels: some were "street side" models designed to be located in the soil beds around Toronto's 600,000 street trees

They also created "Park-Scale Bee Villages" for location in downtown parks. Made out of recycled wood from shipping pallets and the frames of demolished homes, the "villages" provide larger-scale multi-level habitats that can also connect with community garden and education activities in parks. In a way, the Bee Hotel that they built for the top of the Fairmont Royal York Hotel is like one of these: it has many different shelves which hold different types of nesting material attractive to different species. That gorgeous bee domicile has been visited by journalists, pollinator advocates, and even Prime Ministers!

But anyone with some backyard or balcony or roof space can consider building a basic Backyard Bee Motel! You need to start with untreated wood: scrap or recycled lumber that has not been treated for water or pest resistance should work. The Sustainable.TO design offsets each board slightly from the next level, stacking and bundling the wood and then drilling 8" deep holes randomly in the front surface (see illustration). Their design features holes of several different diameters, appropriate to the preferences of a variety of species: experts recommend a range for 2 mm to 10 mm. It is compact, attractive, and has a foot print that you can choose to suit your available space.

In most of North America, solitary bee species emerge and are active as their plant partners come into bloom. The off season is an excellent time to build habitat and to increase the variety of native pollinators sharing space with your bees!





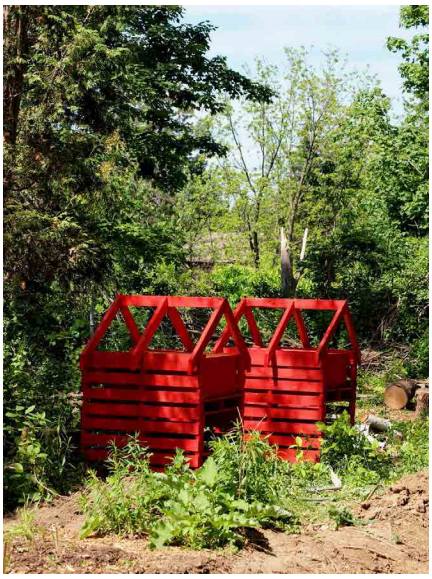
lighter the color, the easier it is for them to find. Go for white, yellow, pink, lavender, pastels, but stay away from reds and deep colors.
- Include some plants for you! Bees love many kitchen herbs that can make it into your diet as well, and these plants are often long blooming perennials: thyme, oregano, sage, chives, lavender (!!!), fennel, rosemary, and catmint.
- No flower will attract all the different bees – there are 2000 species in North America! – but each one is good for someone!

Every city is different: access regional lists of bee friendly plants **— http://www.pollinator.org/guides.htm** and there is an app!

Reason five: fun we can have with non-beekeeper friends and allies

Every year in April or May, we get phone calls from folks who are interested in learning about bees, but we have little to offer them. Our short courses take place in late Winter and are often sold out by early December. These folks are often gardeners, who got the "bug" while they were out turning over the soil for the first time this year. Enlisting them in pollinator planting, and teaching about forage for honey bees and others, gives them a handhold in our world and builds bridges way beyond the numbers of folks we can get into a hive in any season.

It's also a useful science lesson for kids of almost any age, and



appropriate for community gardens, rec centers, churches, schools, parks and many other locations in every city. The time they spend nursing up some flowers and watching avidly for a pollinator or two to come by builds advocacy and a useful basis of experience for future study of beekeeping.

Also, if you have any Master Gardener friends of bees, you may be able to work with them to create a locally appropriate pollinator seed mix: these do not have to be fancy, and they can even be a fundraiser. Consider a seed bomb building session using these materials, as well: though be careful where you throw (*Bee Culture*, October 2013).

Reason six: there may be more public opportunities soon

At the recent NAPPC conference (*Bee Culture,* January 2015), Michael Stebbins of the White House Office of Science and Technology got many of us deeply excited by the news that part of the impact of the June 20 *Presidential Memorandum on Pollinator Health* was the opening of federally managed buildings and lands to pollinator friendly planting and landscaping practices, a change which has apparently captured the imagination of involved officials across the full range of agencies and settings. As a hint of what is possible, in places like San Francisco, where the Green Landscaping Ordinance requires planted offsets and climate-appropriate plant choices, "pocket park" and screening plantings have made helpful contributions to pollinator forage (even though SF is probably heaven for bees anyway!) Though much of the 650 million acres or so managed by the government (28% of the country, according to the Congressional Research Service in 2012!) is already rural or park land, the General Services Administration owns or leases almost 10,000 buildings nationwide, a large number of these within towns and cities. These enormous resources for pollinators are coming very nearly to your back yard if we make sure this happens, and we can keep an eye out for the Pollinator Task Force report due this Spring, and to both monitor what takes place near you for its impact on your bees, or to provide feedback on what you would like to see, including possible involvement and access. The Task Force has emphasized that public-private partnerships are a key element in this work, and we need to raise our hands if we want to get in on it.

Final reason: knowing more about the world of plants and bees makes you a better beekeeper

My job as an urban beekeeper is to try to understand my bees' needs in such a way that they survive and thrive, and also that they make a net contribution to the lives going on around them–human, pollinator, plant, and more. The more you can learn about and improve the green spaces they explore, forage through, communicate about, and depend on, the more you can understand what they are up against, how these marvelous little creatures work, and what you can do on their behalf. Selfishly, some of my most-fun conversations are comparing notes with local beeks on what is blooming, what's going on with hive weight as a result, how the last season seems to be impacting this one, and how it all resulted in more or less swarming, survival, supercedure, harvest, pests, delight, you name it. When you spot a need, or even just a nice-to-have (like something that actually blooms in August around here), you can move from observing to acting on a whole new level, one with mud on your hands and some kitchen herbs outside your window! BC

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

BUILD A VINTAGE HIVE-SEAT

Peter **Sieling**

The 1901 edition of *ABC of Bee Culture* features a woodcut with the caption "How to sit on hive-cover". You might want to check it out if they didn't cover that at your Intro to Beekeeping class. Back then, the beekeepers sat on hive covers while working their bees.

The 1910 and 1920 editions of *ABC and XYZ of Bee Culture* show a photo of a hive-seat, described not just as a "great convenience" and "very handy", but as "almost indispensable" to professional apiarists of that era. A hive-seat doesn't just save your back; it contains compartments for various tools, your record book, and smoker fuel. The smoker hooks on the side. The handle on top makes it easy to tote around all day.

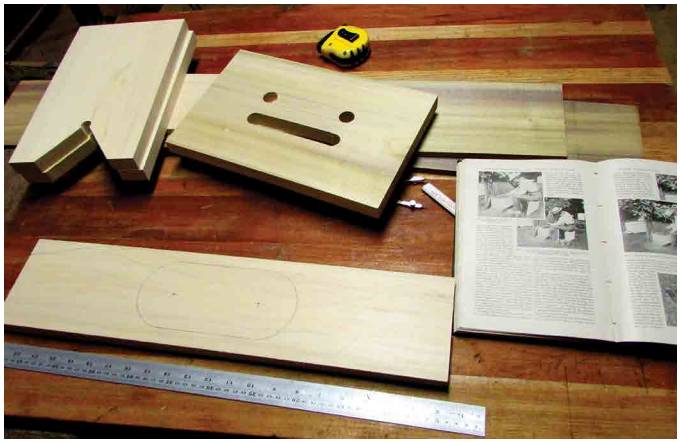
If I were designing a modern hive seat, I would include a longer compartment to fit a modern bee brush and other tools. But this old seat has a folksy, primitive furniture look. Even if I don't use it in the bee yard, it has other uses in the home, garden, or honey house. It would also make an attractive plant stand or a gift for that Special Someone's birthday.

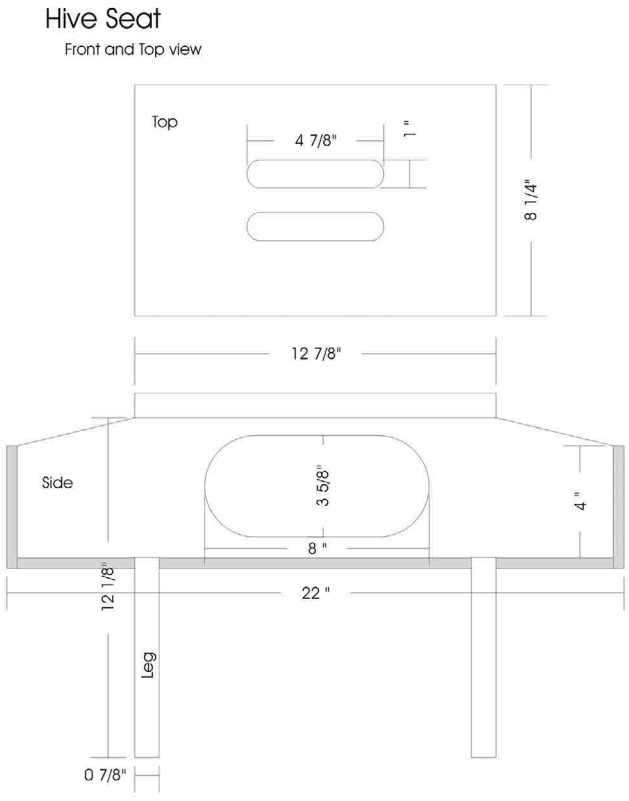
The original hive-seat measures about 22 inches long by 13 inches high. The top and legs use 7/8" thick lumber. The sides, ends and bottom are made from 3/8" thick wood. Standard 4/4 lumber, usually sawed to a plump inch, will easily plane to 7/8", but 3/4" lumber will also work. The lumber should be inexpensive, light weight, and easy to nail; species like poplar, pine, basswood, aspen, cedar, and cypress are all suitable. If you don't have easy access to lumber, I've put together a tulip poplar kit. Ordering information is at the end of the article.

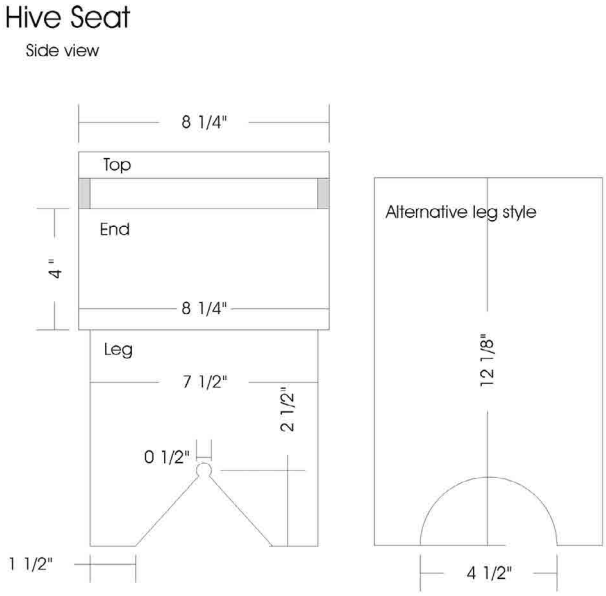
Instructions

I estimated the dimensions based on the proportions in the illustrations but they can vary to suit the builder. Some parts can be cut to their exact size. Others should be left oversize and trimmed to fit as you go. That will reduce the chance of cutting something the wrong size.

1. Surface the top and legs to 7/8", and the sides, ends, and floor to 3/8".
2. Rip the legs to 7½" wide and crosscut to 12-1/8". Two styles of feet are included in the drawing. For the V-style, drill a ½" hole in each leg, then lay out the legs and remove the waste portions with a jig saw or band saw. The half inch hole is optional. The second style is a semicircle and is cut out with a jig or band saw.
3. Cut the 3/8" sides to 21¼" long by 5" wide.
4. Crosscut the top or seat to 12-7/8". Rip to width – 8¼" should be equal to the width of the legs plus the thickness of the two sides.
5. Mark and cut out the handles in the seat. Drill the four 1" holes for the ends, then remove the waste wood with a jig saw. Round off the sharp edges with sandpaper.







6. Mark the tapers on the sides and cut with a jig or band saw. Mark and cut out the oblong hole in one side. Clean up the saw marks with sandpaper.
7. Assemble the legs, sides, and top. I used pocket screws to attach the legs to the seat so there are no visible fasteners on the top. That's partly aesthetic and partly practical; if the nails work loose, they could catch and tear trousers. If you don't have a pocket screw jig, use 2" finish nails. For attaching sides, I used 1½" staples. You can also use 1½" finish nails or the same nails you use for nailing top bars to side bars on frames.
8. Cut bottom pieces to fit. Nail in place with frame nails, staples, or brads. Cut and fasten the ends.
9. Finish any way you want or leave it unfinished. I used old fashioned milk paint, but boiled linseed oil is a traditional clear finish that beekeepers likely would have used one hundred years ago. Apply with a rag, wait five or 10 minutes to soak in. Add a second coat if desired.

That's it. Add some queen cages, a couple pens, markers, duct tape, a small pair of scissors, a bee brush, and a hive tool. Chop up the leftover scrap lumber and stuff it in the center compartment for smoker fuel. You're ready for Spring.

Materials:

Number	Description	Dimensions
1	Top	7/8" x 8 1/4" x 12 7/8"
2	Legs	7/8" x 7 1/2" x 12 1/8"
2	Sides	3/8" x 5" x 21 3/4"
1	Bottom (center)	3/8" x 11 1/8" x 8 1/4"
2	Bottom (ends)	3/8" x 4 3/16" x 8 1/4"
2	Ends	3/8" x 4 " x 8 1/4"

You can buy a hive-seat kit at **www.makingbeehives.com**. Cost is $29 plus shipping. NYS residents add 8% sales tax. If you prefer, order by phone at 607.566.8558. VISA, MasterCard, Discover, and PayPal accepted. BC

Peter Sieling sells cabinetmaking lumber and keeps bees in Bath, NY. His books are available at makingbeehives.com.

Give Bees A Chance

I dream of a world where chickens can cross the road without having their motives questioned.

A Simple Hivetop Feeder For Top-Bar Hives

Marcel **Durieux**

One of the charms of the top-bar hive (TBH) is its lack of standardization. It comes in a variety of forms, and everyone is welcome to create his or her own variant – which indeed is what many TBH builders do. But since there is no standard, it is difficult to find TBH accessories. This is particularly problematic in the area of feeders, for several reasons. First, in modern beekeeping, the feeder is really no longer an accessory: it is an essential. So you'll need one. Second, the typical feeder models used with Langstroth hives are not easily adapted to the TBH. Entrance feeders don't do well with entrances that consist of a row of holes, frame feeders don't work well if in a hive that doesn't use frames. A hivetop feeder needs the bees to be able to climb up between the top-bars, and that's exactly what we don't want in a TBH.

Most people therefore feed in-hive, with some device placed behind the colony, near the back of the hive. I myself have used entrance feeders placed inside the hive. Wyatt Mangum uses cut-off plastic trashcans, if needed strengthened by a piece of coat hanger wire. I trust this works well. In fact, I trust anything to work well that Mangum uses himself, since, with the number of TBH he manages, he certainly would not be using it otherwise. Others have created a feeding reservoir behind a divider board with an opening in the board for the bees to come through. The main problem with all these approaches is that the status of the feeder can't be checked, nor the feeder refilled, without opening the hive. Various ingenious contraptions have been suggested that can be mounted on the back or front of a TBH. Again, Wangum describes several models in his excellent book "Top-bar Hive Beekeeping"[1]. Here the problems include a fairly complicated construction, and a weight issue: if the capacity becomes too high, the feeder might tip the hive. Two gallons seems the maximum for the end, but Mangum suggests more might be possible if a feeder were mounted on the side of the hive.

Here I'd like to describe a simple modification of a Langstroth hivetop feeder that allows it to be used on top of almost any TBH, accessible by the bees and by the beekeeper without opening the hive. The idea is to remove one top-bar, one not used by the bees and somewhere near the back of the hive, and to place the bee entrance of the feeder exactly over that hole. Any exits to the side need to be sealed, so that the bees can't escape.

I use BeeMax polystyrene hivetop feeders. They're easy to handle, hold three gallons of feed and require no maintenance (don't forget to paint the outside prior to first use). But most importantly, they have their bee entrance near the end of the feeder, instead of in the center as it tends to be in many hivetop feeders. This allows me to use the last or next to last top-bar location as the feeder entrance, and this is helpful if the hive is occupied by a large colony that has taken possession of most top-bars. A feeder having its bee entrance in the center would overhang the end of the hive if I did this, and possibly tip. The modification consists of two short pieces of top-bar glued to the feeder as "seal bars" (I did say it was very simple…), one on each side of the bee entrance slit, and spaced such that the distance between their ends is the length of a top-bar. The two pieces plus the gap in between will together replace the one top-bar that will be removed from the hive.

To give some numbers: the bee entrance on a BeeMax feeder is 11.5" (29 cm) wide. I use 18" (46 cm) top-bars on my TBH, and cut top-bar pieces 3" (7.5 cm) long for making the feeder seal bars. I glue them on leaving a distance of 12" (30.5 cm) in between, which will leave the bee entrance completely uncovered, and make the distance between the ends of the pieces equal to 18" (46 cm).

The sole purpose of these pieces is act as bee seals. They are not weight bearing, and therefore do not need specifically strong glue – I just use wood glue and let it dry for 12 h before using. If a wooden feeder is used, they could be screwed or nail on. One secondary benefit of the seal bars is that when the feeder is

A BeeMax polystyrene hivetop feeder.

The bottom of the feeder, with the bee entrance, and showing the two seal bars – short pieces of wood glued next to the entrance to prevent bees from escaping once the feeder is placed on the TBH.

A feeder on a TBH.

The "topbar" on the far right is actually a divider board that closes the hive. The next "topbar" to its left is actually the seal bar glued to the feeder (made from an old topbar: note how the groove for the starter strip is pointing up instead of down). the next topbar to the left is an actual topbar. Also note the telescoping cover on the feeder, and the plastic sheeting drawn beneath it for rain protection.

taken off the hive for maintenance and put on a flat surface, the bars will keep the bee entrance lifted off the ground. This prevents bees from being crushed, and allows bees still inside the feeder to get out and return to the hive.

Before putting the feeder on the TBH, there are two more issues to deal with. First, the feeder top must be closed to prevent access by bees and other insects. The simplest solution is to get a standard Langstroth hive cover and use that. After all, that's how it is designed to be covered. However, this becomes pretty expensive pretty fast. I use very a simple home-built telescoping cover made out of painted plywood, but undoubtedly other solutions would work. Even a sheet of plastic might suffice. One possibility to consider is the placement of a small observation window in the cover, so that both the feeder content and the bees taking it can be checked without even removing the cover.

Second, the TBH cover can't be on the hive while the feeder is there, so any portions of hive not covered by the feeder need to be protected against rain. I do use plastic sheeting for this. In addition, I do put the hive roof on top of the feeder, for extra protection. But I use a very simple and light hive roof made out of corrugated plastic, and this approach may not work with some more complex roof designs.

It is of course not necessary to place the bee entrance of the feeder at the very end of the hive; it can be placed as close to the colony as one wishes, and it also can be moved when needed. However, the system will not work when bees can't leave the cluster, such as during cold spells, or for feeding after hiving a package, when the food needs to be as close to the bees as possible. In that case, some in-hive feeder will work better.

It is possible to use two feeders on a single split TBH holding two smaller colonies! BC

Two feeders on a single, divided hive. The hive contains two small colonies, separated by a divider board in the center (the darker, narrow strip of wood visible between the feeders). The feeder seal bars 9third bars in from the divider) can be recognized as they don't have starter strip grooves.

References

Mangum WA: Top-Bar Hive Beekeeping: Wisdom & Pleasure Combined. Stinging Drone Publications, Bowling Green, VA. Pages 384-390

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Speaker vs. Equipment vs. Speaker vs. Host

Ann **Harman**

Once upon a time – and not all that long ago – the speaker's life was easy. You selected your slides that covered the topic, popped them (correct way up) into a carousel and appeared at the meeting with presentation ready to show. It did not matter if you drove or flew to the meeting. In those days almost everyone owned a slide projector. After all, how else to bore friends and neighbors with photos of your latest vacation? So someone in the association had brought a slide projector and screen and your presentation was ready to show. The worst that could happen was if the bulb burned out.

Fast forward through modern technology. Presentations are now done on the computer, on a Power Point (PPT). So off you go to a meeting with your presentation on a tiny thing called a flash drive (aka thumb drive, USB stick, jump drive, memory stick). Now all you need is: a laptop, a projector, assorted cables so that laptop speaks to projector, an extension cord and a few more items. Screens went the way of the slide projectors so if the venue is not a school or college you need a wall to show your nice PPT on. You hope for a wall that isn't painted green, or dull brownish, or bright yellow. But you are stuck with what the room has.

You have been told that the room has a projector so all you need to bring is your laptop. That seems to be easy. Except after getting everything all set up your laptop does not communicate with the projector. Or your flash drive does not communicate with anything. Does anyone in the audience have a laptop? No. They just came to see your presentation and eat refreshments.

If you are fortunate and are speaking in a school or college that has computer attached to projector you will be given a handheld object with an assortment of buttons – forward, reverse, stop, start, pointer. However these do not seem to be consistent in their designs. You'll get this one figured out after six or seven slides. Sometimes it seems more effective to abandon it.

If you are driving to the meeting place you can go self-contained. Look for a cheap suitcase with many pockets. This will be your traveling presentation kit so nothing will go wrong. You'll need to buy some things that should stay in the suitcase permanently. First a long extension cord. Or two. You will have to buy your own projector. Fortunately projector prices are not as frightening as they once were and the less expensive models are actually quite good. Now you have all the cables that enable your laptop and projector to communicate. Fix a foam-padded slot for your laptop. Put a pointer in even if you have to buy another one to play with your cats. Zip the suitcase up and off you go. All you need is a socket in the room.

Oh! You are flying to the venue? Now what. The host said they had laptop, projector and everything needed for your presentation. Well, first put your PP on two different formats, one a pptx and one on ppt. Those should take care of almost any laptop/projector combination. You can take your laptop but – (see problem above). In the back of your brain is that little niggling feeling – what if. One way out, if there is enough time between the request to speak and the actual meeting, is to mail a flash drive with just your presentation PPT on it to the host and ask to see if it works. That may not be possible in some cases. Well, you tried to conquer the vagaries of modern equipment. If they won, then just give what you remember of your presentation. Just plain, spoken words do still work. A print out of your slides goes a long way in helping.

Now we turn to the association that invited you. The officers have some important responsibilities. Was the invitation issued six months ago? If you are the Program Chair a gentle reminder or definite communication several weeks before the meeting would be important. Human beings forget. Computers get fried and lose information. Keep in touch with your speaker.

The Program Chair and other club officers need to cooperate. The Treasurer knows how much the club can spend. Small clubs tend to have a small treasury. The officers should know what equipment is available for a PPT. Is a sound system necessary? In a large room it can be very tiring to keep shouting for 45 minutes to an hour. What facilities does the venue have? Are tables available for a display or demonstration? Although these seem like small details they are necessary for a happy speaker. Remember that if the speaker arrives and finds endless problems with planning, that club will never see that speaker again. And word gets around.

The person who first contacts the speaker should be able to discuss a topic for the presentation. Members of the club may have expressed a desire for information on a particular subject. Perhaps that subject is better presented combined with a workshop or open-hive demonstration. Small clubs usually have evening speakers but field days are sometimes held. To have an effective presentation

the prospective speaker should be informed about the type of meeting and what facilities are available.

Let's take a look at getting the speaker to and from the meeting. We'll start with a suitable driving distance to a local meeting. Did you give the speaker enough information? The speaker can certainly Google something like MapQuest® to get an idea of distance and time but an address of the destination is needed. Yes, today we have GPS systems that tell drivers how far, what road, turn right or left. But these two sources of information have their limits. Is one stretch of road completely clogged during rush hour? Perhaps there is a better way to avoid the stop-go of traffic. Road construction never seems to stop. Are there detours? You really do want your speaker to arrive in plenty of time – and so does the speaker.

Is there anything peculiar about the venue? Is the entrance obvious? If it is 'around the back after you pass the parked school buses' tell the speaker. If there are restricted parking areas, let the speaker know where to park. Colleges are notorious for having no-parking areas and 'guest' areas that may not have appropriate signs.

The speaker is flying in. Will someone be meeting the speaker? The time to make such arrangements is well before the meeting with a reminder close to the date. And don't forget – the speaker will be flying back home so another ride to the airport is needed. If a shuttle service is available let the speaker know. Some small airports do not have shuttles.

The speaker has a long drive – four or five hours. If the host club really wants a happy speaker the offer of a close motel for the night is definitely necessary. What about meals? Inviting the speaker to dinner with a few members of the club before the meeting is an excellent idea. The speaker can find out about the club, how experienced the members are, how many newbees usually attend – all sorts of information to make the presentation successful.

Handouts share responsibilities – speaker and host. How many people usually attend? Speakers should plan on adding 10 or more to the number given. 'Can you leave a few for those who could not attend?' That is a common request from a club. Who is going to distribute the handouts – the speaker? A club member? Or left on a table? When will handouts be given? If well before the presentation the members will read them before the speaker starts. If at the end of the meeting the members will have something to take home as a useful reminder of the topic presented. If immediately before the speaker begins the audience will be reading them and rattling papers while the speaker is talking (not a good idea).

Some clubs always have a business part of any meeting. The topics that need to be discussed are important to the activities of the club. However the officers need to plan the entire meeting beforehand. Does the speaker have a long drive home afterwards? If so, put the speaker on first to be able to leave immediately after the talk and get home at a sensible hour. Then the business part can take as long as necessary. The speaker does not need to sit through the reading of minutes, treasurer's reports, signing people up for swarm lists or helping at the fair, old business, new business, and definitely not arguments about some problem the club is having.

Yes, compensation (money!) needs to be discussed. The Program Chair and the Treasurer need to have decided what the club's treasury can afford before contacting the speaker. Can the club afford airfare, motel, meals, mileage plus a 'speaker's fee?' That speaker's fee may be an amount set by the speaker or may be what the club can afford to pay. The club should have arrived at some figures before first contacting the speaker. Otherwise the speaker is in a rather awkward position. If, as a speaker, you have a set fee you need to state that amount immediately when asked to speak. Otherwise the club is in the awkward position. If, as a speaker, you are flexible or negotiable, tell the club.

A club can do a few things – little things – that make speakers happy. Providing a glass or bottle of water at the podium is very helpful. If refreshments are served after the presentation then make certain the speaker is not swamped with people asking questions. The speaker would really like to have a piece of someone's homemade honey cake and something to drink. But the speaker is stuck at the podium with six people wanting answers. The speaker is trying to be polite so do not abandon the speaker.

Cranky computers, problematic projectors, disastrous directions, mismanaged meetings, all facing the steadfast speakers. May they always say 'yes, I'll be happy to speak.' BC

Ann Harman organizes speakers and meetings and keeps her bees from her home in Flint Hill, Virginia.

GLEANINGS

MARCH 2015 • ALL THE NEWS THAT FITS

OBITUARY

Randy (Elmer Randall) Johnson 1926 - 2015 Randy Johnson was born in Gooding, Idaho on March 27, 1926 to Edna E. (Yates) Johnson and Milton Winslow Johnson. He worked on his grandparent's farm from a young age and also sold The Saturday Evening Post on street corners to augment the family's income. During these years, he attended a one room school that was quite a distance from their home, often going by wagon or on horseback.

When Randy was 13, the family relocated to Portland, Oregon, where his father worked in the Kaiser Shipyards. He attended Jefferson High School and the Mallory Christian Church where Randy met Betty in Sunday School. He attended two terms at Oregon State University (OSU), and then joined the Navy two days before his 18th Birthday.

Randy returned from the Navy to OSU where he joined Alpha Sigma Phi fraternity, making friends whom he enjoyed for more than 60 years.

Randy and Betty were married on August 29, 1948 and settled in Corvallis where Randy graduated with a Bachelor of Science in Food Technology. He accepted a position with Libby McNeill and Libby and worked for Libby's for 23 years.

Randy resigned from Libby's in 1973 after traveling the world as VP with the International Division to purchase honey bees and establish Honeygold Corporation in Nampa Idaho. At Honeygold Randy worked for almost 40 years with a group of fine men who became friends as well. He and Betty established deep roots in Nampa, where he was President of Rotary, loved to ski at Bogus Basin, go deer hunting on horseback, and attending the Jazz Festival annually.

On Monday, February 2, 2015, Randy passed away peacefully while sitting in his recliner taking a nap with Betty sitting next to him. Randy is survived by his wife, Betty; daughter Marlene Mason and son-in-law Tim, and sons Brian and Leland; grandchildren Nels and Laura Mason, Kristina Mason and Tony Badger; and great-grandchildren Anne, Rachel, Vincent and Oliver Mason, and Jean and Kim Whipple and grandchildren Rand, Nels and Marita. Randy and Betty also have numerous "adopted" children including Tony and Linda Young and their children Terah, Tyler, Tenielle, Troy, Tristen, Tony Thomas and Tanner from Nampa. Randy is also survived by his sisters, Laura Anson of Portland and Maxine Adler of Victorville, CA and numerous Johnson and Hillyard nieces and nephews.

PURINA "BEE CHOW" SPECIALIST WANTED

Description

Purina Animal Nutrition LLC (**purinamills.com**) is a national organization serving producers, animal owners and their families through more than 4,700 local cooperatives, independent dealers and other large retailers throughout the United States. With an uncompromising commitment to animal excellence, Purina Animal Nutrition conducts industry-leading R&D initiatives that create and sustain a valued portfolio of complete feeds, supplements, premixes, ingredients and specialty technologies for the livestock and lifestyle animal markets. Species served by Purina Animal Nutrition include both large and small animals, including cattle, horses, swine, chickens, hamsters, gerbils and rabbits. Headquartered in Shoreview, Minn., Purina Animal Nutrition LLC is a wholly owned subsidiary of Land O'Lakes, Inc.

Position Purpose:

We are looking for a mission driven entomologist to provide leadership for a honey bee nutritional supplement project.

Qualifications

Experience-Education (Required):

· MS or PhD in entomology or closely related field with understanding of honey bee anatomy and physiology.

Competencies-Skills (Required):

· Ability to conduct independent research leading to new products (design trials, analyze, and interpretation).

· You must be creative, work effectively in teams, and have excellent written and oral communication skills

· Competency with typical data software packages.

Experience-Education (Preferred):

· Understand issues related to the decline of honey bees and other pollinators in the U.S.

· Familiarity with animal nutrition and physiology.

Competencies-Skills (Preferred):

· Familiarity with feed formulation software.

EOE M/F/Vets/Disabled. Land O'Lakes, Inc. enforces a policy of maintaining a drug-free workforce, including pre-employment substance abuse testing.

Primary Location – U.S-Missouri-Gray Summit

Job Function – Research and Development

Organization – Feed

Job Type – Experienced

Travel – Yes, 10 % of the Time

Job Posting – Feb 9, 2015, 1:27:08 PM

Hiring Manager – Bill L Miller, BLMiller@landolakes.com

Recruiter – Abby Webber

OXALIC ACID REGISTRATION COMMENTS SOUGHT

There's great news for beekeepers with the U.S. Department of Agriculture seeking approval for the in-hive use of oxalic acid dihydrate to control *Varroa* mites.

It's a treatment long used in Europe that kills up to 97% of mites in a hive.

The government's Federal Register lists an application for Environmental Protection Agency approval for the product, long successfully used in Europe in the cattle against *Varroa*.

The notice is signed by Robert NcNally, director of the Biopesticides and Pollution Prevention Division of the Office of Pesticide Programs.

A spokeswoman at the E#PA's Office of Pesticide Programs confirmed receipt of the USDA application.

Approval of the application would give U.S. beekeepers a new weapon in their fight against *Varroa*.

European beekeepers say they successfully use vaporized oxalic acid, or a 3.2% solution of oxalic acid in sugar syrup, as a miticide against *Varroa*.

It can be used in both the liquid form and as crystals that can be evaporated by electric heater pans.

Oxalic acid had been successfully used by beekeepers in the United Kingdom for several decades to kill *Varroa* when Sussex University conducted a study to determine the effectiveness of different doses and application methods of oxalic acid on mite and bee mortality.

The experiment involved 110 hives comparing three application methods and three different doses was completed in 2014. Hives were treated in early January 2013 when they had no brood.

Oxalic acid does not kill *Varroa* in sealed cells, but rather kills mites carried on the bodies of workers and also those crawling in cells not yet capped.

The researchers determined the proportion of mites killed by washing the mites off a sample of about 300 workers bees immediately before and after 10 days of treatment with oxalic acid.

They also determined the number of bees killed at the time of treatment, together with hive mortality and strength four months later in Spring.

The university says the results came to a clear and encouraging conclusion. Application of oxalic acid via sublimation, where it is applied in its pure form by vaporizing the crystals with a special heated tool, was superior to application as a solution via either spraying or dribbling.

Sublimation gave a greater kill of *Varroa* at a lower oxalic acid level and showed no increase in bee mortality. In fact, four months after treatment, the hives treated via the sublimation had more brood than the 10 untreated colonies.

The sublimation method is quick and easy, as the hives do not need to be opened.

To confirm the results, the sublimation technique was retested a year later in broodless honey bee colonies.

"An amazing 97% of the *Varroa* were killed by using 2.25 grams of oxalic acid per hive, and colony survival three months later in spring was close to 100%," the university says.

It says beekeepers only need to carry out this treatment once a year because it reduced the number of mites so dramatically it takes them a long time to build back up again.

The Federal Register notice says the application potentially affect those involved in crop and animal production, food manufacturing and pesticide production.

Comments must be received by the EPA on or before March 6.

Oxalic acid dihydrate is a colorless, odorless, crystalline solid. It is potentially fatal if swallowed or inhaled. It can also cause discoloration, irritation and burns of the skin as well as permanent damage to the eyes.

One operating manual says all employees who handle this material should be trained to handle it safely.

"Areas in which this compound is used should be wiped down periodically so that this substance is not allowed to accumulate," it says.

In Canada, the British Columbia Ministry of Agriculture says oxalic acid dihydrate should only be applied in late Fall when the colony has no brood. Any open brood in the colony is likely to be killed by oxalic acid.

"Even though the product is not as volatile as formic acid, always wear rubber gloves and safety glasses when handling the product," it says "Avoid inhalation of vapors."

The ministry says it should be applied only once.

"Oxalic acid can be applied at cool temperatures, either through vaporization (crystals heated and converted directly into a gas vapor) or trickling an acid-sugar syrup solution onto the bees.

One European expert goes even further.

"It cannot be stressed too strongly that oxalic acid is an aggressive substance and needs to be treated with respect," he says. "Acid resistant gloves and goggles should be worn and an apron of the type used by mortuary attendants, along with wellington boots that have the tops covered by gaiters so that any falling liquid cannot fall into the boot.

"A respirator that has specialized organic acid filtering will be required in cases where the acid is sprayed or vaporized."

The EPA is also seeking comment on an application from Certis USA L.L.C. to market a product called BmJ WG with a fungicide that claims to reduce plant viral infections and Bacillus mycoides isolate. It is intended for use on almonds, citrus, cole crops, cucurbits, fruiting vegetables, grapes, legumes, lettuce, pecans, pome fruits, potatoes, spinach, and sugar beets.

To comment, go to Federal eRulemaking Portal **http://www.regulations.gov**. Follow the online instructions for submitting comments. Do not submit electronically any information you consider to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute.

Mail: OPP Docket, Environmental Protection Agency Docket Center (EPA/DC), (28221T), 1200 Pennsylvania Ave. NW., Washington, DC 20460-0001.

Hand Delivery: To make special arrangements for hand delivery or delivery of boxed information, please follow the instructions at **http://www.epa.gov/dockets/contacts.html**.

Additional instructions on commenting or visiting the docket, along with more information about dockets generally, is available at **http://www.epa.gov/dockets**.

Alan Harman

OHIO HONEY PLATE!

Beekeepers across Ohio received a wonderful gift for the holiday season.....a gift that will continue to help support beekeeping for years to come. The **Save the Honey Bee Plate** was signed into law! The plate should be available by the 2nd quarter of 2015. On December 9th, OSBA officials were asked to testify in front of the Senate Transportation Committee. OSBA Vice-President Terry LiebermanSmith and OSBA Director Alex Zomchek, along with supporters Paul Lane and his daughter Piper, Marie Crawford, and Louise Adkins arrived in Columbus to support HB 474. The Transportation Committee approved the bill and sent it to the Senate. In the Senate, it was amended (other non-controversial, non-related items were added), and HB 474 was kicked back to the House for re-approval. On the last day before the end of the session, HB 474 was approved and headed to Governor Kasich's desk for final approval….where it was signed with little delay. Thanks to Mike Dovilla (Berea) and Dorothy Pelanda (Marysville), the Joint Sponsors of our license plate, and the tireless follow-up by beekeeper Paul Lane, Ohioans can sport the Save The Honey Bee Plate on their cars starting in the 2nd quarter of 2015. This license plate will bring more public awareness about the plight of the honey bee and raise additional funds that OSBA can use to support education and beekeeping research. There will be information about how to order your own Save The Honey Bee License plate on OSBA's website soon. A special thanks to Paul Lane who guided this project from its inception.

SPIROPLASMAS? TROUBLE ALL YEAR LONG

U.S. Department of Agriculture (USDA) scientists says two pathogens causing mysterious honey bee ailments appear to, pose a threat year-round and are not, as previously thought, just a problem in the Spring.

Entomologists Ryan Schwarz and Jay Evans of the Agricultural Research Service have found that two species of bacteria, *Spiroplasma melliferum* and *S. apis*, are more common than previously thought and infect honey bees in places as diverse as Brazil and Maryland.

Both pathogens were discovered more than 30 years ago, but scientists are still unsure if they are factors in colony collapse disorder or major causes of other bee mortalities.

The two bacteria are often lumped together, since both are in the genus Spiroplasma, an intriguing class of bacteria found in some insects, ticks, and plants.

S. melliferum was discovered in the late 1970s by ARS researchers who noticed higher mortality rates in bees carrying it. French researchers discovered *S. apis* a few years later and called it "May disease," because that's the month of year when it struck.

It made bees "quiver and creep," left some unable to fly, and in that instance, cut honey production by about 25%.

Schwarz and Evans, based at the ARS Bee Research Laboratory in Beltsville, and their colleagues at the Brazilian Honey Bee Laboratory in São Paulo, analyzed the DNA of bees in Beltsville and Brazil between 2011 and 2013.

Bees were collected from 11 states in Brazil and two areas in Beltsville.

Schwarz developed genetic markers that allow researchers to distinguish *S. apis* from other bacteria in bees and the researchers used those markers and another recently developed set of *S. melliferum* markers to determine the year-round prevalence of the two pathogens.

As expected, the researchers found that both pathogens were prevalent in the spring.

But they also found that they were common at other times of the year as well and that their prevalence rates varied depending on the location.

In Beltsville, the pathogens were more prevalent in the spring, while in Brazil they were more prevalent in the fall. The results also showed that *S. melliferum* was the more prevalent of the two and that the presence of one pathogen made bees more susceptible to the other.

Schwarz says the results should help beekeepers and scientists monitor the health of honey bees by raising awareness about the year-round nature of the threat the pathogens might pose.

Equipped with the new genetic markers developed for the pathogens, scientists also will be better able to screen bee colonies for the pathogens.

Certain plants can act as bacteria-transmission sites, and bees pick up the pathogens when they feed on plant nectar, Schwarz says.

The results add to what is known about microbe transmission between plants and pollinators and should help beekeepers and scientists monitor the health of honey bees by raising awareness about the year-round nature of any threat the pathogens may pose.

Alan Harman

LEADERSHIP AWARD NOMINATIONS SOUGHT

Bayer CropScience is seeking nominations for its third annual Bee Care Community Leadership Award, which recognizes an individual's interest in and commitment to honey bees to benefit the community.

The award is part of Bayer's North American Bee Care Program, provides a $5,000 grant to the winner to be used in support of a community beekeeping project.

The winner will also receive an all-expense paid trip to a reception in Washington, D.C. during National Pollinator Week.

The criteria to be considered by a panel of four judges for the award include describing a project that leverages the power of a honey bee hive and beekeeping to benefit a community; answering a set of essay questions on the application form; and a letter of reference from an apiarist, community organization or member of a relevant organization, such as a beekeeping association.

Bayer North America Bee Care Center manager David Fischer says honey bees play an important role in supporting the food supply.

"Beekeepers not only care for these important insects, but also provide a positive influence in their communities by encouraging others to explore innovative ways to incorporate honey bee colonies in their work," he says.

The 2014 winner, Herbert Everhart of Kearneysville, West Virginia, created an initiative that is considered the first beekeeping program for veterans in the U.S. Sponsored by the West Virginia Beekeepers Association, the program was designed to educate young people and veterans on all aspects of beekeeping, including establishing hives and marketing their products.

"Since we received the award this past Summer, we have been able to expand our programs and reach even more veterans by engaging them in the pleasure and responsibilities of beekeeping," Everhart says.

"Bayer's grant allowed us to tap into the growing interest in beekeeping and help a new generation of beekeepers develop an awareness of the importance of bees and their colonies."

The 2013 winner Steve McNair of Flanagan, Illinois, is the director of development at Salem4youth, a therapeutic residential program for at-risk men ages 12-18 years old. Through beekeeping, he provided a unique skill set and approach to teaching responsibility and discipline to Salem4youth teens.

Any beekeeper or individual with a focus on honey bees may apply for the award.

Activities the beekeeper or individual may be engaged in include, but are not limited to, the use of beekeeping in therapy, such as with at-risk youth or veterans, bee care education for children or adults and community events that allow non-beekeepers to understand the inner working of a bee hive and more. Individuals interested in applying for the award can obtain an application at **www.pollinator-week.bayer.com**.

The deadline for submission is April 3, 2015.

Alan Harman

BARCODING POLLEN

Ohio State University develops a new method using DNA metabarcoding of pollen collected with a trapping device beneath beehives to identify the plants from which the pollen originated.

A research team led by Reed Johnson says the work will not only provide other researchers with a foundation for uncovering information from pollen DNA, but will also allow bees to do some environmental science fieldwork.

"Understanding honey bees' pollen preferences can provide insights to what a colony needs and help improve the quality of foraging habitats," says Chia-Hua Lin, a postdoctoral researcher in the Department of Entomology.

DNA metabarcoding is a promising alternative because it is a way to rapidly identify the genera or even species present in a mass DNA sample of multiple organisms. The technology has been gaining popularity across many fields of biology, and the Ohio team is among the first to apply it to pollen analysis.

Their new protocol is published in the journal Applications in Plant Sciences.

Doug Sponsler, a graduate student in the department, says a honey bee colony is like an army of research assistants – thousands of en- ⇨

OZ BEEKEEPER FINED FOR AFB

An Australian beekeeper was fined A$6,500 (US$5,321) of allowing his hives, infected with American Foulbrood disease, to be near healthy hives in Victoria state, an action officials say threatened the country's A$300-million (US$245.6 million) almond industry.

The unnamed 50-year-old New South Wales apiarist pleaded guilty at the Mildura Magistrates Court to four charges under the Livestock Disease Control Act 1994 involving exposure of diseased apiary materials to honey bees on two Victorian properties and failure to brand hives with a registered brand.

The maximum penalty for each of the offenses is A$8,856.60 (US$7,248).

Victoria Department of Environment and Primary Industries apiary officer Daniel Martin says department officers detected 69 diseased hives while conducting routine apiary inspections during last year's almond pollination season.

"The apiaries were owned by the man and were being presented for commercial almond pollination services," Martin says in a statement.

"The hives were infected with AFB which is a highly infectious, notifiable, bacterial brood disease that weakens and kills honey bee colonies.

"This disease is highly transmissible between beehives because diseased hives that have been weakened become susceptible to being robbed-out by bees from stronger hives. As a result, nearby healthy hives owned by other beekeepers who are providing professional paid pollination services are vulnerable to disease spread."

"Beekeepers who suspect the presence of AFB in their hives must notify the department within 12 hours.

AFB is controlled and eradicated by the containment and destruction of infected live colonies and the destruction and/or appropriate disinfection of infected hive components.

Martin says the beekeeper was also using hives not correctly marked with a department beekeeper registered brand, a legal requirement for identification and disease traceability, similar to other livestock industries such as ear tags for cattle.

He says the fine highlights the importance of biosecurity within the honey bee industry.

"Approximately 130,000 commercial hives are moved into the Riverina and Sunraysia areas (of Victoria) from as far afield as Queensland, New South Wales and South Australia during the annual Spring almond pollination," he says.

It's the largest annual movement of livestock in Australia.

"This man created a major biosecurity threat to other commercial apiarists by delivering diseased hives to two separate commercial almond orchards, posing a high risk of disease transmission to healthy hives owned by responsible commercial beekeepers," Martin says.

Alan Harman

Barcoding ... Cont. From 99

thusiastic, flying research assistants that work all day and trespass with impunity.

While foraging each day, bees are unknowingly monitoring plants in their surrounding landscapes, some hard to reach by researchers, and collecting valuable data in the form of pollen. They can also serve as bioindicators of pollution and pesticides.

Graduate student Rodney Richardson says traditional methods of analyzing pollen data under the microscope suffer from being difficult, slow, and often imprecise.

"There's a huge bottleneck in the workflow because ultimately every sample needs the undivided attention of one expert behind a microscope," Richardson says.

Metabarcoding results in higher sensitivity and resolution and identifies twice as many plant families than microscopic analysis of the same pollen samples. It lacks, however, the ability to quantitatively assess the relative proportions of each pollen type and the researchers say this will need to be addressed in future advancements.

For now, a combination of traditional microscopic analysis with DNA metabarcoding offers a deeper look into bee foraging behavior than either method alone.

For scientists, it is only the beginning of uncovering the secret life of bees. For the bees, it is only the beginning of their work as research assistants.

Alan Harman

STATS & NEONIC PESTICIDES

At first glance, data from Statistics Canada shows a growing honeybee industry.

The number of beekeepers increased to 8,777 in 2014 from 8,489 a year earlier, while the number of colonies rose to 694,217 from a year-ago 667,397.

The figures do not include Newfoundland and Labrador.

Honey production rose to 81,556.000 lbs. from 76,468,000 lbs. Its value climbed to C$201,620,000 (US$173,4 million) from C$181,283,000 (US$156 million) a year earlier/.

But Ontario Beekeepers' Association president Tibor Szabo says in a published interview the Statistics Canada numbers are deceiving.

He says because pesticides are harming the industry, beekeepers are attempting to produce more hives because they know that there will be a higher percentage of losses.

"But that's not sustainable," Szabo says.

He says the numbers in Ontario may well continue to climb as pollination demand has gone up. Eastern provinces need another 100,000 hives to maintain blueberry pollination services – they now use about 30,000 hives –and they're seeking to Ontario to provide them.

Meeting the demand in the face of declining bee populations implies making additional colonies, hence the greater numbers.

"Production is not uncomplicated," Szabo said. "Prices are most unquestionably up, but it requires extra colonies to make the similar amount of honey."

Thus, Szabo says, while the numbers are increasing, the costs of keeping more colonies and producing honey falls on the beekeeper.

"You could have to take care of three or four hives to generate the similar quantity of honey one hive (previously) produced," he says.

The Ontario government has announced plans to restrict the use of pesticides and Szabo says he hopes that after the neonics are out of the crops, beekeepers can expect a healthier crop and with significantly less of a struggle to keep higher colony numbers.

Meantime, a poll by Oraclepoll Research Ltd. shows 80% of Ontarians believe the Ontario government is on the right track with its intention to limit use of neonic pesticides. Only 12% do not agree with the action.

The poll, released by Friends of the Earth Canada, Canadian Association of Physicians for the Environment, and the Ontario Beekeepers' Association, shows support for the government's plan is strong among both rural and urban respondents, across all regions of the province.

The proposed reduction is endorsed by 85% of residents in southwestern Ontario; 81% in Toronto; 79% in the Niagara/Hamilton region; 78% in the Greater Toronto Area; 77% in Eastern Ontario; 63% in Northern Ontario; and 60% in Central Ontario.

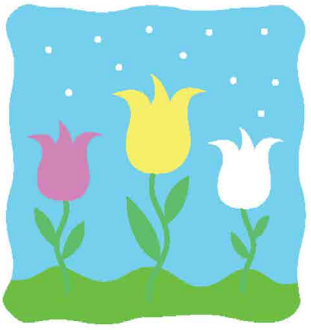
"Support for the government's plan is both broad and deep," says Friends of the Earth Canada. Chief executive Beatrice Olivastri, "The vast majority of Ontarians –from every corner of the province –think Ontario is on the right track in protecting our bees. Rarely do you see such consensus."

Support for neonic reductions is also strong across supporters of all political parties.

The poll also found 76% of Ontarians are concerned about the future of honey bees and wild bees and want the government to take action.

"Ending the overuse of neonics is the right thing to do and we're happy Ontarians agree." Szabo says.

Alan Harman



DIET AND NUTRITION IMPACT BEES ABILITY TO RESIST

Feeding honey bees a natural diet of pollen makes them significantly more resistant to pesticides than feeding them an artificial diet/

A team at Penn State University's Center for Pollinator Research also finds that pesticide exposure causes changes in expression of genes that are sensitive to diet and nutrition.

"Honey bees are exposed to hundreds of pesticides, while they are foraging on flowers and also when beekeepers apply chemicals to control bee pests," says Christina Grozinger, professor of entomology and director of the center.

"Our study demonstrates that exposure to non-lethal doses of at least two of these pesticides causes large changes in the expression of genes involved in detoxification, immunity and nutrition-sensing. This is consistent with results from previous studies that have found that pesticide exposure compromises bees' immune systems. Furthermore, our study reveals a strong link, at the molecular level, between nutrition, diet and pesticide exposure."

Exploring this link further, the researchers report in the Journal of Insect Physiology that they found that diet significantly impacts how long bees can survive when given lethal doses of a pesticide.

The USDA's-Agriculture and Food Research Initiative funded the research.

"This interaction between pesticide exposure and nutrition is likely what's at play in our finding that feeding bees a complex diet of pollen – their natural diet – makes them significantly more resistant to lethal doses of a pesticide than feeding them a more simple, artificial diet," says Daniel Schmehl, a postdoctoral researcher at the University of Florida.

To determine the impact of pesticide exposure on gene expression patterns in honey bees, the scientists first fed one of two miticides – coumaphos or fluvalinate, the two most abundant and frequently detected pesticides in the hive – to bees for seven days.

On the seventh day, the researchers extracted RNA from the bees, attached a fluorescent marker to the RNA and examined differences in gene expression patterns – indicated by changes in patterns of fluorescence – between the pesticide-treated bees and the control bees.

"We found significant changes in 1,118 transcripts, or pieces of RNA, among the bees that were fed either of the two miticides compared to the control group," Schmehl says. "These transcripts included genes involved in detoxification, immunity and nutrition."

Based on the results, the team performed several subsequent analyses aimed at understanding the impact of pesticides on honey bee physiology. One of these examined the susceptibility of bees to pesticide stress after consuming a pollen diet or an artificial diet, either a soy protein or no protein diet.

The team fed the bees these diets while simultaneously feeding them a lethal dose of the pesticide chlorpyrifos, an insecticide that is frequently used to control pests in agricultural crops and commonly detected in honey bee hives. They then recorded bee mortality daily for each of the treatment groups for 16 days.

The researchers also report the bees that were fed a pollen-based diet exhibited reduced sensitivity to chlorpyrifos compared to the bees that were fed an artificial diet.

"This is the first time such a strong link between pesticide exposure and diet has been demonstrated at the molecular level, and the first time the effects of artificial versus natural diets have been explored in terms of resistance to pesticides," Grozinger says.

"Diet and nutrition can greatly impact the ability of bees to resist pesticides, and likely other stressors. However, agriculture and urbanization have reduced the amounts and diversity of flowering plants available to bees, which likely nutritionally stresses them and makes them more sensitive to these other stressors.

"If we can figure out which diets and which flowering plants are nutritionally optimal for honey bees, we can help bees help themselves."

Alan Harman

HONEY BEE VIRUSES A THREAT TO WILD POLLINATORS

Viruses carried by commercial bees can jump to wild pollinator populations with potentially devastating effects and UK researchers are calling for new measures to be introduced that will prevent the introduction of diseased pollinators into natural environments.

Researchers at the University of Exeter says commercial species of honey bee and bumble bee are typically used to pollinate crops such as tomatoes, sweet peppers and oilseed rape.

Fast evolving viruses carried by these managed populations have the potential to decimate wild pollinator species, including bees, hoverflies and butterflies, placing biodiversity and food security at risk.

The global value of insect pollinators has been estimated to be about €153 billion a year.

"Our study highlights the importance of preventing the release of diseased commercial pollinators into the wild," university researcher Lena Wilfert says.

"The diseases carried by commercial species affect a wide range of wild pollinators but their spread can be avoided by improved monitoring and management practices," Wilfert says. "Commercial honey bee keepers have a responsibility to protect ecologically and economically important wild pollinator communities from disease."

The researchers say in a report published in the Journal of Applied Ecology that they reviewed existing studies to determine the potential for disease emergence within wild pollinator communities based on known honey bee viruses.

They say the main culprit of disease-related losses from commercial honeybee colonies is the *Varroa* mite, which helps spread viral diseases and may increase their virulence.

One of these viruses – the Deformed Wing Virus – has recently been identified as an emerging disease in pollinators and its prevalence in commercial honeybees has been linked to its existence in wild bumblebees.

The social behavior of honeybees, bumblebees and social wasps, provides perfect conditions for disease transmission both within the colony and between different species, the researchers say.

The risk of disease transmission can be further increased through poor management of commercial species including international transportation of bees without appropriate checks, intensive breeding, poor pathogen screening, and the release of commercial bees into the environment to interact freely with wild pollinators.

The University of Exeter researchers now will investigate which commercial species is driving disease transmission. They will also monitor the effectiveness of existing conservation schemes to determine their success in protecting wild pollinator populations.

The study was funded by the Royal Society and the Natural Environment Research Council.

Alan Harman

BEEKEEPERS WANT FORTRESS

The new Newfoundland and Labrador Beekeeping Assn is asking the public to help it protect the Canadian island province's unique bee population, arguing that foreign bees and seeds from other parts of the world could harm local bees.

Newfoundland's bee population has not yet been infected by mites and illnesses that have been a blight on bees around the world.

"It's the last place on earth that hasn't been touched," association president Dan Price tells the Canadian Broadcasting Corp.

Price says provincial legislation protects local bees by banning the importation of bees from other parts of Canada or the world but fears new beekeepers might make mistakes.

"Don't bring used beekeeping equipment or, live bees into the province," Price says.

He says gardeners may also be unknowingly putting bees at risk.

"Like ordering gardening seeds from a catalog, knowing that a lot of these seeds are treated with neonicotinoids and poisons that, that can kill or harm our native bees," Price says.

"They need to get in the game and know that backyard beekeeping and urban beekeeping are established across North America and around the world in high density areas.

"People don't have to fear bees or beekeeping. The Newfoundland bee is one of the most easy-going and gentle bees around."

Alan Harman

CALENDAR

♦ALABAMA♦

South Alabama Beekeepers Association will hold their workshop and field day March 21 at Auburn University Gulf Coast Research and Extension Center, 8300 State Hwy. 104, Fairhope, 36532.

Cost is $25/person or $35/family. Pay at the door. Lunch provided.

Mail your check to Roger Bemis, P.O. Box 353, Bon Secour, 36511. For information contact Roger, 251.213.0168 or **BemisRoger@hotmail.com**.

♦CONNECTICUT♦

Back Yard Beekeepers Association 2015 Speaker Schedule – March 31, Izzy Hill on the Bugonia Project; April 28, Dr. Diana Sammataro subject TBD; May 26, Wyatt Mangum subject TBD; June 30: Dinner Meeting; September 29, Sam Comfort subject TBD; October 27, Juliana Rangel Posada on the Reproductive Biology of Honey Bees; November 17, Michael Fairbrother of Moon Light Meadery on Mead.

Each month we have timely weekend hands on inspection workshops, bee school, mentor program and more. For dates and locations and more information please visit **www.backyardbeekeepers.com**.

♦ILLINOIS♦

The 2015 IL State Beekeepers Association Annual Summer Meeting will be held June 27 in Effingham.

For information visit **www.ilsba.com**.

♦KANSAS♦

NE KS Beekeepers Beginning Class will be held March 15 and 22 at the Douglas County Fairgrounds in Lawrence.

Clarence Collison will be the teacher on March 15.

For more information visit **www.nekba.org** or contact 913.593.3562 or **joli@heartlandhoney.com**.

Northeast Kansas Beekeepers Funday – June 6 at Douglas County Fairground, Lawrence.

Marla Spivak, Marion Ellis and Chip Taylor will be the guest speakers.

For information visit **www.nekba.org**.

KS Honey Producers will hold their Spring meeting in Manhattan March 13-14, at the Holiday Inn, 1641 Anderson Avenue. For reservations call 785.539.7531, use code khp.

For more information call Joli, 913.593.3562 or **joli@heartlandhoney.com** or visit **www.kansashoneyproducers.org**.

♦MICHIGAN♦

The MI Beekeepers' Association will celebrate their 150th Anniversary March 13-14, with their annual ANR Week Conference in E. Lansing at the Kellogg Hotel and Conference Center.

Roger Hoopingarner and Michael Bush will be the keynote speakers.

For more information visit **www.michiganbees.org** or contact Steve Tilmann 517.543.5525.

♦MONTANA♦

Master Beekeeping Certificate endorsed by MT State Beekeepers Association; The American Honey Producers Association and Project Apis m.

For more information visit **www.UMT.EDU/BEE**.

♦NEBRASKA♦

Beginning Short Course offered by Univ of NE March 7 at the Christenson Ag Research Education Bldg near Mead.

Registration is $40 and includes lunch, breaks and a workbook.

To register send a check to Jeri Cunningham, Dept. of Ent, U of NE, 103 Entomology Hall, Lincoln 68583-0816.

♦NEW YORK♦

Southern Adirondack Beekeepers Association will hold their annual seminar. Speakers include Allen Dick, meghan Milbrath and Wyatt Mangum.

For information visit **www.adirondackbees.org** or call Anne Frey 518.258.7503.

The Long Island Beekeepers Club will host Dan Conlon from Warm Color Apiaries, Deerfield, MA, March 22 at the Frank Brush Barn, 211 E. Main Street, Smithtown from 2-4p.m.

For information visit **www.longislandbeekeepers.org** or 631.265.8249.

The Champlain Valley Beekeepers will hold their annual meeting April 25, 9-3.

Guest speaker will be Tom Seeley. Bring your lunch.

For details contact Dick Crawford 518.561.7167.

♦OHIO♦

Medina County Beekeepers Association meets the third Monday of the month at the Root Candle Company in Medina, OH. The meeting starts at 7:00 p.m.

March - Reed Johnson
April - Larry Connor
May - Jim Thompson
June - Field Day
September - Phil Craft
October - Dave Duncan and Ellen Harnish

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

Medina County Beekeepers Association will hold Beginning Beekeeper Classes starting in February for three consecutive Saturdays or six consecutive Tuesday evenings. Kim Flottum, editor of *Bee Culture* will be the instructor.

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

Geauga County Beekeeping Association will hold a beginning beekeeping workshop April 22, 7-9 p.m. at Kenston Middle School, Art Room 231, 17425 Snyder Road, Chagrin Falls. The instructor will be Dale Olson.

For more information visit **www.kenstoncommunityed.org or call 440.543.2552**.

Knox County Beekeepers Classes will be held March 14, Advanced at the Apostolic Church, west of Mount Vernon. Registration date by February 28. The cost is $40. Make checks payable and mail to Knox County Beekeepers, John Schmidt, 3270 Curve Road, Delaware, OH 43015.

Questions call Jeff Gabric 515.450.1359.

Tri-County Beekeepers Association Annual Meeting will be held March 6-7.

Speakers include Larry Connor, John George, John Grafton, Tammy Horn, Reed Johnson and more.

For information contact Randy Westfall, 330.801.1309.

Lorain County Beekeepers Association will hold beginners classes four Fridays beginning March 6 at 7:00 p.m. at First Church, 106 North Main, Oberlin.

For more information visit **www.loraincountybeekeepers.org**.

♦OKLAHOMA♦

NEOBA's Big Buzz will occur in Tulsa March 27-28 at Eastside Christian Church, 1438 S. Indianapolis.

Speaker include Jeff Harris, Stephen Repasky, Ed Levi and Leo Sharashkin. The cost is $35. Meals included.

Register and obtain more information at **www.NEOBA.org**.

♦PENNSYLVANIA♦

Chester County Beekeepers Association will hold their annual conference March 14 at The Merion Science Center at West Chester University.

Speakers will be Tom Seeley, Michael Palmer and Dewey Caron. The cost is $60 which includes lunch. To register send check to Bob Haniwalt, 214 S. Walnut Street, West Chester 19382-3462 or go to **www.ChescoBees.org**.

The Capital Area Beekeepers' Association will hold their 28th Annual Short Course May 2 and 9. The first class will be at the Dauphin County Agriculture & Natural Resources Center, 1451 Peters Mt. Road, Dauphin 17018 at 8:00 a.m. The second class start at noon at Dave Anderson's Apiary, 7081 A Colebrook Road, Palmyra 17078.

The cost is $40 which includes CABA membership.

For more information contact John Novinger, 717.365.3215 or **jdnovinger@epix.net**.

♦TENNESSEE♦

Adventures In Agriculture will held April 11, 10:00 a.m. to 2:00 p.m. and Lane Agri-Park, 315 John R. Rice Blvd., Murfreesboro.

It is free and open to the public.

For more information contact Charlotte Peay, peaybrain14@gmail.com or 615.896.0737.

♦VERMONT♦

Organic Beekeeping For Beginners will be held May 10-11 or May 17-18 at Metta Earth Institute Center For Contemplative Ecology, 334 Geary Road South, Lincoln. To register call 802.349.4279.

The cost is $110/person which includes *Natural Beekeeping* book. Ross Conrad will be the speaker.

Advanced Organic Beekeeping will be held May 24 at Metta Earth Institute Center For Contemplative Ecology, 334 Geary Road South, Lincoln. To register call 802.349.4279.

The cost is $50/person. Ross Conrad will be the speaker.

♦VIRGINIA♦

Mid-Atlantic Organic Honey Bee Convention will be held March 28 at 4500 Kensington Ave., Richmond.

Speakers include Sam Comfort, Wyatt Mangum, Keith Tignor and John Adams. $50/person, $90/family.

For information visit **www.maohbc.com**.

♦WISCONSIN♦

Beginners Classes March 28, April 11 and May 2 at Dane County UW Ext Bldg., 5201 Fen Oak Dr., Madison.

2nd Step Class will be March 21.

For more information contact Jeanne Hansen, 608.244.5094 or **jeannieralabeannie@yahoo.com**.

♦WYOMING♦

The Laramie County Extension Office will host Wyoming Bee College at Laramie County Community College, Cheyenne March 21-22.

Speakers include Glen Anderson, William Meikle, Rnada Jabbour, and Ronald Fessenden. The cost is $65.

For information contact Catherine at **cwissner@uwyo.edu**.

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Ski patrolling on Aspen Mountain remains a dream job, especially for someone half my age. I'm not the only veteran. We talk about retiring before we're too busted up to take a fun run with our lifetime ski passes. I could swing it, I guess, but I take patrolling day by day, season by season. We have a union, and the company treats us right.

Lyle tempts me. "You should come out to California for the almonds. You've never seen anything like it," he drawls. Ah, a beekeeper's dream – springtime in California, for the Big Show.

I'm not a bucket list guy, but there are loose ends to tie up. I don't want to drop dead on the job. There'd be all that messy CPR, and they'd have to take me down in a toboggan. The beeyard would be so much better. I'm fortunate to have reached the Autumn of my life. Now it's time to take stock.

We're enjoying a Colorado January thaw, and I used this opportunity to dribble oxalic acid onto 25 brood-less colonies, for *Varroa* mite control. Last November when I sugar-shake tested these hives, they all tested at five or fewer mites per 300-bee sample. These are not alarming mite counts. I could wait until they were brood-free to treat.

They looked OK and still reared brood when I fed them in balmy early December. Now they don't look so great. On January 6, they ranged from two to 10 frames of bees per hive, the average being four or five. I wonder how many of these colonies will make it to April.

From October until now, the weather see-sawed from unseasonably warm to bitter cold. I had a pathetic 2014 honey yield, and most of these colonies never plugged their brood supers. Then after the honey flow they ate their winter stores like there was no tomorrow. I repeatedly fed them sugar syrup, and I open-fed dry pollen supplement for good measure. But I'm concerned that all this pampering threw off their timing. Maybe the little darlings never realized it was fall, time to hunker down and raise long-lived "fat bees" to carry the hive through until Spring. Or maybe they have Nosema.

It's possible I did everything 180° wrong. It wouldn't be the first time.

It's weird, but hives that load up the brood supers with honey seem set for the Winter. If a colony is dead-heavy in September, it's got enough. But a light hive in September eats through its puny stores, and when you feed 2:1 sugar syrup, it's like the more you give them, the more they eat. I eventually got the upper hand, but maybe this is God's way of telling us that bees should eat honey, not sugar water.

Then there are my sick hives. I put six in a mini "hospital" yard, not far from a healthy apiary. I knocked out their American Foul Brood (AFB) with Tylan in the Fall. If I can just get them through the Winter, I can re-queen them and put them on foundation come Spring. But they dwindled through Autumn, and I started combining colonies. When I opened the three remaining hives in January to dribble oxalic acid, they looked pathetic. One still reeked of AFB. If my healthy bees start robbing these weak AFB hives, maybe I'm in trouble.

I had 120 hives last Spring, including nucs I used for re-queening. Now I'm down to 83. This even before I count my Winter losses! Where did they all go? They never really got on a honey flow. They got sick. They dwindled. They got united with other hives. Queens failed. Death from a thousand cuts.

Despite the much ballyhooed pesticide disasters and "unsustainable" hype, in my limited experience, the best thing I can do for my bees – and for myself – is send them to California for the Winter. The 40 strong colonies I shipped for the 2014 almonds came back full of brood and honey, ready to be split. They had a few mites. So what? Bees that overwinter here in Colorado struggle. They should bounce back with the dandelions, or when I haul them to Grand Junction for the fruit bloom, but how are they going to build up in a snowstorm? It's always something.

I sent 40 again this Fall. Paul ships in November before it gets too cold, and I put them on one of his loads. I could have sent more. Paul's rule is ten frames of bees for California. I had the bees, but not the time to get the little darlings mite-treated, fed, and forklift-ready on four-way pallets. Between my Summer Aspen Mountain job, vacation, a bee talk in Ohio, vagaries of the weather, and return to work on the patrol, I got squeezed.

Vacation, you say, when there's so much to do? Look, I need to keep my gal Marilyn happy. When we went to the Apimondia bee conference in Ukraine in 2013, we befriended two women who convinced her that she needs her own hive. Why? She can always come with me. She drives a bus, writes a newspaper column, plays the pesky reporter at Army chemical weapons disaster drills, ditch-rides on her mountain bike, gardens, cooks, remodels her century-old house in town. Isn't that enough? Why pit beginner's luck against a hive of honey bees?

She wants one of mine, and you know I'll cave. I know a thing or two. I know I need to keep her happy.

Ed **Colby**

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