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Sep 2011
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A Taste Of Honey
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John Piechowski works a pallet, equalizing and checking, in one of his 40-50 beeyards near Redgranite, WI. Visit John and his son, Dan at Henry's Honey Farm on page 60.

Publisher – John Root
Editor – Kim Flottum, Ext. 3214, Kim@BeeCulture.com
Production Coordinator – Kathy Summers, Ext. 3215, Kathy@BeeCulture.com
Circulation & Advertising – Dawn Feagan, Ext. 3220, Dawn@BeeCulture.com
800.289.7668 • www.BeeCulture.com

Contributors
Clarence Collison • James E. Tew • Ann Harman • Kim Lehman
Steve Sheppard • Larry Connor • Connie Krochmal
Jennifer Berry • Ross Conrad • Audrey Sheridan

Subscription Information
U.S., one year, $25; two years, $48. Newsstand price: $4.99. All other countries, (U.S. Currency only), $15.00 per year additional for postage. Digital Edition $15. Send remittance by money order, bank draft, express money order, or check or credit card. Bee Culture (ISSN 1071-3190), September 2011, Volume 139, Issue 9, is published monthly by The A.I. Root Co., 623 W. Liberty Street, Medina, OH 44256. Periodicals Postage Paid at Medina, OH and additional mailing offices.

Subscriptions, Book Orders
V800.289.7668 • V330.725.6677, Ext. 3220 • F330.725.5624
www.BeeCulture.com; email: info@BeeCulture.com

Advertising
Contact Dawn Feagan
800.289.7668, Ext. 3220; Dawn@BeeCulture.com

POSTMASTER: Send address changes to
BEE CULTURE, The A.I. Root Co.,
623 W. Liberty St., Medina, OH 44256

Bee Culture

FEATURES . . .

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Finally A Beekeeper

I would like to take the time to compliment you on your fine magazine. I really do enjoy all the articles and input from other readers. I am going into my third year with my honey bees. I waited for years to be able to get started with them.

I grew up on a dairy farm and always enjoyed watching the honey bees in the fields as a child. I also had a farm when I grew up but was unable to have bees due to two of my three daughters being allergic to any bee stings (wasps, etc.). Now that they are on their own I have been able to have my honey bees and enjoy them.

I've been lucky enough to have a mentor who lives just up the road. You can't imagine how excited I was when I ordered my first hive and package of bees. There is still so much to learn and nothing is written in stone once you get started. Enjoying the honey is quite an experience.

Thanks for a great magazine and keep up the good work. I look forward to it each month.

Roberta Thirsk
Adell, WI

Hard Places & Rocks

I enjoyed the July *Inner Cover*. If I had the power I would put Hard Places and Rocks on the front page of every newspaper in America.

Ron

Backyard Beekeeper

My three-year-old daughter has expressed an interest in bees for a while now, and I have dutifully brought her to all the bee exhibitions in our area. We attended our local screening of Vanishing of the Bees in May where we purchased two raffle tickets to donate to our local sustainable project holding the screening. This inadvertently won us our new beehive and a bag of "bee goodies." I was very overwhelmed with our new luck? . . . and my daughter elated . . . in the "bee goodie" bag was your book. I set about reading the *Backyard Beekeeper* that night and couldn't put it down. What an informative, well planned, thought out, concise yet interesting book. Thank you from the bottom of my heart! You have given me hope that with much effort this can be achievable and fun in the process.

You are definitely growing the next generation of beekeepers by authoring such a wonderfully informative yet digestible book for moms who don't know where to begin. Again thank you so much for this resource! As we progress I have a feeling all your books will be housed in our household library.

Alison Edgerly

Save The Bees

Apiculture is a traditional agricultural activity in Slovenia. Anton Janša (1734-1773), the first apiculture teacher in imperial Vienna, brought the knowledge of the Slovenian rural beekeeper to the world more than 230 years ago. One hundred years later the region became renowned for its bee *Apis mellifera carnica* which soon became famous throughout the world.

Bees have remained uniformly populated throughout the territory of Slovenia, thereby contributing to maintaining the balance of nature. By pollinating indigenous and cultivated plants, bees contribute the most to food production by far. The international expert public assesses pollination as having a 10- to 20-times greater economic significance than the direct economic significance of apiculture products.

Bees are not only important as pollinators in agriculture, for through pollination they also significantly contribute to the extraordinary biological diversity in our country, which Slovenian experts rank as one of the most naturally rich regions in Europe. Today the conditions for apiculture have changed: presence of *Varroa* mites in bee colonies, intensive agriculture and the use of phytopharmaceutical preparations, climatic changes and environmental pollution, all of which has resulted in apiculture becoming an increasingly endangered industry. **To avoid the catastrophic effects of the deterioration of bee colonies, the Beekeeping Association of Slovenia has launched the large Save the Bees campaign**. The purpose of the campaign is to declare bees as an endangered animal species, inform the public of the importance of bees, emphasise the need for educating and training young beekeepers, increase bee pastures through the planting of bee plants and trees, increase the number of studies on bee maintenance, eliminate and decrease the detrimental effects of using phyto-pharmaceutical substances, increase the concern for a clean environment and clean water, encourage a nature-friendly economy, etc.

We collected 30,000 signatures in 2010 with the Save the Bees Petition, asking the competent institutions to adopt suitable legal solutions in line with the specified demands.

The Beekeeping Association of Slovenia carries out numerous activities within the scope of the Save the Bees project. We call on Slovenian municipalities to only plant indigenous medicinal plants in public spaces such as parks and lawns, inform people of the importance of bees through educational and promotional materials, proclaim municipalities and companies whose activities are environmentally-friendly as bee-friendly, cooperate with the association Eco Slovenia and collect donations within the fund for preserving Car-

Continued on Page 9

niolian honey bees in order to build didactical apiaries in the adjacent surroundings of Slovenian elementary schools. We also established the Save the Bees website in a number of languages.

Our mission and objective is to inform as wide a circle of people of the significance of bees for our environment and lives. Therefore we have also prepared promotional shirts bearing the slogan: "No bees, no life," "Keep healthy through bees" and "Plant a flower for a bee." Next year end of March will be Slovenia the host of the Second International Conference of Beekeeping Organizations. This Conference will be dedicated to the preservation and planting of indigenous, melliferous, bee plants across European countries. The Beekeeping Association of Slovenia is also calling on apiculturists from other countries to join in the campaign, for we should all have the same goal, namely to SAVE THE BEES.

Additional information and promotional activities are available at the website www.ohranimo-cebele.si.

Boštjan Noè, President of the Beekeeping Association of Slovenia

City Bees In Edmonton?

The Canadian city of Edmonton is to develop a strategy supporting urban agriculture, food policy and food systems including beekeeping.

Mayor Stephen Mandel says there is a growing community and business interest in supporting local food producers and purchasing local food to support the local economy.

"We want to tap into that interest to help guide us toward building a sustainable local food system in Edmonton," Mandel said in announcing consultations at a farmer's market in the Alberta city.

The food and agriculture strategy will guide city planning and decision-making in community design and land use, economic development, waste management, transportation and parks.

It would cover a variety of including market gardening, commercial farming, community gardens, backyard gardens, edible landscaping, rooftop gardens, fish farming, raising animals and beekeeping.

City rules now ban urban beekeeping and chicken rearing.

Would-be urban farmers don't see the sense of this.

"I just don't get what they city's concern with chickens is," one told *The Edmonton Journal*. "I think they just don't have the manpower to regulate it. They should license it, charge us a fee and get on with it."

Chickens would produce fresh eggs and manure for composting, while bees would pollinate neighborhood flowers and fruit blossoms and produce honey.

The city allows cats, dogs and even pet rabbits.

City staff will compile input from Edmontonians through informal surveys and booths at Sum-

mer events, as well as preparing for a symposium in the fall that will bring together experts and advocates on the subject.

"We want to check in with interested groups and organizations on how we can address food and agriculture issues when it comes to city planning and decision-making."

"A food and agriculture strategy will give us direction about how to better integrate urban agricultural practices within the city boundaries."

The city's municipal development plan already proposes a range of possible actions the city could take as it develops the strategy.

These include supporting the establishment of a food policy council; working with the community to create a local food charter; working with the region to develop a regional food policy council and food charter; collaborating with communities, landowners and other organizations to identify potential areas and lands for urban agricultural activities; and establishing guidelines for integrating urban agriculture into public and private spaces and developments.

"It's important that we begin the dialogue so we can properly build a food and urban agriculture strategy that will increase access to food in our neighborhoods, provide opportunities to grow and process food in the city, and stimulate and diversify the local economy."

Dave Loken
Edmonton

INNER COVER

Long ago and far away I had a job at the USDA Honey Bee Research lab at the University of Wisconsin in Madison. That lasted just about four years, but I was abruptly retired when President Reagan took office and killed funding for a lot of government research projects, mine included.

With not much going on in research (see above) and other employment opportunities limited, I moved to Connecticut for a place to live and a fresh start, this time in the Horticulture industry.

After settling in and recovering from culture shock, I (at first reluctantly) began attending meetings of the Connecticut State Beekeeper's Association. It was a heavy transition time for Connecticut . . . Tracheal mites had recently arrived and were causing all manner of problems, pesticides were killing lots of bees, and beekeepers were leaving in droves. Part of the transition was that both the President and the Newsletter Editor for the State Association had left the fold, and very quickly I was both President and co-Editor of the newsletter.

There's all manner of adventures to go with what else was going on in Connecticut at the time, but for this story the next chapter is how the Connecticut beekeepers organized their Association. It seems that the President was automatically Connecticut's Representative on the Board of the Eastern Apicultural Society (EAS), a large regional beekeeping association. Two hats, one job, one price. EAS is comprised of member states each with a representative that sits on the governing Board. The states are, you guessed, all from the eastern part of the U.S. and provinces of Canada.

Since I was from the Midwest I didn't have a clue what EAS was or what they did. But I was a Director now, so I'd find out.

I attended my first Board meeting in the fall and met most of the Directors. John Root was one of them . . . I knew of John of course. Who didn't? But he was more myth than real, he was The A.I. Root Company . . . not actually a flesh and blood person. But there he was, sport coat and tie, as always.

What I found out was that EAS sponsored a once-a-year Conference that was hosted by a member state association and held at a college or university. The next meeting was to be in August the next year at a small college in Pennsylvania, and Clarence Collison, then the State Apicultural Extension Specialist at Penn State, was Program Chair.

Clarence asked if I would like to speak at the Summer conference, and if so, on what topic. My research stuff was pretty boring but the sideline work on honey plants I'd been involved in seemed OK, so we went with that. No problem.

Come August.

Back then everybody used slides, and I was prepared – what those plants were, where they grew, when they bloomed, what kind of honey, and how predictable a crop they could be – from early Spring until after first frost. I'd WOW them I thought. Little did I know.

I was scheduled to speak on the second day of the Conference in the morning. I don't recall the first speaker that day, but the second was a professor from Ohio I'd never heard of just talking about Bee Yard Adventures. I wasn't impressed.

It's right over there – Disney World! (1999)

So he begins.

He told of working hives, of heavy supers, lost and forgotten tools, smoker relighting issues, now meaningless symbols scribbled on the top of the hives from when he last visited – all the truisms all beekeepers go through, with a touch of humor and a lot of realism. He'd been there and done that. It was a pleasant, light hearted trip through beekeeping.

Then he started on the mouse.

When he moved to the next hive, he smoked it gently, lifted the cover and started to remove the top deep super, plumb full of honey. He got it off and was balancing it on his thigh, when, because of the commotion, a mouse ran out of the hive and took cover in the first dark, deep hole it could find . . . the opening in his pants leg.

This can get exciting. As the mouse moves up and away from the light the space it has to move in becomes tighter and tighter and bending over to put the super down becomes more and more difficult because your pants begin to squeeze that little mouse. But if you stand up straighter, the space between your pants and your leg becomes larger and the mouse can move even further up. You see (and can now probably feel) the problem. You can't move either way. So picture this professor standing in a bee yard, incredibly heavy super balanced on his thigh, not daring to move, with a mouse heading for . . .

By the time he was done with this adventuresome story, nobody, and I mean nobody was still sitting – they were all rolling on the floor, laughing till they cried, trying to breath and not having any success. I was one of them.

It took Clarence a bit of time to regain his composure, and that of

Jimmy

the crowd, and he introduced me. I don't think this is what he said, but I recall it was something like. And now ladies and gentlemen, here's a speaker you've never heard of, telling us something you don't want to know about.

That was my introduction to Dr. James E. Tew.

A year later I was in Medina, and it turns out that Professor from Ohio had been writing for this magazine for a couple of years already.

These were the days before email, electronic transmissions, faxes and the like, so when a deadline came, the hard copy of all our articles needed to be physically here so we could get them typed and ready. There are numerous stories of Professor Tew rushing from Wooster, about 30 miles down the road, to Medina in the wee hours of dawn to get his article here before the place opened. The office I was in then had jalousied windows, and with effort, one of the flaps could be pried open enough and the article stuffed in – so when I arrived later in the morning there would be this crumpled and disheveled article laying on the floor. Email attachments were a God-send for Professor Tew. They still are.

Early on he had a teaching load along with his Extension duties that kept him busy getting students ready to be commercial beekeepers. I still have a flyer for that course. He went through a couple of field technicians before landing Dave Heilman, who stayed on for years and years in the job, becoming Jim's right hand after not too long, and establishing a name for himself in the beekeeping world. Dave eventually moved on to other duties at the University in Wooster, but is still a beekeeper, supply dealer and mover in the local association.

Jim's Secretary, Sherry Ferrell, has been by his side the whole time, and is absolutely critical in the ongoing activities of the lab. There is no doubt that, with all the lab is involved in, Jim would not, could not function without Sherry managing the show. She is smart, organized, energetic beyond belief and married to the Top Cop on the Wooster campus . . . four very valuable assets.

There was a space of a few years when Jim took on the additional task of becoming the USDA Extension Specialist for dealing with African Honey Bees. They weren't here yet so his job was to make sure everybody, and anybody who wanted to know, knew everything there was to know about these creatures. He spent a lot of airport time during that stint, away from Wooster and his family but he easily filled a niche I think no one else at the time could have filled. When killer bees finally arrived it was a yawner in the first degree. Everybody knew what to expect, what to do, and who to call. Of course the Texas folks were in high gear already, but the rest of the country mostly slept through the event because they already knew what to expect. Beekeeping dodged a very big bullet that day because of his efforts.

Because of our magazine ties, and the fact that we live fairly close together we have engaged in a lot of projects, activities and silliness over the years, but there have been some highlights.

One of the best was when The Ohio State beekeepers hosted an EAS Conference at Wooster College. Jim and I put our heads together, along with Sherry, Dave, Kathy, Dawn and many others and we pulled it off. It was the last EAS meeting that had more than 600 people attend, so we did something right. Jim was Program Chair and he and his crew put together more outside workshops than ever before or since. And we brought in most of our writers – Dick Bonney, Richard Taylor, Ann Harman, and of course Jim. We even brought in the Editor of *The American Bee Journal!* It was spectacular.

Because of our schedules even today too often the only opportunity we have to visit in person is at a meeting some hundreds of miles from Ohio, or traveling to one together. We have spent a lot of time driving to meetings. Some of those trips have been memorable.

While driving to a meeting in Western Ohio we were so engrossed in conversation that we completely missed the town we were to go to. Suddenly, the sign said Welcome to Indiana . . . oops. In Orlando Jim rented a car at the airport and we headed for the hotel some miles away. Suddenly we were in Disney World, driving down a six lane entrance ramp headed for Mickey and Donald. We made an emergency U-Turn over the middle grass strip and headed back. Exit the entrance six-laner and back toward . . Disney world on the entrance six laner again. It was the Twilight Zone.

One of those trips was more memorable than the rest. We were traveling to Columbus to talk to the Ohio Farm Bureau when a van pulled into our lane from the left. It wasn't going very fast but we were at freeway speed in the left lane and it hit our car directly on the left front tire. Jim was driving. The collision pushed us across both lanes and far into the ditch on the right side of the road before we came to a full stop. Jim was slammed against the door, hitting his head hard on the ceiling/door edge, while his shoulder, hip and leg tried to get through the door. I was bounced around but didn't hit anything of substance, and only managed to spill my coffee. Somebody was looking out for me that day. The van and the car were total wrecks and the other driver suffered life-threatening injuries. Lots of people were there right away, ambulances were called and I rode with Jim to the nearest hospital. From there I called work, who called Sherry who called Jim's wife who hurried to the hospital. He was thoroughly examined but after

Moving forward. (2011)

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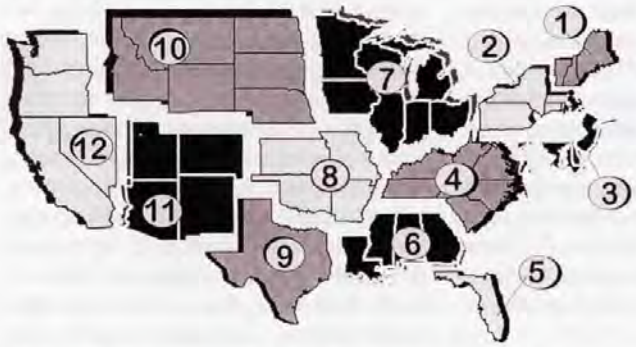
SEPTEMBER – REGIONAL HONEY PRICE REPORT



However, putting the variety of the honey seems steady in importance, so consider that. Using a second label, like one on top stating variety or local or something …either it's not an issue and isn't used, of folks haven't thought about it yet…still, we recommend using one especially if your honey is sitting on a table and difficult to see. Labels, generally, are the most important vehicle you have for marketing your honey and the more information you can get on them the better. And, rather than simply Wild Flower, consider a good artisanal name, like seasons, places or types of flowers in the name…give it a distinguishing name that customers can remember.

Containers. Glass and plastic remain basically unchanged, but from a consumers perspective, plastic still reigns, but for beekeepers, it's still glass. Ranking… qt., 1 lb., 2 lb., pt., 12 oz., and the 5 lb.

What's Important When Selling Honey?

This is the sixth year we've looked at what our reporters do to help sell their honey. The scoring is self-evident and the numbers represent the percent of our reporters who favor one of the three choices…very, moderately or not important. Note those items that have not changed much over the years, and those that are evolving, to either more or lesser importance. There are interesting trends for some…

The label is interesting. Design seems to be becoming less important, with the name on it not as important, and even local not as important as it has been. We suspect that local, however, will continue to have a draw, so if you are using it, don't stop, and if not, consider it.

	% Important				% Moderately Important				% Not Important			
	2008	2009	2010	2011	2008	2009	2010	2011	2008	2009	2010	2011
My Label Design	63	65	55	43	13	32	31	38	25	3	15	19
Glass Container	45	36	33	29	33	41	36	31	23	23	32	40
Plastic Container	23	14	13	22	44	50	45	42	33	26	47	37
12 oz. Size	25	47	44	37	18	21	21	30	57	36	35	33
1 lb. Size	62	59	58	48	28	23	23	26	14	17	20	26
2 lb. Size	38	38	41	43	32	25	22	26	30	37	37	31
5 lb. Size	42	34	36	32	19	28	21	32	39	43	42	37
Quart Jar	50	53	49	55	20	18	23	25	30	29	28	38
Pint Jar	42	49	42	38	26	18	19	24	32	34	39	38
Price	47	62	-	66	47	32	-	24	7	6	-	10
Local Honey	79	84	72	59	15	14	15	29	6	2	14	18
My Name On Label	72	80	72	60	14	13	13	26	15	7	14	14
Variety On Label	23	22	57	22	27	41	34	32	29	37	39	40
Time of Year	18	28	23	18	29	42	41	39	37	30	36	43
Store I Sell In	29	37	39	47	26	30	36	35	21	33	24	18
Specialty Container	-	-	30	18	-	-	15	25	-	-	55	57
Second Label	-	-	9	10	-	-	17	25	-	-	74	64

REPORTING REGIONS													SUMMARY		History	
	1	2	3	4	5	6	7	8	9	10	11	12	Range	Avg.	Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS																
55 Gal. Drum, Light	1.74	1.90	1.74	1.53	1.80	1.60	1.63	1.80	1.80	1.68	1.72	1.89	1.53-1.90	1.74	1.69	1.65
55 Gal. Drum, Ambr	1.63	1.10	1.63	1.48	1.75	1.50	1.78	1.78	1.68	1.50	1.53	1.80	1.10-1.80	1.60	1.65	1.50
60# Light (retail)	145.00	170.00	140.00	136.25	140.00	145.00	140.29	148.75	78.00	139.80	132.50	182.50	78.00-182.50	141.51	146.77	134.49
60# Amber (retail)	145.00	157.50	140.00	142.00	140.00	136.67	134.50	150.00	111.00	132.22	122.00	161.48	111.00-161.48	139.36	144.16	126.89
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS																
1/2# 24/case	63.36	74.48	48.00	61.07	68.96	52.85	50.20	70.00	68.96	48.00	55.60	85.80	48.00-85.80	62.27	66.95	58.20
1# 24/case	91.20	103.97	76.80	77.20	84.00	92.76	84.28	89.70	72.00	109.08	81.50	108.76	72.00-109.08	89.27	89.49	81.88
2# 12/case	84.60	72.98	75.00	66.50	78.00	85.13	77.26	84.50	66.50	81.00	69.00	87.75	66.50-87.75	77.35	79.37	71.59
12.oz. Plas. 24/cs	78.24	96.77	61.20	75.32	67.20	61.60	68.23	80.90	66.00	68.00	65.40	78.53	61.20-96.77	72.28	72.81	66.22
5# 6/case	99.50	94.48	82.50	76.52	76.61	78.00	82.30	93.67	82.00	77.10	60.50	104.50	60.50-104.50	83.97	87.32	79.19
Quarts 12/case	120.83	129.50	120.83	109.80	98.00	94.84	109.50	105.50	126.00	134.02	98.60	130.50	94.84-134.02	114.83	118.65	115.83
Pints 12/case	74.03	82.98	74.03	73.25	68.00	56.29	72.80	70.35	72.00	80.64	61.50	79.00	56.29-82.98	72.07	82.14	73.51
RETAIL SHELF PRICES																
1/2#	3.00	4.48	2.60	3.84	3.49	3.33	3.06	2.74	3.49	3.15	2.96	4.40	2.60-4.48	3.38	3.39	3.35
12 oz. Plastic	3.75	4.79	3.77	4.29	3.99	3.57	3.53	4.27	4.19	3.58	4.14	4.63	3.53-4.79	4.04	4.09	4.02
1# Glass/Plastic	4.88	5.59	5.90	5.06	5.25	5.31	4.55	5.64	4.73	5.32	5.09	7.10	4.55-7.10	5.37	5.38	4.85
2# Glass/Plastic	8.00	8.36	11.05	8.63	9.50	8.00	7.81	8.85	7.79	8.88	8.78	11.33	7.79-11.33	8.91	8.69	8.19
Pint	12.23	8.19	12.23	6.53	6.13	7.09	7.19	7.30	9.75	7.73	7.38	9.41	6.13-12.23	8.43	7.94	8.18
Quart	18.13	13.18	18.13	11.28	12.00	10.83	10.50	12.18	15.50	13.69	10.87	16.00	10.50-18.13	13.52	12.44	13.08
5# Glass/Plastic	19.25	18.82	17.89	19.88	21.71	19.89	17.09	20.16	19.00	16.69	18.23	23.00	16.69-23.00	19.30	19.41	19.50
1# Cream	6.28	6.98	6.80	5.61	6.28	5.59	5.70	5.79	6.28	5.22	6.42	7.00	5.22-7.00	6.16	6.20	8.98
1# Cut Comb	7.50	6.32	7.80	6.81	7.82	8.83	7.40	6.75	7.82	12.00	7.70	11.00	6.32-12.00	8.15	7.73	7.14
Ross Round	8.12	6.65	7.80	5.42	8.12	8.12	8.25	8.00	8.12	8.12	7.88	8.62	5.42-8.62	7.77	7.06	6.46
Wholesale Wax (Lt)	3.25	4.25	2.88	3.60	2.25	5.17	3.42	4.92	4.75	5.00	3.00	4.50	2.25-5.17	3.91	4.20	3.98
Wholesale Wax (Dk)	2.25	3.73	2.63	3.34	2.00	4.43	2.81	4.75	5.00	3.61	2.68	3.80	2.00-5.00	3.42	3.61	3.72
Pollination Fee/Col.	90.00	120.00	75.00	54.67	55.00	43.75	57.00	80.00	88.37	88.37	58.00	110.00	43.75-120.00	76.68	70.79	82.23

behavior, a study was designed to determine whether the Nasanov gland was the origin of the attractive flower-marking cue. Bees were killed by freezing and used either fully intact or "parted out," so that the attractiveness of whole bees could be compared to that of individual body parts. The dead bees and parts were placed in glass dishes and set on a feeding table to which foraging bees had been previously trained to come. Whole bees, heads, thoraces and abdomens elicited alighting in foragers; legs did not. Extractions of body parts in various solvents were also compared, and all but the thoracic extractions had a repellent effect on foragers. Finally, filter paper wipes of all of these body parts were made from recently killed bees and compared in the same manner. Wipes from the dorsal surface of the abdomen, where the Nasanov gland is located, were the most effective at eliciting alighting behavior. However, because alighting behavior was also elicited by other body parts, the flower-marking pheromone could not be fully attributed to the Nasanov gland.

Some researchers believed that the same stimuli that induce a forager to dance upon returning home also induce it to expose the Nasanov gland and 'scent' when it next visits a food source, and that these two behaviors were correlated (Free and Williams 1972). There is very little anecdotal evidence that foragers expose their Nasanov gland when feeding at a natural floral source; however, they do scent on and around artificial food sources, and at water sources quite reliably (Free and Williams 1972). There is also no apparent correlation between Nasanov scenting and dancing, although it seems these behaviors would be logically linked if Nasanov scenting was intended to recruit more foragers to a particular floral site. To demonstrate this, Free and Williams (1972) trained bees from an observation hive to a sucrose feeding station and observed them for scenting at the food source and subsequent dancing back at the hive. In a series of 26, four-hour experiments, the distance of the feeding station from the hive was varied from 30 meters to 140 meters; also, the concentration of sucrose was decreased during the third hour and returned to 50% during the final hour. Results showed that when the concentration of sugar syrup was decreased and then increased, the amount of dancing and scenting similarly decreased and increased. Varying the distance of the feeder from the hive did not have a similar effect on scenting and dancing. Overall, the number of bees scenting increased over time, but the number of bees dancing did not; statistically speaking, there was no significant correlation of the two behaviors.

"Not only do honey bees mark flowers that contain nectar with an attractant; they mark unrewarding flowers with a repellent."

Later, Free and Williams (1983) demonstrated that not only do honey bees mark flowers that contain nectar with an attractant; they mark unrewarding flowers with a repellent. A repellent marking had been suggested in the literature previously, but had not been described. The detection of repellent scent marks is thought to improve foraging efficiency, by reducing the time that is wasted in probing depleted flowers (Stout and Goulson 2001). Scientists have reported observations of flower rejection in other species of bees when a flower was previously visited by a conspecific (same species) forager. In the carpenter bee, *Xylocopa virginica texana,* for instance, flower rejection could be induced in the field by rubbing Dufour's gland extract from the females on flowers that contained nectar (Williams 1998).

Giurfa and Nunez (1992) found that the repellent mark left on recently visited flowers was quite short-lived in comparison to the attractive mark. Thus, when the repellent mark wears off, the attractiveness is restored to the flower. They demonstrated the mechanism in the laboratory using an artificial flower patch to which was affixed an air extractor that would clear any volatile odors left by bees on the "flowers" (yellow circles with a feeding tube in the center). Forty bees were trained to fly 50 meters from their hive to feed at the artificial flower patch, which supplied a 50% sucrose solution in 12 synthetic yellow flowers. The feeder was designed to automatically replenish the sucrose supply to each flower after a feeding event. Once the experiment began, each bee was observed foraging under two experimental conditions: the first with the air extractor turned off and the second with it turned on. Results showed a significant increase in the number of flower visits and the length of visit time when the air extractor was turned on; there

were also significantly more rejections of flowers when the air extractor was off. This validated the hypothesis that a repellent scent had been left by foragers, and that the air extractor successfully removed the volatile odor. This repellent marking system accomplishes two things: 1) it allows the flower's nectary to be replenished before the next bee attempts to forage, and 2) it allows bees to reduce the number of flower inspections necessary to attain the particular crop-load appropriate to the sugar flow in relation to distance from the hive. In a subsequent study of repellent flower-marking behavior, Giurfa (1993) demonstrated that the repellent mark left by an individual forager was essentially a reminder to itself not to make another attempt at foraging that particular flower. From paired forager trials, he ascertained that the scent mark was predominately a self-use signal, although it was perceived by other foragers.

The honey bee repellent mark was later identified as 2-heptanone (Vallet et al. 1991), a highly volatile compound that originates from the mandibular glands located in the head. This chemical was historically known as an alarm pheromone, but it only produced an alarm reaction in large doses, or when coupled with isoamyl acetate from the sting gland. The amount of 2-heptanone produced by workers increases with physiological maturity (not necessarily with age). Vallet et al. (1991) quantified the amount of the chemical released in the airspace around the head as ranging from 0.1µl in a newly emerged worker to 7µl in foragers. They did not find a significant difference in the amount of 2-heptanone produced by aggressive and docile colonies, which would be expected if the chemical functioned primarily as an alarm pheromone. They also found that 2-heptanone had either an attractive or repellent effect on guard bees according to season, and it showed a temporary repulsive effect to nectar foragers on treated flowers.

Stout and Goulson (2001) compared the duration and heterospecific (different species) effects of repellent marks left by honey bees and bumble bees on foragers of both species. Previous research by Williams (1998) found that borage flowers that were previously visited by bumble bees were not repellent to honey bees, and vice versa. Stout and Goulson further investigated this observation using yellow sweet clover, *Melilotus officinalis*, as the nectar source. They hypothesized that one of three things was occurring when more than one species of bee was foraging on the same flower: 1) bumble bees and honey bees will avoid flowers recently visited by conspecifics but not flowers visited by bees of the other species; 2) 24 hours after a bee visit, flowers will be visited at the same rate as flowers that have never been visited, regardless of the species of the previous visitor; and 3) the rejection response of both bumble bees and honey bees will fade over time, and this will relate to nectar build-up in flowers. The experiments were carried out in a patch of 30 sweet clover plants. If bees landed on and probed a flower, this was counted as 'acceptance'; if a bee investigated a flower without landing, or landed and did not probe, this was considered 'rejection'. Observations that were made included the length of time until a flower was visited after a bee had foraged, probability of one species rejecting a flower after the other species had visited it, and the amount of time necessary for a flower to replenish its nectary. Results implied that both bumble bees and honey bees could detect the repellent scent of the other species, although the scent compounds are believed to be quite different: 2-heptanone for honey bees and straight-chained hydrocarbons for bumble bees. Both species of bees did not return to previously foraged flowers for 40-60 minutes. After 24 hours, however, the rates of rejection on previously visited flowers were not significantly different from rejection of unvisited flowers. Honey bees, in fact, tended to prefer flowers that had been visited to those that had never been probed. This again infers a fairly persistent attractant mark is being used by foragers. The system of attractant/repellent marks has not been entirely elucidated, for there are still unexplained inconsistencies in forager behavior in semi-field and field experiments. Bees behave differently on artificial flowers than real flowers, and tend to scent-mark the artificial more readily. Ultimately, further investigations of forager behavior in a natural setting will unravel the complex mechanism behind honey bee flower choice. BC

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

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Effects Of *Nosema* On Honey Bee Behavior and Physiology

Zachary **Huang**

Nosema, No Matter Which, Is Bad For Bees

Currently there are two species of *Nosema* infecting the Western honey bee, *Apis mellfiera*. *Nosema apis* is the first species described by Zander in 1909. In 1995, Ingmar Fries described a new species of *Nosema* in the Asian honey bee, *Apis cerana*, thus it was named *Nosema ceranae*. It was thought that *N. ceranae* mostly infected *A. cerana*, although there was a mention that *A. mellifera* could become infected with *N. ceranae* under laboratory conditions. In 2005, natural infection of *N. ceranae* was reported in *A. mellifera* colonies from Taiwan (Huang et al., 2005). Shortly thereafter, the infection of *N. ceranae* to *A. mellifera* was reported in Europe, United States, China, and worldwide. In this article I will review old studies done on *N. apis* and recent studies on *N. ceranae*, from a behavioral and physiological perspective. For basic biology, diagnosis and control of *N. ceranae*, please refer to Tom Webster's article at **http://www.extension.org/pages/27064/*Nosema*-ceranae-the-inside-story.**

Differences among the two species

The differences between the two *Nosema* species are listed in Table 1, but I will only discuss differences in morphology and symptoms here, other differences are dealt with in more detail in the following sections. *N. ceranae* spores are slightly smaller, less symmetrical and the two ends are sharper, compared to *N. apis* spores (Figure 1). Cross sections of *N. ceranae* spores show a fewer number of coils of polar filament compared to *N. apis* spores. *N. ceranae* is more resistant to high temperature but less so at low temperatures, compared to *N. apis*. Fenoy et al (2009) claims that at 60°C for one month, over 90% of *N. ceranae* spores were still viable, but *N. cenarae* spores lost ~90% infectivity after freezing temperature for one week, while *N. apis* spores retained 100% of its activity after freezing.

The typical symptoms for *N. apis* infection are also lacking in *N. ceranae* infected bees, such as defecation near or inside the hive entrance during Winter (Figure 2), and milky color of midgut in heavily infected bees (Figure 3). Spanish studies claim that *N. ceranae* infection rates do not show the typical changes with season, while prior studies of *N. apis* indicate that infection rate drops down in summer but stays high in Spring.

Is *N. ceranae* more virulent than *N. apis*?

In a widely cited study conducted in Spain (Higes et al. 2007), bees infected with *N. ceranae* in the laboratory cages showed 94.1% and 100% mortality seven and eight days after inoculation, respectively. Although *N. apis* was not compared in the same experiment, by comparing cage studies using *N. apis* conducted earlier, it was suggested that *N. ceranae* is much more virulent than *N. apis*. More recent studies from other laboratories failed to see this difference.

Forsgen and Fries (2010) compared the mortality of bees infected with either species and did not see a difference between the two. The MSU honey bee laboratory also failed to see a difference in mortality between bees infected with either species of *Nosema* (Z.Y. Huang, unpublished data). It is not clear whether the Spanish *Nosema* strain is more virulent, or whether the Spanish honey bees (*Apis mellifera iberica*) are more susceptible to *N. ceranae*.

Effects of *Nosema apis* on workers and queens

In the 1990s, T.P. Liu in Canada conducted many studies on the effects of *N. apis* on honey bees. His studies indicated that workers infected with *N. apis* show ultrastructural changes in the cells from the midgut epithelium, hypopharyngeal glands, and the corpora allata (sources of juvenile hormone). Oöcytes in queens infected with *N. apis* for only seven days were already degenerated. The ovariole sheath became wrinkled. In the oöplasm, yolk granules broke down into small spheres and granular substances and the oöcytes became extensively autolysed. It is not clear whether the oocyte degeneration in infected queens is due to a pathological process, a lack of protein nutrition, or to increased juvenile hormone production as a result of *Nosema* infection (see below).

N. apis causes earlier foraging, and higher JH production

Worker bees infected by *N. apis* have smaller hypopharyngeal glands and show an earlier regression in gland size than uninfected bees. In addition, *Nosema* infected bees show a more rapid behavioral maturation than uninfected bees (Wang and Moeller, 1970). Infected bees also guarded more frequently, and performed the following behaviors earlier than uninfected bees: orientation flights, dance following, and foraging. Infected bees also show a decreased tendency to feed the queen. As predicted by a theoreti- ⇨

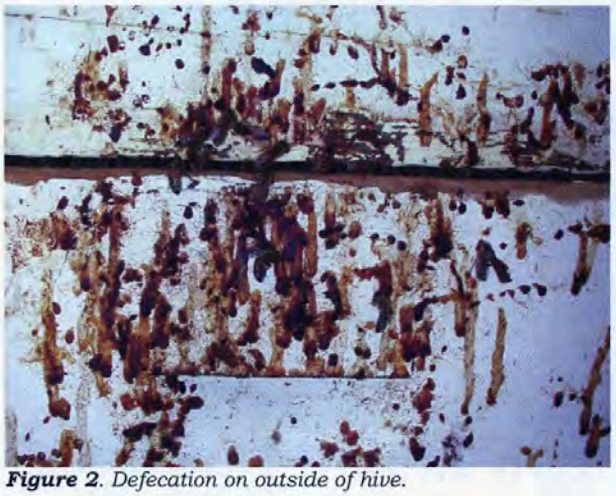

***Figure 2**. Defecation on outside of hive.*

Figure 3 - Infected on top.

cal model which states that workers should take more risks when they are parasitized or "not as worthy to the society" as others, Woyciechowski and Kozlowski (1998) demonstrated that *N. apis* infected workers showed more foraging activity than healthy foragers during adverse weather conditions.

The changes in *N. apis* infected bees are very similar to those induced by artificially applying juvenile hormone (JH) to various aged bees. JH is low in nurses but high in foragers. Huang et al. (2001) studied whether the earlier foraging in infected bees was due to an early raise of JH. They found that infected workers foraged at an earlier age and showed higher haemolymph juvenile hormone (JH) titers than control bees of preforaging age. This suggests that *N. apis* infection induces workers to forage earlier via higher JH titers. The higher JH titers could be achieved by several alternative mechanisms including enhanced JH production by the host corpora allata (CA), reduced JH degradation, or JH production by *Nosema* directly. The same study found that rates of *in vivo* JH biosynthesis as well as JH degradaton were higher in *Nosema* infected bees than control bees. Workers with their source of JH (CA) removed, but fed *Nosema* had no detectable levels of juvenile hormone in hemolymph and these bees did not forage early. These results suggest that *Nosema*-infected workers forage at an earlier age than control bees due to higher JH titers, which arise through increased JH production, despite the increased JH degradation in infected bees. The data also suggests that *Nosema apis* does not produce JH directly.

Most likely smaller hypopharyneal glands and earlier foraging in *N. apis* infected workers is due to the fact that *Nosema* infects the epithelial cells of the midgut, therefore greatly reducing the host's ability to digest pollen, needed for gland development. Impaired protein metabolism is deduced by lower proteolytic activity of the mid-gut, lower amounts of amino acids in hemolymph, lower levels of proteins in the fat bodies (reviewed by Kralj and Fuchs, 2010) and lower protein levels in hemolymph in infected bees (Z.Y. Huang and T. Zhou, unpublished data). Inadequate nutrition could fail to increase vitellogenin, which normally inhibits JH production. Therefore JH increases prematurely in these bees with poor protein nutrition.

It is not clear whether *N. ceranae* causes the same changes in workers as *N. apis* or not that is earlier foraging and higher JH production. However, based on that fact that both species affect the midgut epithelial cells, *N. ceranae* most likely causes the same early foraging and enhanced JH production in workers. This is now being studied in Marla Spivak's laboratory at the University of Minnesota.

Effects by *N. ceranae* on learning and homing behavior

When Kralj and Fuchs (2010) studied the homing behavior of bees mainly infected with *N. ceranae*,

Table 1. Differences between ***N. apis*** and ***N. ceranae***.

	N. apis	***N. ceranae***
Spore size	6 x 3 µm	4.4 x 2.2 µm
Spore morphology	Ends rounded, symmetrical	Ends sharper, less symmetrical
Polar filament coils	>30	18-21
Resistance to high temperature	Low	High
Resistance to freezing	High	Low
Seasonal fluctuations	May have infections in summer	Lack of seasonality
Defecation near or inside the hive	Yes	No
Milky color of midgut	Yes	No
Virulence	Low	Higher
Earlier foraging	Yes	unknown
Enhanced JH production	Yes	unknown
Homing ability	Likely reduced	Reduced
Energy cost	Low	High
Immuno-supression	No	Yes

some bees were co-infected with *N. apis*. They found that infected bees released six and 10 m away from the colony took longer times to return than uninfected bees. The percentage of bees that did not return home was higher in the infected bees compared to healthy bees when released 30 m away from the colony. They also found a lower rate of infected bees among the returning foragers compared to departing foragers, suggesting some infected bees did not return home successfully. It is not clear why infected bees did not return home as well. The study used bees of known ages, so this is not because infected bees were developing precociously. The alternative is that infected bees did not have proper protein nutrition which affected their brain development and capacity of learning. It is not clear whether *N. apis* causes the same effect in honey bee learning and homing behavior. We have tried to determine if *N. apis* infected bees drifted more to surrounding colonies but failed to find if this is the case (Z.Y. Huang and H. Lin, unpublished data).

N. ceranae causes higher energy costs

Mayack and Naug (2010) compared the effect of energy stress on healthy and *N. ceranae* infected bees and found that *N. ceranae* infection caused an energy stress in bees from several lines of evidence.

First, bees infected with *N. ceranae* were more responsive to sucrose solution (not as picky as healthy bees) and would extend their proboscis at a lower sugar concentration.

Second, infected bees consumed about 87µl of 30% sucrose solution in 24 hours, while healthy bees consumed only 60µl. Therefore it appears that *N. ceranae* made the bees more "hungry" and caused them to drink more syrup.

Third, control bees fed with 5, 10, 20 or 30 µl of syrup survived better compared to infected bees fed the same amounts during a 24 hour period. However if bees were fed *ad libitum*, or not fed at all, the two groups did not show any difference in their survival.

The authors therefore concluded that *N. ceranae* caused an energy stress in infected bees, and speculated that this might be a main reason for the shortened survival of infected bees inside colonies.

N.ceranae infection caused an energy stress in bees from several lines of evidence.

Martín-Hernández et al. (2011) compared the energy cost of both *Nosema* species. Using caged bees, they showed that both mortality and sugar syrup consumption are the highest in *N. ceranae* infected bees, intermediate in *N. apis* infected bees and lowest in uninfected control bees. This study further demonstrates that *N. ceranae* has subtly different effects on honey bees compared to *N. apis*.

N. ceranae causes immune suppression

Antúnez et al. (2009) studied the immune response of honey bees after infection with either *N. apis* or *N. ceranae*. They measured gene expressions of several antibiotic peptides, abaecin, defensin and hymenoptaecin, produced inside honey bees after bacterial infection. In all three genes, *N. apis* infection caused an elevation of gene expression in either four or seven days post infection, but *N. ceranae* did not show any difference in gene expression compared to the control (uninfected bees), or even significantly reduced it (abaecin at seven days). These data suggest that *N. ceranae* actively suppresses the immune response in infected honey bees while *N. apis* does not.

Alaux et al. (2010) studied whether a neonicotinoid (imidacloprid) and *Nosema* (a mixture of both species) would show a synergistic interaction in affecting honey bees. They found that the combination of both agents caused the highest mortality and food consumption. They also found that the activity of glucose oxidase, an enzyme bees use to sterilize colony and brood food, was significantly decreased only by the combination of both factors compared with control, *Nosema* or imidacloprid only groups, suggesting a synergistic interaction between the two agents. Because the combined group showed similar *Nosema* spore counts to that of *Nosema* infected bees alone, it seems that the synergistic effect is due to the immune suppression of *N. ceranae*, causing bees to be more sensitive to the pesticide, rather than the

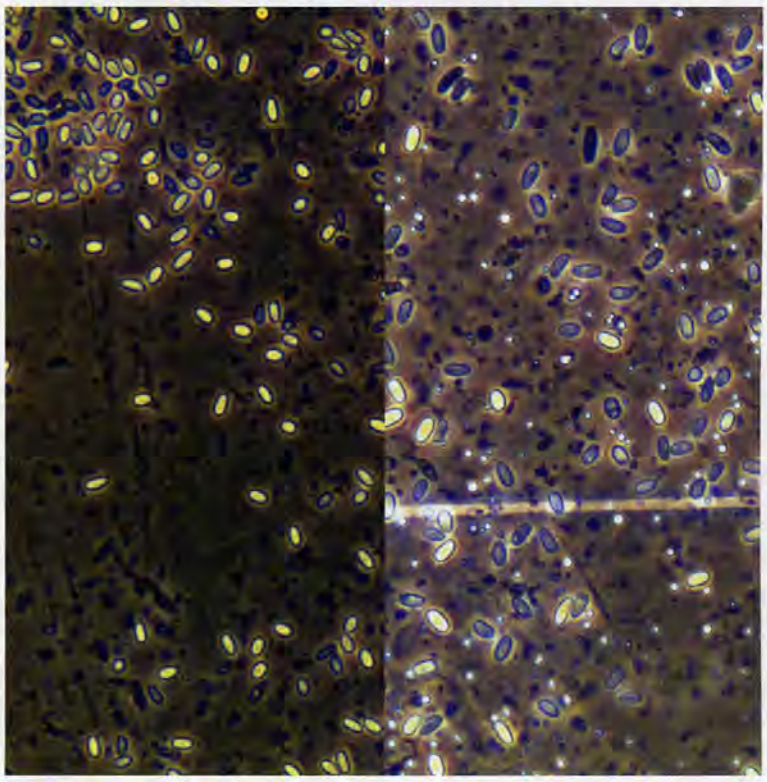

Figure 1.

The combination of *Nosema ceranae* and imidacloprid caused the highest mortality and food consumption and the activity of glucose oxidase, an enzyme bees use to sterilize colony and brood food, was significantly decreased only by the combination of both factors compared with control, *Nosema* or imidacloprid only groups, suggesting a synergistic interaction between the two agents.

pesticide reducing bee resistance to allow more severe damage by *Nosema*.

In a more recent study, Vidau et al. (2011) found a similar synergistic effect between pesticides and *N. ceranae*. After being exposed to sublethal doses of fipronil or thiacloprid, *N. ceranae*-infected bees showed a higher mortality than in uninfected ones. The synergistic effect of *N. ceranae* and insecticide on honey bee mortality was not linked strongly to a decrease of the insect detoxification enzymes. This is because *N. ceranae* infection induced an increase in glutathione-S-transferase activity in midgut and fat body but not in the 7-ethoxycoumarin-O-deethylase activity. It is not clear how tightly the insect detoxification system and the immune system are linked – they might well not be tightly linked since one is induced by pesticides and another by parasites.

N. ceranae affects queen health

Alaux et al. (2011) studied the effect of *N. ceranae* infection on eight day old honey bee queens. They found that *N. ceranae* did not affect the fat body content, which is an indicator of energy stores, but changed the vitellogenin titer, which is an indicator of fertility and longevity, the total antioxidant capacity and the queen mandibular pheromones. The strange thing is that these changes were contrary to the predicted direction that they were all increased in *Nosema*-infected queens. It is possible that these are only seen in eight day old queens, perhaps due to accelerated development as seen in *N. apis* infected worker bees. It is not clear whether in older queens these changes will remain or become reversed.

Conclusions

Studies on *N. apis* were mostly done during the 1970-1990s, but there has been a huge increase in interest in *N. ceranae* since 2007 after Colony Collapse Disorder (CCD) appeared in this country. *N. ceranae* infection by itself does not seem to explain colony loss in the U.S., but in Spain it was speculated to be the main cause for CCD. There are clear differences in how the two species of *Nosema* affect our bees (Table 1). However, there are still many unanswered questions in the biology, epidemiology, and pathology of *N. ceranae* despite many studies. We are not even certain how many old studies attributed to *N. apis* might actually be of *N. ceranae*, and how long *N. ceranae* has been in the U.S. Until now we did not have a single sample showing that prior to a certain time, we only had *N. apis* and *N. ceranae* came after that point. The notion that *N. ceranae* is replacing *N. apis* is also based on circumstantial evidence, however with ongoing monitoring of whether and how *N. apis* is slowly disappearing might help clarify this. BC

Acknowledgement

I thank Randy Oliver, Xianbing Xie, Julie Adams, Mike Jessup, and Alice Jiang for reviewing this manuscript. Research by the author's laboratory on N. apis was supported by USDA NRI grant (97-35302-5304), and N. ceranae by Managed Pollinator CAP USDA NIFA 20098511805718.

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Beekeepers Get A Tax Break!

Andrew **Pruett**

I'm excited about what's going on in Wisconsin today! In June I was talking to my Father-in-Law Joe, who was explaining how he managed his land for bees but didn't get credit for his agricultural endeavors like the farmers with cattle pasture did. His land is excellent bee pasture consisting of open meadows, heavy forest, swamp land, and ponds. He uses his property to produce bee products for sale. Why can't he get the same tax advantages as other farmers for his pasture land? Why couldn't his land be classified as pasture since that is what it is for – his bees?

Joe did some research and discovered that bee pasture *is* an agricultural land classification written in the Wisconsin Property Assessment Manual. It turns out that bees and cows have something in common; both pastures are eligible for the same tax classification. He decided to find out how to qualify and receive that classification.

Calling everyone he knew who had bees Joe found no one knew or had taken advantage of this land classification! How could this be? It is spelled out clearly in the Manual that anyone with **more than 50 hives who produces bee products** can have their land classified as bee pasture. Why aren't beekeepers taking advantage of this? Joe turned to the internet for further research. There he learned of a court case, Appeal No. 2005AP2376. This court case states that Clyde Winter had 40 beehives, owned by a beekeeper, on his property. The Assessor had classified five acres of Winter's personal property as Bee Pasture, and 18 additional acres of the land owned by Winter's corporation for a total of 23 acres.

Why would Winter go to such lengths to get his land classified as bee pasture when he is not a beekeeper, and owns no hives? The answer is that land classified as Bee Pasture is taxed at the same rate as cow pasture which is the lowest classification rate of any land!

Now, Joe had a precedent. He called Winter and talked with him about the reclassification process. Following this conversation Joe called his local assessor and inquired about getting his own land reclassified. The assessor was not interested in reclassifying Joe's land and had little knowledge of bee pasture as described in the Assessor's Manual. This was interesting and presented a challenge.

Joe contacted his local Township Tax Board and set up a meeting to see if he could get them to ask the assessor to reassess and reclassify his property. The town set the meeting date and Joe and I set to work. This is a formal process that you have to follow, and it only happens once per year. The title is called an 'Open Book' process.

We needed to do two things to get the board to ask the assessor to take a second look at Joe's property. First, we needed to educate the Board about the benefits of bees and the commercial side of beekeeping. We needed to present the Manual and its' regulations as they pertained to Beekeeping. Second, we needed to demonstrate that Joe's land and his management of the land met all the stated criteria and that Joe's land was eligible for reclassification.

The Assessor and the Township Tax Board were a considerate audience and approved of the change. These days when there are challenges to beekeepers it is a great feeling to know that the local community and the State support the bee industry. I believe that the government needs to treat beekeepers as other agricultural operations. Therefore it is important to pass this information along about how beekeepers are eligible to have land classified as bee pasture. What needs to be done is simple if you live in Wisconsin.

Pages 11-10 and 11-11 of the Wisconsin Property Assessment Manual for 2011 state:

> Apiculture – This industry comprises establishments primarily engaged in raising bees. These establishments may collect and gather honey; and/or sell queen bees, packages of bees, royal jelly, bees' wax, propolis, venom, and/or other bee products.
>
> A typical Wisconsin beekeeper maintains 150-200 hives and generally has other sources of income. Hobbyists in Wisconsin maintain one to two hives, while sideliners in Wisconsin maintain up to 50 hives. Many beekeepers in Wisconsin transport their bees south when the local growing season and pollination need is complete.
>
> The *Wisconsin Property Assessment Manual* uses the North American Industry Classification System (NAICS) for bees as described above. Use value would apply to land associated with beekeeping if it can be demonstrated that the crops are for the consumption of the bees. Use value would not apply to persons involved in the practice of beekeeping that are considered hobbyists or sideliners by bee industry standards in Wisconsin.
>
> Although honey is a livestock product, the following issues make it difficult to identify land as unique to "bee grazing land." Bees are not "fenced" into a particular area and are often moved to different lands to take advantage of flavored honey crops and the need for pollination (e.g. clover, cranberries).
>
> Lands that are used to graze bees without producing a vegetable or grain crop would have to be evalu-

ated by the assessor to determine if the use of the land was adequately dedicated as a commercial operation for the production of bee products as defined in NAICS above.

Reclassifying Joe's land didn't cost any money for licenses or fees, but only our efforts and time. Here are the steps we used, and you can follow to classify land as bee pasture in Wisconsin (and maybe other states).

1. Own at least 51 hives. The manual does not state that these have to be in one apiary. Joe has his bees in 3 different apiaries on his property and several apiaries on other people's property.
2. Raise bees, produce honey, or other bee products. You demonstrate this to the assessor with sales receipts or contracts etc. However, the assessor does not need a complete financial breakdown of your operation. If you also pollinate, pollination must be secondary to product sales *either* in time allocated or income received.
3. Meet with your assessor. Walk around your property and teach them about beekeeping, and the ways your land is managed for bees. For example, bees use almost all flowering plants as sources of nectar and pollen. They use trees! Many people do not know that *all* trees flower. The bigger the trees the more valuable they are to your bees. Though bees do not visit pine and fir tree flowers with regularity, they do gather propolis from them. If you have a lot of pine on your property you might inform the assessor that propolis is an essential part of the hives immune system. Bees use your ponds, and swamp land to forage on the flowering plants there and drink the water or gather water to use in cooling the hive on hot days.
4. If the assessor is reluctant to reclassify your land, set up a meeting with the township tax board.
5. Put together an education folder for each member of the board. The folder should contain the following sections, tabbed for easy use.
   1. Relevant assessment manual pages 11-10 and 11-11.
   2. Letter of support from State Apiarist Elizabeth Meils.
      a. Elizabeth.meils@wisconsin.gov
   3. Refer to the Precedent from Mr. Winter's court case Appeal No. 2005AP2376 and Joe's experience.
   4. Relevant correspondence, for example any letters you exchanged with the assessor, business partners or customers that help demonstrate that you produce and sell bee products.

   5. Copies of last year's property taxes.
   6. Attend the meeting/s. We had to have one meeting to educate the board and the assessor and one meeting for the vote.

Why go through the trouble of classifying your land as bee pasture? There is the potential for reclassification to substantially lower your property tax rates. Land currently classified as bee pasture is taxed at the use value of livestock pasture land. Land being taxed at the general rate for nonagricultural use is usually taxed at a much higher rate than agricultural land, and this value is set by your local community. Here are some examples of what moving from nonagricultural land to pasture can do for you. We were able to drop the taxable value of Joe's land a total of 36%. Each parcel of land a person owns may have several tax classifications. For example if you own 40 acres, 10 acres can be classified as recreational, 10 as forestland, 10 as swamp, and 10 as tillable. Therefore each parcel of Joe's was reassessed separately and his savings varied between each of the 8 parcels. This is why he received savings from 1.1% to 196% rather than a flat rate for each parcel. The substantial savings to Joe's bee farm cannot be understated. Land tax rates differ across the State and your tax savings will be dependent on your local tax rates, and current classifications. Your savings may be more or less than those stated above. **Another example**: Nonagricultural land may be taxed at $2,650 per acre. If this land were assessed as bee pasture it would drop in taxable value to $50 per acre thus representing a 98% savings per acre for the bee keeper. Take the mill rate of 0.014012158 times the assessed rate of $2,650 = $37.13 per acre tax. Take the mill rate of 0.014012158 times the assessed rate of $50 = $0.70 per acre.

Get excited! Make some phone calls! Put a folder together! And get your land classified as Bee Pasture! It's good for bees, good for the economy, good for the industry, and good for the local community! So get out there and do your good deed today!

Note: With the money that Joe is saving on his taxes he will be able to invest in a more productive honey farm. He will be able to plant for bees. Currently he is considering planting bass wood, and managing his pasture (grassy land) for flowering plants. BC

To Be Or Not To Be . . . A Bee

A Bee Flight

Roger **Hoopingarner**

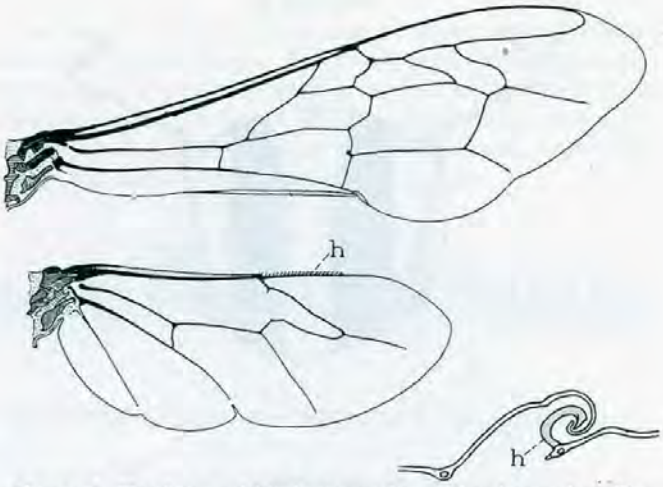


Figure 1. *The fore and hind wings of a worker honey bee. The hamuli (h) are shown on the hind wing and in a cross-section indicating the hook-like system of connecting the two wings.*

So far in this series of articles we have covered the parts and organs of the head.

Now, as we move backwards through the body of the honey bee we come to the he middle region known as the thorax. This is the part of the body that is the locomotion center of the bee. In this article I'll cover the wings and flight of honey bees and in the next I'll discuss the wide variety of adaptations of the legs of the bee.

In the 1930s a biologist asked an aerodynamic engineer if a bumble bee could fly. The famous (or infamous) answer was that according to aerodynamic theory the bumble bee could not fly. Of course, everyone knew that they could fly. The problem was that the engineer was using fixed-wing calculations and not the flexible, hovering type of wing that bees have. However, there is still a serious physiological problem and that is the wings of bees move (flap) at 200-400 times *a second*, and this is at least *10 times* the speed that muscles or nerves can operate. This high rate of vibration of the wings enables the bee to fly and maneuver, but still demands an explanation of how this can happen.

First, lets look at the parts of the system as this will help explain the dynamics of wing vibration and flight.

The exterior of an insect is both skin and skeleton and in all arthropods is called an exoskeleton. Once a bee has emerged from the sealed cell as an adult bee this exoskeleton begins to harden rather quickly. (If you want to impress a non-beekeeper and you see a newly emerged bee on a frame of bees, you can pick it up and hold it as she is not yet able to sting you. It takes a hardened and stiff exoskeleton for the bee to be able to sting.) This stiff yet somewhat flexible exoskeleton will come into play a little later in the discussion on flight.

The wings of the honey bee are on the second and third segments of the thorax. The wings of insects are basically an extension of the exoskeleton, and as such they are two layers that that come together and when hardened after emergence are quite stiff. The two wings of a bee are shown in Figure 1. In the honey bee the two wings are kept moving together in synchrony by a series of hooks on the hind wing, called hamuli, that couple the hind wing with a curved flap on the fore wing. The hamuli are labeled (h) in the figure. The wings sometimes become unattached. The so-called K wing found in bees with certain parasites or diseases is an example of such disconnected wings. The wings are then two surfaces of the exoskeleton that come together without any muscles in the wings. Then how do the wings move? For that answer we have to look at the structure of the thorax and the muscles that reside inside.

Figure 2 shows the cutaway diagram of the thorax of the bee. There are three tubes, or structures running through it; the esophagus, nerve cord, and the aorta. The rest of the thorax is essentially filled up with muscles. (Red in the diagram.) There are two sets of muscles, a dorsal-ventral pair and a longitudinal pair. These two sets of muscles work in opposition to each other and alternately raise and lower the dorsum of the thorax. The wings pivot over a fulcrum (the side of the thorax) as shown in Fig. 3. When the dorsal-ventral muscles contract the notum (upper surface of the thorax) is pulled down and the wings are lifted (tipped) upwards. When the longitudinal muscles contract the notum is flexed upward and the wings are tipped downwards. There are also muscles attached to the base of the wing that can tip the leading edge of the wing up or down. In flight the wings move in almost swimming-like fashion.

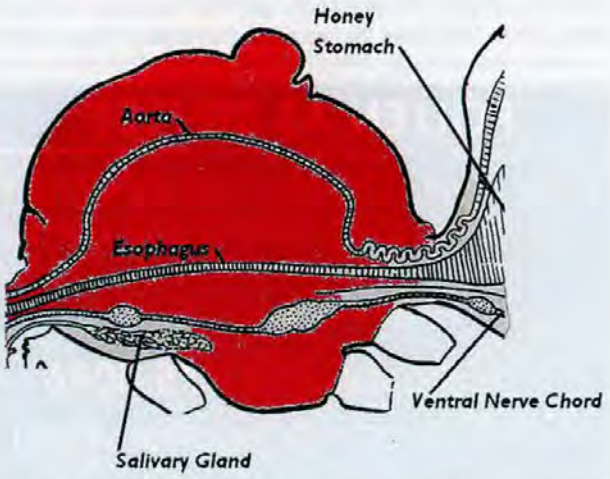
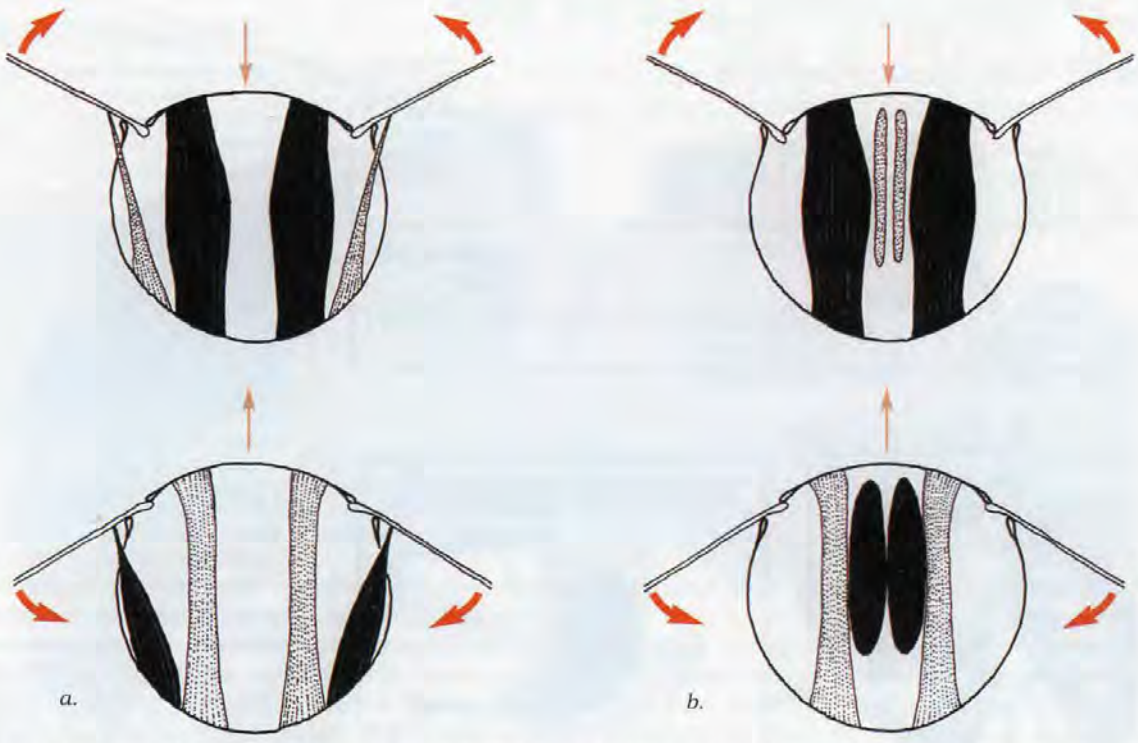


Figure 2. *A cut-a-way diagram of the thorax of a worker honey bee. The red indicates the muscle volume.*



Transverse sections through the thorax showing the main flight muscles during the upstroke (upper pair of diagrams) and during the downstroke (lower pair). (a) Direct and indirect dorsoventral flight muscles, and (b) indirect dorsoventral and longitudinal muscles. Muscles shown dark when contracted, light when relaxed and stretched. Heavy arrows show direction of wing movement. Light arrows indicate direction of movement of the roof (notum) of the thorax. Redrawn from Snodgrass. (Diagram taken from Form And Function In The Honey Bee, *by Goodman. It is available at the* ***IBRA Bookstore*** *at http://ibrastore.org.uk/.*

Now comes the almost surreal part of bee flight. Go back to the opening comment on aerodynamics of flight and the statement that bees cannot fly. Much of this thinking was because physiologists knew that muscles and nerves can only respond about 20-40 times a second. Any beekeeper that has listened to a bee flying knows that the sound that the bee makes is in the audible range – 200-300 times a second. If the muscles cannot contract that fast then how does the bee move the wings that fast? I indicated that the exoskeleton was stiff, but it still has some elasticity as well, and the thorax of the bee is a fairly well constructed "box." In order for the bee to move its wings hundreds of times a second the muscles shown in Figure 3 essentially put the exoskeleton into a vibration. It is almost like plucking a violin string, and the vibrations are in the audible range about 200-300 times a second. It is this rapid wing beat that allows a bee to fly with such ability and agility. A worker bee can carry 50 mgs. of nectar which is half its weight. This would not be possible without the high speed of the wings.

There is one other aspect of the bee's flight that is not seen by just looking at the flight muscles. The tracheal system, which I will cover in a later article, is the system by which the bee gets its oxygen supply. The trachea of the bee has evolved very large air sacs that fill parts of the thorax and abdomen. These air sacs give the bee added buoyancy for flight. BC

Roger Hoopingarner is retired Extension Apiculturist, Michigan State University, East Lansing.

The Doolittle Method of Queen Production

Part III – A Traditional System for Enticing Nurse Bees To Produce New Queens

A Reminder

In Part I, I offered information on using natural cells to produce honey bee queens. In Part II, I discussed using larvae (and occasionally eggs) to produce queens. In this article we'll look at the famed Doolittle procedure. In upcoming months, I'll discuss plastic queen-raising devices, and finally, capturing, caging, storing, and introducing new queens.

The "Doolittle" method of producing honey bee queens

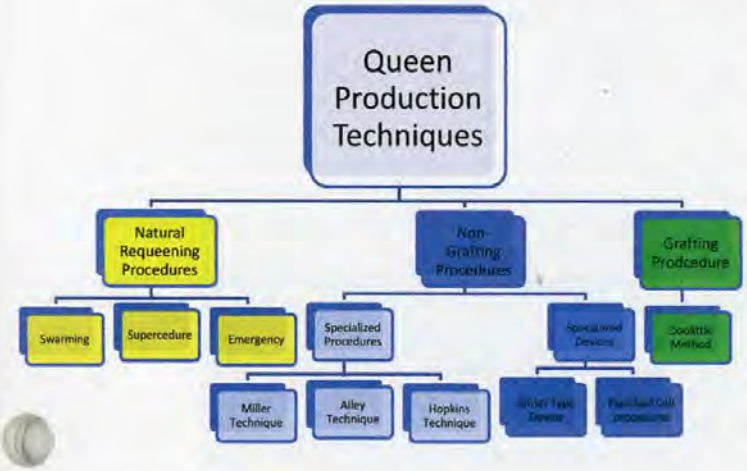
G.M Doolittle[1], from Borodina, NY, is credited with being the father of commercial queen production. Mr. Doolittle published the procedure which was a compilation of some of his own observations and that of others before him. He stated this fact clearly and honestly in his book. Even so, it is Doolittle who is remembered rather than earlier observers such as Jacob or Schirach.

The essence of the procedure

Essentially, a beekeeper makes a strong colony queenless and removes all eggs and larvae so the colony is without hope of producing a queen from its own stock. The beekeeper then moves a (very) young larva from a desirable colony, called a *breeder*, to an artificially-made wax cup (today's cups are normally plastic). This contrived queen cell, along with others like it, is presented to the desperate colony. Overnight, the nurse bees will (probably) begin to feed some or all of the improvised cells.

From this desperate colony, the accepted cells are moved to cell finishing colonies and from there, the finished cells are moved - on a strict schedule - to mating nuclei (nucs) from which the virgin queen takes her nuptial flights.

The components of the system are: (1) *Breeder colony*, (2) *Cell starting colony*, (3) *Cell finishing colony* and (4) *Nucleus colonies*.



All the various components will require:

1. An abundance of young worker bees (nurse bees)
2. Plentiful honey stores
3. Plentiful pollen (protein) stores
4. Supplemental sugar feeding
5. Plentiful mature drones
6. Grafting stock (from breeding queen mothers)
7. Plentiful young larvae

The items required clearly indicate that the process of producing queens, artificially, will require populous colonies that are well fed with both pollen and honey stores. Additionally, to encourage the production of wax needed to build so many queen cells, additional sugar-syrup stores should be offered. The cadre of young nurse bees will be required to nurture the large population of grafted larvae. These queen larvae (and worker larvae, too) have a prodigious growth rate. A dramatic comparison that is a newborn human compared to a newborn larva. In five days, if the human infant grew at the same rate as the larva, the infant would be the size of a fully grown elephant. Due to the tremendous growth rate and short development time, it is imperative that food be presented to the developing larvae constantly; hence the pressing need for plentiful nurse bees.

First Component: *Breeder Queens*

The breeder colony is the colony that has all the characteristics that you wish *all* your bee colonies had. This desire, of course, is founded in the ideal world. Most of us trying to produce queens will settle for simply finding enough of the larvae of the correct age. But producers who are serious and are trying to earn an income producing quality queens specifically look for desirable colony

James E. **Tew**

[1]G. M. Doolittle. Scientific queen-rearing as practically applied; being a method by which the best of queen-bees are reared in perfect accord with nature's ways. Chicago, T. G. Newman & Son, 1889. 169 p. incl. front. (port.) 20 cm.

Figure 1. *Grafting (transferring) larvae to wax cells. Plastic cells are commonly available.*

attributes. Some of the more common characteristics are listed below.

1. Brood production
2. Disease/pest resistance
3. Adult population
4. Propolis production
5. Temperament & attitude
6. Pollen storage
7. Honey production
8. Beeswax characteristics
9. Eagerness
10. Color

I don't know that I have ever seen such a deluxe colony as the hypothetical one described above. Only a good commercial queen producer with a solid reputation would be expected to continually search for the perfect colony described above. I don't mean to cheapen the process, but those of us with just a few colonies should simply do the best we can with the colonies we have. Some specific comments on some of the characteristics are in order:

Propolis

As beekeepers, we don't particularly care for high propolis producers. The stuff is sticky, it colors comb honey boxes, and sticks to our hives, clothes, hive tools and steering wheel. However, I bet that the colony that produces more of it has more antibiotic protection than minimal propolis producers.

Eagerness and color

Colony energy is difficult to describe, but colonies that forage earlier and during more marginal weather will probably be better producers and survivors; therefore, they are energetic colonies. As for color, many of you like golden-colored queens. Color is not an indication of quality in any way, but frequently queen breeders look for either yellowish or black queens. Yellow or black, queen color is not an indicator of quality.

Second Component: *Starter Colonies*

There is no "standard" starter colony setup. To make it even more confusing, starter colonies can be either open or closed – meaning the bees are allowed to fly or they are confined within the starter hive by screened wire closing devices.

A perfect starter has the following characteristics:

1. Queenless
2. Populous (maintain high adult population)
3. Young nurse bees
4. Sealed brood
5. No ***(absolutely none)*** eggs or young uncapped brood
6. Honey and pollen stores and supplemental sugar feed
7. Empty frame space for receiving the grafting frame
8. Selected from different styles

This specialized colony is a VERY populous colony with plenty of honey and pollen. It has lots of young bees for feeding the larvae. It could have some sealed brood but absolutely no eggs or young larvae. Leave it queenless overnight and check it for natural emergency cells. Destroy any that have been started and then put grafted cells into it. A five-frame open starter colony with about five pounds of bees packed into it can easily handle 40-50 grafted cups. It can be used for about three to five cycles if the accepted larvae are removed every day. When the starter is retired, combine the exhausted bees with the colonies from which they were originally taken or use the bees to make a split.

This procedure requires a surprising high number of young worker bees and drones. It is very probable that young bees will need to be taken from several colonies to make up the starter. A nectar flow is helpful, but not required. If the starter colony is put together correctly, there will be precious little space for nectar processing.

Third Component: *Cell Building Colonies*

Cell building colonies may also be called *"cell finishing"* colonies or simply *finishing* colonies. As with the previous specialized colonies, a finishing colony is a strong colony in all ways, but the queen is confined below a queen excluder. Brood and young bees are moved above the excluder and empty slots are available to put frames of 1-day old accepted larvae. As with the previous colonies, typical components of a strong colony are required to finish the cells properly.

A perfect finishing colony has the following characteristics:

1. Queen-right
2. Populous (maintain)
3. Young bees (nurse)
4. Mostly sealed brood
5. Honey and pollen stores
6. Two to three deeps
7. Queen excluder restricting queen to bottom deep
8. Open slot(s) for a cell bar(s)

9. About 20 cups just above brood nest would be maximal
10. Fed protein and sugar

The queen-right colony is strong but the queen is confined to the bottom deep with her brood. Above the excluder, three to four frames of nurse bees and emerging bees are positioned with an empty slot remaining for a frame of accepted grafts. Some produecers use more than one. These young bees are of the correct age to feed and finish building the cells. As with the starter, the colony should not lack either honey or pollen stores. About 20 cells can be usually be finished by one cell-building colony.

These finishing colonies are in the Doolittle system because they are so much easier to maintain and less stressful on the bee population. They are simply free-flying colonies with storage space but they do have two brood nests – one above and one below the excluder.

The Queen Emergence Calendar[2]

Of course, larvae can be grafted at any time of the queen-producing season, but for the sake of discussion, if larvae were grafted on day one, they must be removed on day 11 – at least. This number is derived by: egg – three days; larval age at time of graft – two days; 11 days in starter and finisher = 16 day development time for the average queen. At that time, the ripe cells are moved to mating nuclei. At this point of development, ripe queen cells can be *"candled"* or held in front of a light to watch for movement and to check the amount of food remaining in the cell. If all food has been consumed, the queen may not be of the highest quality.

Figure 2. *An open slot in a starter colony for accepting a grafting frame*

Fourth Component: *Mating Nuclei*

The mating nuclei are the final hive components required to produce queens using the traditional Doolittle method. There are innumerable nuclei styles and sizes. In much of the cooler climates, larger mating nuclei are used (deep frames: three-frame, four-frame, or five-frame (rarely six-frame) are used to make a nucleus hive). In warmer climates, smaller nuclei can be used. Some of the very smallest are called "baby nucs." While they take very small amounts of bees, they can be difficult to maintain and frequently abscond. Small hive beetles are particularly hard on baby nucs.

Nucleus hives are generally set up for the season starting in late Spring and ending in late Summer or early Fall. Larger mating nucs may be converted into splits while baby nucs are recombined into colonies in specialized equipment. The following characteristics apply to most mating nuclei.

Queen Emergence Calendar

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1 Graft Date	2	3	4	5	6	7
8	9	10 Nucs made up	11 Queen cells must be moved to nucs	12 Queens begin to emerge	13	14
15	16	17	18	19	20	21 Queen begins to lay eggs

Figure 4. *Queen development calendar.*

[2]Calendar taken from: ***Producing Honey Bee Queens In Ohio. A Handbook of Advice and Practical Instruction.*** *Compiled by Ohio beekeepers. (Dana Stahlman, Senior Contributor).* 2011. Ohio State Beekeepers' Association. 30pp.

Figure 3. *Grafted larvae ready for cell finishing colony?*

A perfect nucleus colony has the following characteristics:

1. Properly sized for the existing seasonal climate – not all styles are available commercially
2. Normally queenless until cells installed
3. Generally temporary colony format – only maintained during warm season
4. Require intensive management

Smaller nucleus hives require fewer bees – in some cases hardly one cup of bees, while larger nucs styles require more bees and brood but can withstand periods of cool, rainy weather that is common in early Spring.

The Big Step – Grafting Larvae into Artificial Cups

Most beekeepers can use help the first few times they attempt to graft. If you are working alone, you could choose to graft larvae that you know are too large just to get the feel for moving *any* larvae. As your dexterity improves, progressing to grafting much smaller larvae should be feasible. Know this – the larvae must be small – hardly larger than the egg stage. If it is a large, easy larvae to graft, it is entirely too old. Grafting can be a challenge for many of us, so alternative procedures have been discussed in earlier articles on this subject.

There is no way to learn to graft other than to persevere – try and then try again. Chinese grafting tools that incorporate a sliver of goose quill are popular and inexpensive grafting tools. Alternatively, modified toothpicks, twigs, pieces of brazing rod, or commercially-made tools are commonly used as grafting tools.

Some larvae-grafting characteristics and challenges:

1. Use "grafting tool" to transfer larvae. There are multiple designs from which to choose.
2. Larvae should be one or two days old, no more than three. Eggs can be grafted but are more difficult and specialized to move.
3. Commercial or beekeeper-made cups can be used. For enjoyment, queen cups can be made from molten beeswax, but to be safe, we suggest plastic cells be used.
4. Graft larvae from the breeder colony.
5. Good near vision is necessary. LED flashlights are helpful in seeing larvae.

The small, grafting-age larvae should be lifted from its royal jelly bed and gently repositioned in the artificial queen cup[3]. The larvae should be laid on the same side it was originally on.

There is no getting around it. This grafting step requires practice. Having someone who is experienced give you an idea of the sizes required is helpful but if you have no one to help, know this *(I write this again because it is important.)* – you should be grafting larvae that are very near smaller than eggs.

There are ways to simply this procedure. Next month, I will discuss devices that allow most components of the Doolittle system to be implemented without grafting.

A very personal note

By the time you read this, I will have retired from my position as Honey Bee Specialist for Ohio State University Extension. I would like to be on public record stating that I loved my decades at OSU, Entomology and I will miss being on active status there. However, I will remain active in beekeeping. I plan to continue to interact with Ohio State, other universities and various state and regional beekeeping groups. It is my hope that this transition will allow me to travel and do more of the beekeeping things that I have always enjoyed doing. Please stay in touch as I pass through this transition.

For now,

Jim Tew

Tewbee2@gmail.com

(New social media addresses will come in future articles.)

[3]See YouTube video at: Grafting Bee Larvae – Wendell Honey Farm for a quick look at the grafting procedure. This production is not sponsored or supported by Bee Culture, The Ohio State University, or Dr. James E. Tew.

Pacific Northwest Honey Bee Pollination Economics Survey 2010

Basic info to help you decide what to charge next season.

Michael **Burgett**

Since 1986 the Honey Bee Laboratory at Oregon State University has conducted an annual survey of pollination economics in the Pacific Northwest (PNW). The information from each year of the survey has been made available both regionally and nationally. The information has proved to be most useful to individual beekeepers who generate income from pollination rental, which is the primary source of income for the majority of commercial beekeepers in the PNW. The report for 2010 represents 25 years of summarizing the general state of pollination economics in the PNW. This is the longest running examination of pollination economics for any region in the U.S.

The use of managed honey bee colonies for commercial crop pollination remains the most important function of the PNW beekeeping industry. The vast and diverse agriculture of the region relies on a healthy and strong beekeeping industry to maintain optimum production. An enhanced knowledge of pollination economics is crucial to every beekeeper that enters into the world of commercial crop pollination.

The USDA National Agriculture Statistical Service estimates that there are 92,000 production honey bee colonies in the PNW (Oregon and Washington). With these numbers there are some interesting hypothetical calculations that can be made. For instance, if all growers of crops that require or benefit from managed honey bee pollination in the PNW, were to rent two colonies for each acre of crop that relies on and/or benefits from bee pollination (ca. 350,000 acres), the resulting pollination requirement would utilize 700,000 colony rentals. If we multiply the hypothetical rentals by the 2010 average colony rental fee ($70[85]) it results in a potential pollination rental income of nearly 50 million dollars for PNW beekeepers. If we add to this the estimated 2010 California almond pollination income, available to PNW commercial beekeepers ($25 million), we end up with a potential gross pollination rental income of 75 million dollars. Another way to look at this is by asking the question, 'how much pollination income, under optimized conditions, should have been produced from one commercial PNW honey bee colony in the year 2010?' For 2010 that figure is approximately $815 per hive. Which is obviously unattainable, if for no other reason than the impossibility of one colony being sequentially utilized in all of the necessary cropping systems required to produce such a hypothetical per colony income.

Comparing the hypothetical PNW rental income (50 million $) to the farm-gate value of the crops pollinated in the PNW (2.75 billion $) shows that the money spent by growers to ensure adequate pollination is about 1.8% of the total crop value. This is an impressive illustration of what a remarkable bargain pollination rental is to the at-large commercial agricultural industry of the PNW.

The 2010 pollination survey continues to illustrate the critical reliance of PNW beekeepers on income generated from colony rentals. For 2010 the average commercial beekeeper reported receiving 73% of his or her annual operating gross from pollination rental, which is a slight increase from the 2009 crop year. This percentage shows the dominance of pollination rental income to a PNW beekeeper's financial "health".

Recent increases in the average pollination rental fee have been strongly influenced by the dramatic rise in the pollination rental fees paid by California almond growers. In 2005 almond growers responded to a perceived shortage of colonies by dramatically increasing the price they were willing to pay for pollination; this continued into the 2009 pollination season where the average almond pollination fee was $150[25]. For 2010 the average fee paid for almond pollination was $137[20] which is the first decrease seen in five years; however almonds are still by far and away, the highest rental crop for PNW beekeepers. Almond pollination is a target crop for nearly all commercial beekeepers in the Pacific Northwest and represents the beginning of the annual pollination season.

For 2010 the average pollination rental fee, computed from commercial colony rentals on all crops reported (including almonds), was $70[85]. This is a 21% decrease from the average pollination fee paid in 2009 ($89[90]) (see Table 1). This decrease is strongly influenced by the corresponding decrease in the average fee for almond pollination in 2010. Table 2 provides the average rental fees by crop and a comparison to the average fee received in 2009. For table 2 only crops where at least 3 commercial beekeepers reported rentals are listed.

During the past 10 years the average pollination rental fee has increased from $33[65] (2001) to $70[85] (2010), an increase of 210%. While dramatic gains in pollination fees have occurred, it needs to be stressed that honey bee colony rental was for many decades, an underpaid service to the agricultural industry at-large. It is really only within the past decade that rental fees have begun to more accurately reflect

Table 1. Average Pollination Fee 2001 - 2010

2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
33.65	36.40	36.45	38.65	51.30	73.85	70.65	81.15	89.90	70.85

Table 2. 2010 Average pollination fees as reported by 18 commercial beekeeping operations.

Crop	No. Rentals	Avg. Fee	Fee +/-[1]
Pears	6,239	$45.90	-10.7%
Cherries	14,546	$46.80	-9.1%
Apples	29,433	$49.00	-1.5%
Berries[2]	5,734	$32.25	-16.0%
Blueberries	11,488	$39.60	-6.8%
Vegetable seed	7,345	$55.75	+3.7%
Clover seed[3]	4,027	$44.20	-4.3%
Squash & Pumpkin	2,392	$48.90	+3.4%
Meadowfoam	4,910	$45.25	0%
Almonds	33,738	$137.20	-8.7%

Average Pollination Fee = $70.85

[1]+/- change from 2009
[2]Includes blackberries, raspberries, Marion berries, & Logan berries.
[3]Includes red & white clover as grown for seed.

the enormous value-added service of managed pollination. Figure 1 depicts the average pollination fee paid since the beginning of the PNW pollination survey in 1986.

Within the PNW, tree fruits (apples, pears and sweet cherries) have been and remain the dominant crop types for pollination income. In 2010 the combination of apples, pears and sweet cherries and accounted for 40% of all reported rentals and 21% of all reported pollination income. Paradoxically, the single most important crop for PNW beekeepers is grown in California, *i.e.*, almonds. Almonds were responsible for 27% of all rentals and 52% of all rental income in the 2010 survey (see Table 4). Almonds have consistently produced a high average pollination fee and for the past five years have displayed remarkable fee increases compared to the 2005 average fee of $79[40]: for 2006, $129[20]; for 2007, $137[35]; for 2008, $148[15]; and for 2009, $150[30].

In 2010 the combination of California almonds and PNW tree fruit accounted for 67% of all rentals and 79% of all pollination income, which illustrates the dominance and importance of these crops for a commercial PNW beekeeper (see Table 4). All other PNW cropping systems that utilize honey bee pollination, contributed 21% of the beekeeper's gross pollination income in 2010.

In terms of acreage, apples are the largest crop grown in the PNW (almost 200,000 acres) and this is reflected by the large number of reported rentals (23.5% of all rentals and 16% of the total reported rental income).

The average PNW commercial honey bee colony was rented 2.1 times in 2010 and this includes California almonds. This is a slight increase from 2009. This statistic had been trending downwards since 1999 when the average number of rentals per colony was 2.8. Does this actually reflect the real world situation? Are PNW commercial beekeepers concentrating on almonds and tree fruit (which historically provide the major sources of pollination income) and reducing the number of colonies involved in minor crop pollination? Following almond pollination, are colonies being shifted away from pollination to concentrate on honey production? At this time our data are not able to provide reasonable answers to these questions.

For the 2010 pollination season, an average rental fee of $70[85], combined with an average of 2.1 pollination rentals per colony, results in an annual per colony pollination income of $148[80]. Table 3 displays the data concerning the trends of ever larger individual operations, and the increasing per colony income derived from pollination. With the "average" commercial operation running 3,284 colonies, a hypothetical 2010 gross pollination income for the "average" commercial beekeeping operation in the PNW was $488,660.

Table 3. Average colony numbers, average rental fee per hive, and average annual rental income per hive for a hypothetical commercial beekeeping operation in the Pacific Northwest 1992-2010.

Year	Average No. Colonies	Average Rental Fee	Average Annual Rental Income per Colony
1992	765	$19[25]	$49[70]
1993	990	$22[50]	$62[25]
1994	1,225	$28[10]	$78[70]
1995	1,348	$29[60]	$78[15]
1996	1,350	$31[55]	$97[50]
1997	1,504	$31[05]	$92[20]
1998	1,153	$29[65]	$83[00]
1999	2,058	$32[25]	$89[30]
2000	2,055	$32[85]	$77[40]
2001	3,168	$33[65]	$64[60]
2002	4,255	$36[40]	$63[75]
2003	2,612	$36[45]	$86[40]
2004	3,555	$38[65]	$74[60]
2005	2,055	$51[30]	$112[85]
2006	3,855	$73[85]	$151[10]
2007	3,091	$70[65]	$176[60]
2008	4,800	$81[15]	$154[20]
2009	5,140	$89[90]	$164[50]
2010	**3,284**	**$70[85]**	**$148[80]**

Table 4. Pollination rentals and income by crop type as reported by 18 PNW commercial beekeepers in 2010.

Crop	# Rentals	% of total	Rental Income	% of total rental income
Tree Fruit	50,218	40.0%	$2,408,221	27.1%
Almonds	33,738	26.9%	$4,628,560	52.1%
All other crops	41,417	33.1%	$1,848,992	20.8%
Total	**125,373**		**$8,885,774**	

The combined colony numbers from those commercial beekeepers who responded to the 2010 survey, (59,948 hives), represent about 65% of the USDA's estimate of commercial colony numbers in Oregon and Washington. Therefore, if we divide the total reported pollination income of the survey respondents ($8,885,774) by a factor of 0.65, we have a ball park estimate of the pollination income generated by commercial beekeeping in the PNW in 2010, *i.e.*, a regional pollination income of approximately 13.5 million dollars. This is far more than the "estimates" assigned to the bee industry by agricultural economists, who, for reasons unexplained, usually do not even include pollination rental income in their evaluation of beekeeping economics. Pollination income in the PNW far exceeds the value of honey and wax sales for our regional beekeeping industry. Pollination rental income is frequently four to five times greater than honey and wax sales in any given year. This disparity between pollination income and combined honey/wax sales has increased dramatically, especially in the past few years, concurrent with the impressive rise in pollination rental fees.

The 2010 survey once again asked commercial beekeepers to report the total number of full-time or full-time equivalent employees working for their operations. An interesting way to look at this question concerning the average number of full-time employees, is to ask "what is the colony equivalent," meaning, how many colonies are necessary in order to hire one full-time employee? That figure was very close to 1,500 colonies/employee in 2004 and 2005. The reported "colony equivalent" for 2010 is 960 hives which is little changed from the 2009 "colony equivalent" of 996 colonies. Lower colony equivalent numbers suggest that hives are receiving more intensive management, which ultimately means healthier hives.

While colony income from pollination rental is a critical statistic, so therefore is the annual cost to maintain a healthy hive of honey bees. Numerous commercial beekeepers, who have over the years maintained accurate cost accounting records, have reported colony maintenance costs that are very reasonable relative to today's economy. The average annual hive maintenance cost was $157 per colony for the year 2010. The range in individual responses was from a high of $220/hive to a low of $110/hive. This wide range suggests that beekeepers should try to be more precise in calculating their operational costs. If you can't answer the question of your operating cost on a ***per colony basis***, you should reconsider adjusting your operational accounting system.

For 2010 the average colony maintenance cost is once again higher than the average per colony pollination income. From the 2010 survey data, pollination income was $148[80]/colony and the colony maintenance cost was $157; a difference of $8[20] per colony. This illustrates that the net operational profit needs to be generated by sources of income outside of pollination rental, most frequently, honey production.

In interpreting the average pollination fee for an individual crop

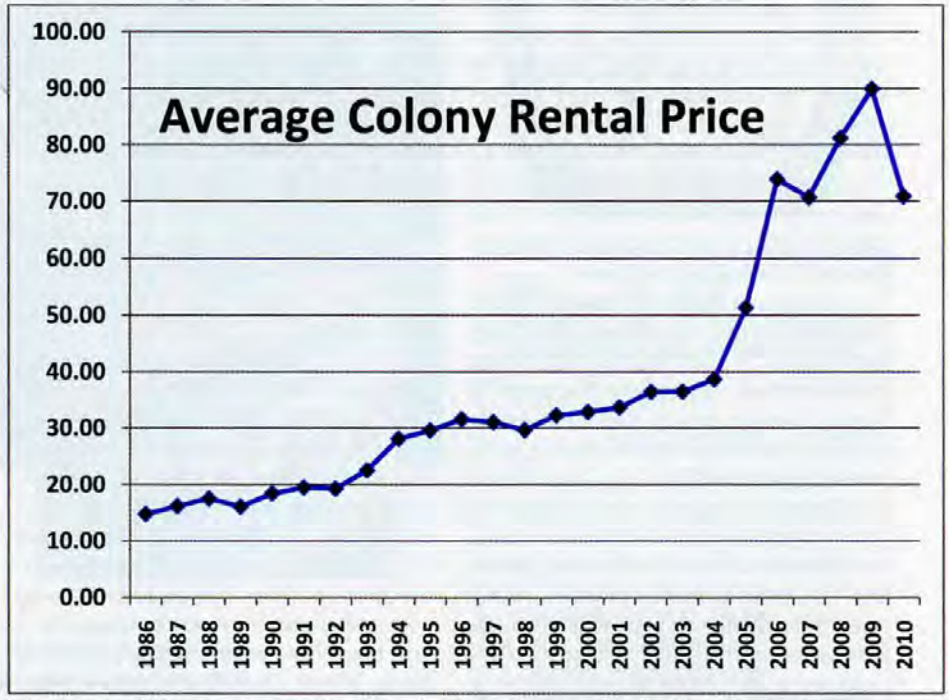


Figure 1. PNW average pollination fee for all crops (including almonds): 1986-2010.

Summary Information - 2010

Number of participating commercial beekeepers = **18**
Number of colonies in the survey = **59,948**
Total colony rentals = **125,373**
The average colony pollination rental fee (for all beekeepers, for all crops including California almonds) was: **$70.85**
The average commercial colony was placed in 2.1 pollination sets in 2010, for an average per hive rental income of **$148.85**

The average commercial bee operation maintained 3,284 colonies and grossed **$488,660** in pollination rental income for 2010.

(Table 2), it is important to recognize that the reliability of the "average" is strongly influenced by the number of reported rentals. The "average" for almonds should be considered very realistic because of the large number of beekeepers and rentals reported for this crop, and such is also the case for tree fruit in the PNW. For this year's survey report, pollination rental averages for crops with fewer than three beekeepers reporting, have been excluded from Table 2, but these low reported crops have been included for computing the average pollination fee for all reported rentals.

It is important to remember that the data presented here represent the pollination rental situation of a hypothetical "average" commercial beekeeper in the Pacific Northwest. For individual beekeepers the survey results are most useful as benchmarks against which they should compare their individual operations. Let it be stressed again that all of these "projections" are only as accurate as the data provided by responding beekeepers. The projections also assume that the participating beekeepers collectively represent the mainstream of commercial beekeeping in the Pacific Northwest.

I wish to again thank all those beekeepers in Oregon and Washington who took the time to participate in the survey, which over the past 25 years, has generated the most accurate assessment of commercial pollination known in the U.S. It has been an illuminating and rewarding activity to track the pollination economic conditions of the Pacific Northwest for the past quarter century. Over the years feedback received from the beekeeping industry suggests that this work has been of assistance to PNW beekeepers in their pollination management and I wish them all ever improving fortune in the coming years. BC

Michael Burgett is Emeritus professor of Entomology at Oregon State University, Corvallis, OR. You can contact him at burgettm@hort.oregonstate.edu.

Inner ... Continued From Page 13

a couple of hours under scrutiny declared darn lucky and sent home. He still has a piece of the wreck sitting on his bureau at home I understand.

I've talked about the Tri-County meeting in Wooster several times on these pages. It started a few years before I got here and has been building steadily ever since. John Root and I went together the first year I was here...they had a couple hundred people attend and Richard Taylor was the guest speaker. Sherry and Jim, Dave and Jim Thompson, and members of the Tri-County group, who meet at Jim's Lab each month, take a year to get this organized, and after nearly thirty years, 1000 or so beekeepers show up in March to get their first beekeeping fix of the season.

We have driven together many, many times to the Southwest Ohio Beekeeper School near Cincinnati – the other BIG beekeeper's meeting in Ohio. We always go in a van, with Sherry, Dave, Jim Thompson, Kathy, myself and various others over the years, heading south to speak, give demonstrations, sell books and drum up business for The Ohio State Beekeepers . . . not all in the same year of course...but it's all in the same memory.

Jim, Jim and Dave and Jim and I worked with Vesta Video and Bob Smith over the years putting together a series called *Bee Culture's* Beekeeping Workshops. We found queens, read frames, harvested honey then extracted it, opened colonies and lit smokers – a host of fundamental how-to films for beginning and somewhat experienced beekeepers. I still have the set of originals of those films. When I'm old and gray – wait, I'm already old and gray – I'll dig them out and relive the past, again.

Because Jim primarily has an Extension appointment, and not much Research or Teaching, his funding is always in jeopardy, and each year it seems it gets smaller as The Ohio State University puts less emphasis on that part of University service and more on hard science. So for years the lab has subsidized their income by having a seasonal honey sale, selling honey harvested from the lab's bees, and some brought in for varietal flavor, at the University campus in Columbus and Wooster. They made enough each year to pay for the extras that the regular budget didn't cover – truck repair, tools, beekeeping equipment and the like. But to make this work volunteers are needed – Sherry does most of the work from the lab dealing with sales, but the bottling and hauling and selling on site always needed several people to help, and they needed others who could travel to Columbus and spend the day chatting and selling and filling and hauling and bagging and filling again. They were busy, hectic days and evenings to look forward to each Christmas season, and though we didn't get to go often enough, it was always a great way to spend days or nights helping out.

Well, state budget cuts have finally got the best of the University, and this year both Jim and Sherry were made retirement offers they could not afford to turn down because it would only get worse later on. Take the best you can get and make the most of it, is the phrase and they both have. Retired. Finished. Done. Gone from University life.

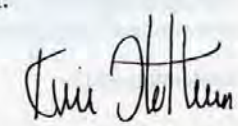
And, with the foolish way Ohio politics goes, they won't let either Jim or Sherry come back and work in some other capacity to help out, to smooth a transition, to close the doors or turn out the lights.

Sherry has had some family issues that have taken an incredible amount of her time this year, so that's not such a bad thing for her right now, but she has connections and ties and isn't eager to let go of everything just yet. She'll be back in some capacity, fired up as always, looking for something to do, we're sure. There's just too much energy there to keep quiet.

Interestingly, that tornado thing last Spring, which trimmed down a lot of what the lab used to own, has made this somewhat easier, but not easy. Jim isn't going to stop writing for us which is a very good thing, and he's still dealing with his part time Alabama appointment, but that, too is being looked at. And then there's all the grandchildren he has now...eager, active little people who need the attention of a humorous old guy who spends a lot of time out in the wood shop.

But soon, I'll get him to tell you about that mouse. It's a great story. You'll laugh until you fall out of your chair. I promise.

Thanks Jim.



Barbara **Boyd**

A Taste Of Honey . . .

Using Sensory Analysis To Evaluate And Market Your Honey

Fruity, flowery, smoky . . . How would you describe your honey? Good? Sweet? Good to you might be sickeningly sweet to someone else. How about lime with a hint of mint or Jordan almonds and vanilla? A sommelier has the technique to analyze and evaluate wine and the vocabulary to describe it; with sensory analysis, beekeepers and honey aficionados can do the same with honey.

Whether choosing a new car or an apple at the market, most of the decisions we make are influenced by input from our senses, which give us the information necessary to decide if something is pleasing or not. Sensory analysis, also called sensory evaluation, uses perceptions based on sight, hearing, smell, touch and taste to evaluate honey. Whereas chemical analysis makes sure food meets FDA standards, and microscopic analysis, specifically of pollen content, determines botanic and geographic origin, sensory analysis is a part of quality control – quality being the combination of characteristics that make a product satisfying. It's used to identify the plant origin and determine if the honey is free of defects. And, perhaps most importantly, to simply determine which honey you like. Sensory analysis can be an effective tool for promoting and adding value to your product. Offering guided tastings at tradeshows, markets, fairs or privately organized events is a compelling way to teach consumers how to discern and appreciate the honey you have to offer.

Before the 1960s, traditional sensory analysis was conducted by an expert, a person who had applied experience. The "Principles of Sensory Evaluation of Food" (Maynard A. Amerine, Rose Marie Pangborn and Edward B. Roessler, June 1965) established the technique used for scientific, professional, and technical evaluation, and the text is still used today. Rather than rely on the expertise of one person as in the traditional method, the modern method uses groups or panels for sensory analysis and generates repeatable results. In the Autumn of 1978 and the Spring of 1979, following the technique used for wine tasting, Gabriel Vache, a beekeeper, and Michel Gonnet, a tasting expert, organized the first honey analysis seminars in France. A year later, after perfecting the method to assure an objective analysis, a third seminar was held in Italy. More than 30 years later, the sensory analysis seminars have evolved into a three-part course totaling 60 hours that includes an exam, which entitles those who pass to membership in the National Board of Experts in Sensory Analysis of Honey (Albo Nazionale degli Esperti in Analisi Sensoriale del Miele). Members' activities include giving guided tastings and judging honey competitions. This article won't make you an expert, but it can provide a starting point to practice in your own apiary.

Let's take a look at how we use our senses for evaluating honey. The words "taste", "tasting" and "taster" are used throughout for simplicity's sake but sensory analysis uses all the senses, not just taste. For a consumer tasting is subjective – it's about pleasure, liking or not liking something. With sensory analysis we go beyond good or bad and learn to objectively describe the honey being evaluated. By practicing and memorizing the characteristics of different unifloral honeys, we educate our senses, and then use those memorized, repeatable parameters to evaluate other honey. You might think that you have to have an acute sense of smell or extra-sensitive taste buds, but the truth is, like learning a language or musical instrument, it's more about training and practice than prodigy.

The analysis begins with sight. A few spoonfuls of honey are put in a balloon-shaped wine glass. This allows the taster to hold the glass by the stem without covering the honey. Honey can't be analyzed by sight alone, but it is an important parameter to be considered. For example, something's suspicious with a dark, crystallized honey that has been labeled as acacia, and bee parts floating in the honey make for a hard sell. Hold the glass by the stem and observe the following three visual characteristics:

Physical state – is it liquid or crystallized (solid)

Aspect – note everything that isn't the color: impurities, foam and for liquid honey, the limpidity or turbidity; for solid honey, the crystal size and homogeneity

Color – the intensity: very light, light, medium, slightly dark, dark, very dark, and the tone: champagne, wheat, beige, light yellow, dark yellow, orange, red, light brown, brown.

After sight, comes smell. This is the most important step. Experts can determine the type of honey based on its odor and then confirm with taste. Warm the glass in your hands and smear the honey around the sides with a spoon or tasting stick; this helps release the volatiles. Sniff the honey without inhaling too deeply. Before describing the odor itself, consider the intensity. Is it weak, medium, or strong? Then go on to describe the odor. The first reaction is often "smells like honey" or "smells sweet". Sniff again, a bit deeper this time, maybe it's floral or warm. Try to name what it smells like for you then refer to the odor and aroma wheel (Figure 1) to develop a descriptive vocabulary. The odor and aroma wheel offers a common vocabulary for honey tasters although each taster also uses personal descriptions that help memorize a honey. When I smell fir honeydew honey, it smells like Christmas, whereas to describe it to someone else, I'd use descriptors such as pine resin or balsamic. Dandelion honey smells like cat urine, it's unmistakable. Canola honey smells like

Smelling the aroma.

sauerkraut. We use these distinct descriptors to memorize and identify those honeys, but to a consumer, we might describe canola honey as astringent, since sauerkraut honey isn't much of a selling point. To many dandelion honey is lemony! If your nose gets overwhelmed, sniff your sleeve to reset your olfactory sensors; your own scent acts as a neutralizer.

There are two parts to the third step, technically called olfactive-gustative but for simplicity, aroma and flavor. Aroma follows the descriptors on the aroma wheel whereas flavor comprises the qualities of sweet, bitter, acid, and salty. Consider how our senses function. The tongue is divided into four areas each sensible to a specific flavor: bitter – at the back of the tongue, acidic – on the sides in front of bitter, salty – on the sides in front of bitter and sweet – on the tip of the tongue. Try to taste the honey with all parts of your tongue to pick up on each of the four flavors. Aroma is what an odor tastes like. Anatomically, we can't detect aroma without the sense of smell, think of how you can't taste food when you have a cold. If you hold your nose while the honey is on your tongue, you can't perceive the odor or aroma. Let go, and whoosh, the odor and aroma come rushing in.

To proceed with the analysis, with a spoon or tasting stick, scoop a bit of honey and put it in your mouth. First, notice the initial flavor impact, is it sweet, acidic or sour; then identify one of the seven groups on the aroma wheel and finally notice the fine points. Take notes to help you remember this type of honey. Rest a moment, drink some still water or eat a slice of a bland apple to clean your taste buds, then smell and taste it again to confirm what you found or identify finer characteristics. Grade the intensity, persistence and aftertaste of the honey. How long does the flavor or sensation linger in your mouth? Does something else arrive after you've swallowed?

Sweet and sour or acidic are always present in honey. Sweet is classified as slightly sweet, normally sweet, and very sweet (almost sickeningly sweet, like powdered sugar). Acidic or sour, on the other hand, is either absent, weak, medium or strong. The two are perceived together. Citrus honey is normally sweet with an acidic level that can be weak to medium, whereas, acacia honey is very sweet with a medium or normal acidic level.

The same vocabulary is used for bitter: absent, weak, medium and strong. The bitter taste tends to become more evident in the aftertaste. It's difficult to say that honey tastes salty although the term is used but it indicates sapid or savory, similar to the taste of molasses.

In addition to the taste and flavor, tactile perceptions are communicated through the tongue. We consider the consistency, granularity and temperature. A liquid honey can be defined as very fluid, normally fluid or viscous, while a crystallized honey may be soft, pasty or compact. Crystallized honey merits a description of both the size and shape of the granules. Are they fine, medium or large? Round, sharp, easily dissolved? (The sense of hearing could be added here with the sound that chewing large crystals makes although it isn't something that's noted.) The consistency often determines the perception of temperature. Smooth honey with a fine crystal creates cool or refreshing sensation in the mouth and liquid honey tends to give a warm sensation. Honey that is very acidic may cause an astringent sensation. A metallic taste or sensation is considered a defect; not that the honey is necessarily non-comestible but it's not a desired quality.

Aside from identifying the botanical origin of honey, sensory analysis is useful for evaluating honey quality. Fermentation takes place when naturally occurring yeast combines with a water content higher than 18 percent. If there is a high level of yeast in the honey, it may ferment at 17 percent. The honey will smell like ripe apricots or alcohol. If fermentation has just begun, it can be a pleas-

ant fragrance and difficult to detect. Odors absorbed from poorly timed thymol treatments, old moldy frames, overuse of the smoker or from the environment where the honey was stored detract from the honey's quality as well. In each of these cases, there's not much you can do to salvage the ruined honey but the lesson is learned for future honey harvests. Visual defects such as non-homogeneous crystallization or liquid floating on top of a crystallized mass won't affect the flavor of the honey but they make the honey less attractive to a consumer.

Sensory analysis is a great marketing tool. Honey consumers tend to be interested in the beekeeping process and have fun at guided tastings. Consumers are more likely to buy something they know more about. Ideally, the tasting takes place in a well-lit room with less than 60 percent humidity and a room temperature between 68 and 72°F. Still water and bland apples should be avail-

Ideally, the tasting takes place in a well-lit room with less than 60 percent humidity and a room temperature between 68 and 72°F. Still water and bland apples should be available to clean the taste buds between one honey and the next.

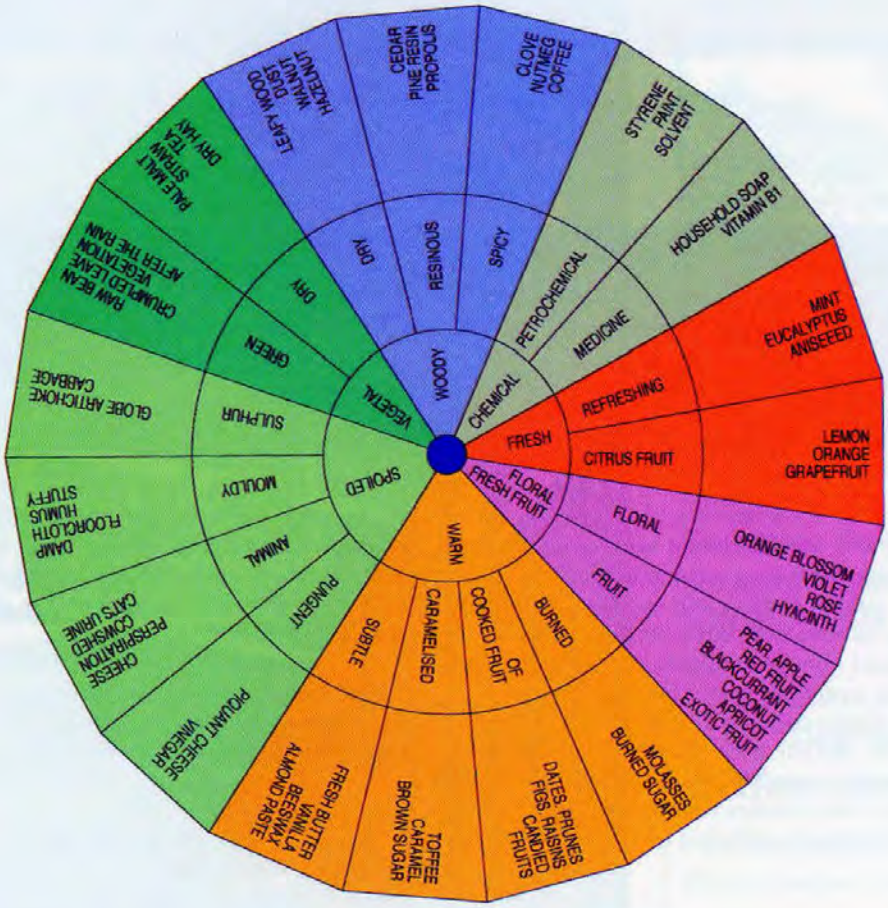


Figure 1. *Odor and aroma wheel. Sensory evaluation of wine, beer, coffee, chocolate, cigars, and water use odor wheels to describe the product. Groups of odor classifications fan out into subgroups, and the final outer circle gives descriptors. The honey descriptors were developed by Étienne Bruneau, Christine Guyot-Declerck from the Centre Apicole de Recherche et d'Information in Belgium and tested by the International Honey Commission (IHC).*

HONEY DESCRIPTIONS

Honey	Acacia	Canola	Citrus	Lavender	Linden	Thyme
Sight						
Physical State	liquid	crystallized/solid	crystallized	crystallized	crystallized	crystallized
Aspect	clean, limpid	homogeneous	large, grainy crystals,	homogeneous	homogeneous, large crystals	compact
Color	almost transparent, champagne	light beige/old ivory; amber in its liquid state	light beige, can also be white; transparent to light yellow in its liquid state	ivory, light beige	light beige, pearly; clear amber with green highlights in its liquid state	light brown; dark beige with orange pearlessence in liquid state
Odor						
Intensity	weak	strong	weak to medium	medium	medium	medium to strong
Description	warm, vanilla, Jordan almonds, powdered sugar	vegetable, pungent, propolis,sauerkraut, wet paper	floral, fresh, orange blossom; as it ages, becomes fruity, orange marmellade	floral, fresh vegetables, fig leaves, incense	fruity, fresh, bergamot, lime, mint, linden tea	proteic, both floral and spicy, clove, magnolia, grafite
Aroma						
Intensity	weak	strong	medium	medium	strong	strong
Persistence/Aftertaste	weak	medium	weak	absent	strong; if pure, bitter aftertaste	medium
Description	vanilla, Jordan almonds, corresponds to fragrance, sometimes irritates the throat	sauerkraut, vegetable	citrus, corresponds to fragrance, lightly acidic at the end	fresh, fruity, lavender flowers	fruity, lime, green apple, balsamic, herbs	spicy floral, pungent, potpourri-like, grafite
Flavor						
Sweet	very	slight	normal	normal	normal	normal
Salty						slight
Acidic/sour		slight	slight	slight		
Bitter					slight	
Other sensations (refreshing, astringent, burning, metallic)			fresh	refreshing	astringente	
Tactile						
Consistency	liquid	velvety, smooth	compact	homogeneous	very compact	compact
Crystals	none	very fine	large	very fine, round smooth	large but soluble	irregular
Origin						
Botanic origin	Robinia pseudoacacia L.	Brassica napus L.	Citrus spp.	Lavandula spp.	Tilia spp.	Thymus capitatus

able to clean the taste buds between one honey and the next. I host events with a professional beekeeper. We give a brief introduction to honey production then take the guests through a guided tasting. We concentrate on the types of honey we have to sell, but I try to have a couple of the more unusual honeys available to give guests an idea of the variety available even though we don't sell them. We also do what's called a Triangle Test – a "one of these honeys is not like the others" activity where three honey samples are presented, two are the same and one is different. We pick two honeys that are similar in color and consistency to make it confusing but the participants usually enjoy it.

Some of the more common honeys are described in the chart using the vocabulary referenced above. Use this as a reference tool and begin to keep a honey tasting log for honeys that you harvest and taste. BC

Barbara Boyd is a member of the Italian National Board of Experts in Sensory Analysis of Honey and keeps a few hives in the hillsides of the Calabria region in southern Italy. Her blog is ***http://honeybeesandolivetrees.blogspot.com/***

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A Single Clover

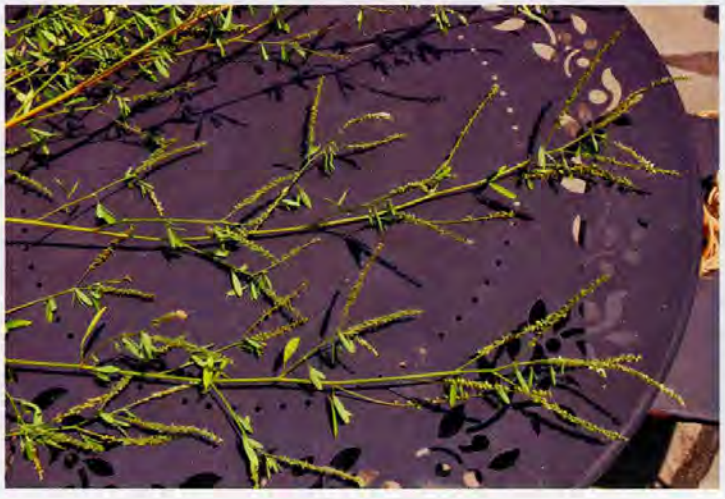
White flowered *Melilotus alba* Medik was introduced from Europe and Asia in early 1664, and was (and often still is) considered a weed because it occupies neglected fields and roadsides. It is found in all 50 states.

Larry **Connor**

Last Summer a single white sweet clover plant germinated outside my spare bedroom window. Where and when did the seed arrive? Who knows, but between my receiving gifts of clover seed, a 30-year germination potential and the fickle nature of suburban Michigan, it happened. During one of my rare frenzies of weeding I held the young plant in my hands to pull out by the roots, but my inner beekeeper won out over my active gardener, so I let it grow to see what happens. This Spring it was quick to green up, since it was next to both the foundation of the house and the outside furnace/air conditioner unit, with full South exposure. I can only suspect that it was a perfect place for such a plant, for by June it grew to the top of the roofline. When it started to flower in mid June it attracted a huge number of insect pollinators, from honey bees (of course) to potter's wasps and a full range of solitary bees, many of them quite small in size. Normally the plants grow four to six feet in height.

The plant shaded the bedroom window as well as any shrub, providing diffused light. I gazed at the plant's growth and pollinator activity through the window holding my first cup of coffee on rare quiet mornings at home. In July a significant storm with 75 mph straight-line winds flattened many flowers in my garden, and the clover plant was pushed against the nearby roses. That did not stop the pollinators, as they reached the flowers as well as before.

This single plant has kept my mind working. It is beautiful to watch grow so rapidly and I like the way it screened the window until the storm hit. I enjoy seeing so many insect species visiting its tiny flowers (but not all of us worked on degrees studying insect pollination). It makes me wonder so much: Why are these plants not sold next to the snapdragons and petunias in garden centers? Why doesn't Wal-Mart (and all the other box stores) sell flats of sweet clover plants for gardeners who appreciate bees and other pollinating insects? Why don't beekeepers pass out these seedlings by the tens of thousands at farm markets and urban gardener meetings? How many of these plants would a suburban yard support and provide an endless amount of fascination and scientific inquiry while fixing nitrogen for the plants nearby? And perhaps just as important, how much honey does one such plant produce over its blooming period?



Technically sweetclover is not a true clover, but a related member of the Leguminacae family, that huge group of plants with flowers that are often highly attractive to bees due to their large nectar and pollen production. Yellow-flowered *Melilotus officinalis* Lam has a shorter growing period and is a bit more branched than the white species. It is more drought tolerant and is well suited for conditions in North and South Dakota and surrounding states where rainfall is limited. I have been amazed to find it growing out of cracks in the rock along the Salmon River in Idaho, where annual rainfall is less than five inches per year. (The long taproot is clearly how it survives). When the two species grow in the same region, the yellow-flowered sweetcover blooms before the white-flowered plants. With some selection for different varieties within the white sweetclover it is possible to extend the blooming period. Yet I have not found a source for 'mixed' white clover seed containing different varieties.

White flowered *Melilotus alba* Medik was introduced from Europe and Asia in the early 1664, and was (and often still is) considered a weed because it occupies neglected fields and roadsides. It is found in all 50 states. Around 1900 it was discovered for its potential use for hay, pasture and silage, and the popularity of this plant exploded. Beekeepers were able to produce large crops of honey in many parts of the United States where the plants enjoyed a period of extreme popularity with farmers. These may have been some of the largest honey crops ever produced. Those plantings are largely gone, with the fields supporting field corn and soybean production. In the Midwest, it is rare to find a recently abandoned field filled with either white or yellow sweet clover.

As a legume, and when inoculated with the proper bacteria, sweet clover supports nitrogen fixation as the nodules form on the roots. A vigorous two-year planting will produce as much as 100 to 120 pounds of nitrogen per acre. Where sweet clo-

ver is still used by farmers it is often for its value as a nitrogen source. It is also plowed under as a green manure plant. Maybe some of this culture fits into the more organic, local food producers?

Sweet clover responds well to the addition of lime. It does best at a soil pH of 6.5 or higher. It does the best in full sun, and grows in hot and cold climates. Young plants cannot tolerate flooding, but generally grows very well in abandoned fields, pastures and prairie communities.

Sweetclover is an excellent wildlife cover crop, and is grown in game and wildlife conservation areas, often in disturbed soil. Quail, grouse and ring-necked pheasants eat the seed. It provides nesting materials for ducks and a wide range of birds. Small mammals also eat the seed. The growing plants provide forage for deer, elk and antelope, depending the region. So while some clover and hay producers consider white sweet clover an invasive weed and potential seed contaminate, the beekeepers, hunters and wildlife enthusiasts are promoting and planting this exotic import.

How do you grow sweet clover?

Seed is often broadcast at the rate of 10 to 15 pounds per acre into Fall planted small grains in the late Winter before the period of Spring freezing and thawing. The freezing-thawing cycle covers the seeds. It is also drilled into the soil at a depth of a half-inch during late Summer, but this usually yields less than the spring seeded sweetclover due to the exposure of the seedlings to Winter soil heaving and exposure. Once the fall planted small grains are harvested the sweetcover plants are able to grow profusely. They may be used for a hay crop, used for grazing, or left alone – depending on the variety used.

Seed must be scarified since new seed is 50 to 80% hard seed and, alive in a tough seed coat, may not germinate for up to 20 years! Seed producers scratch the surface of the clover seed so moisture can reach the plant embryo inside.

The smell of fresh-cut hay

Perhaps you grew up on a farm, or you have spent time on a farm, and you know the sweet smell of newly cut hay is amazing. There is a source of the sweet odor of freshly mowed hay, and one of the key components is a compound called coumarin (not to be confused with coumadin). This is a sweet-smelling plant substance, a benzopyrone that is in sweet clover. Used in perfumes, and the source of the *sweet* part of the name. Once used as a tobacco and drink flavoring, it has been found to have a toxic effect to on the livers. There is an initial aversion, since high levels of coumarin are produced by plants to discourage feeding upon by animals. Once they have fed on the plant, they continue, adjusting to the taste.

Coumarin has no anti-coagulant properties, but a number of naturally occurring fungi transform the molecule into dicomarol, and is the cause of "sweet clover disease" in cattle after feeding on moldy sweet clover silage. Pharmacists have taken coumarin and used it to produce dicoumarol, especially warfarin (Coumadin) for use both as a blood thinner and as a potent rodenticide by causing the animal to bleed to death.

Plant breeders have selected strains of sweetclover that posses a lower coumarin concentrations. The yellow-blossomed Norgold was released by Agriculture Canada as a low-coumarin variety, and is recommended for animal feed. The white-flowered equivalent is Polara, released by Agricultural Canada in 1970.

Annual sweet clover

Most of the sweet clovers, both yellow and white, are biennial, growing only leaves the first season and then flowering the second season, after which they die. There was early interest in the development of a single season, or annual sweet clover, called Evergreen. The Ohio Ag Experiment Station produced it in 1935. Seed may be hard to find, but it was popular with some beekeepers due to its later and prolonged blooming period.

A few thoughts about my one plant

I crawled into the tangled mass of sweetclover and roses and made these very non-scientific observations:

The plant consisted of 25 separate stems coming out of the ground. I interpret the significant growth rate as the advantage of the plant taking two years to develop over one – it can produce more floral structure and more seeds.

Each stem had about 15 side stems plus a terminal area. The side stems almost all had three flower spikes, and the there were about 10 flower spikes at the tip of each stem not growing on a side stem. That is 55 flower spikes per stem. If there are 25 separate stems, this yields 25 x 55 or about 1375 flower stems on this plant. Note: The flower development of this plant was determinate – meaning that only a set number of flower spikes were produced on each plant. With more rainfall, I doubt more flowers would develop, certainly not that the terminal growth points of the plants. If grazed upon or cut by a farmer it would produce new growth if done before seed has occurred. My plant produced flowers and bee food for about four weeks, but the weather was hot, and pollinator activity strong. If the bees and other insects cannot visit the flowers, they hold on until the weather improves. This has save many honey crops for commercial beekeepers after a cold early Summer.

Seed and flower counts on each flower stem ranged from 45 to 85 individual florets or seeds, taking a midpoint of 65 potential seeds per spike, that gives us (1375 x 65) or just under 90,000 seeds from this one plant. One reference (see below) stated that there are about 260,000 seeds in a pound of sweetclover seed. That means that my plant produced about a quarter pound of seed, making me think I should harvest it.

Clearly a more detailed set of observations is needed, and I suggest that my plant is at the far high extreme of average.

Why promote sweet clover?

1. It is an excellent nectar source, and when someone asks, "what can I do to help the bees?" tell them to plant sweetcover or another appropriate clover for their location. Of course we want our honey bees to visit sweet clover, but the plant is very useful to a wide range of pollinating, nectar-feeding insects, including butterflies and solitary bees. Remember, sweet clover grows in all 50 U.S. States and much seed is produced in Canada.

2. It is good forage for animals, including cattle, goats, horses, rabbits and sheep, providing them with about 10% digestible protein. Wild deer, antelope, elk and mule deer graze on the plants enthusiastically.

3. Birds of many feathers use the plants for food and nesting materials. It is a good blind for birds to hide.

4. The plants develop deep taproots and can survive in very marginal areas, including old gravel pits and areas where coal has been strip-mined. Like other Legumes, the sweet clover helps fix nitrogen and thus improve the soil. The plants may also be used as a green manure plant. The long taproots penetrate the subsoil and increase soil aeration and water adsorption.

5. Because of the coumarin, the plants do not taste very good to many plant feeders. When used as forage, there is not risk to grazing animals, but when exposed to certain molds in siliage it can be fatal to cattle. So leave it in the natural state. Use of the low-coumarin varieties like Norgold and Polara reduce the risk to animals.

There is a lot of confusion in the minds of beekeepers about sweet clover. I used two references that I recommend. They both provide clear detail about culture of the plants as well as lots of additional information of potential use to your farmer and small-plot gardeners. BC

1. YELLOW SWEET CLOVER & WHITE SWEET CLOVER Melilotus officinalis (L.) Lam. & M. alba Medik, United States Department of Agriculture, Natural Resources Conservation Service Plant Guide **http://plants.usda.gov/plantguide/pdf/pg_meof.pdf**
2. Dwain Meyer, Sweetclover Production and Management, R-862 (Revised) September 2005, North Dakota State University Extension Service. **http://www.ag.ndsu.edu/pubs/plantsci/hay/r862w.htm**

*For books written by Dr. Connor, and for popular beekeeping books, consult **www.wicwas.com**.*

Thoughts On DRONES

The hive that is able to conserve and make the most efficient use of the sperm collected by the queen through the sacrificing of drone larva and unfertilized eggs when a reduction in the brood nest is necessary, is the colony that is more likely to reach its fullest potential during its lifetime.

Ross **Conrad**

There is more to the male honey bee than we tend to give him credit for . . .

A parasitic loafer, or one who lives off the work of others; these definitions of a drone from dictionary.com seem, at first glance, to apply appropriately to the male honey bee. Unequipped with a sting, corbicula (a.k.a. pollen baskets), or wax glands, the drone does not contribute to the busy work and defense of the colony. Content with letting his sisters take care of all the chores of the hive and provide him with food, the male honey bee is free to focus on the important task of mating with a virgin queen, whether during her "nuptial" flight following the issuance of a swarm emergency queen rearing procedures to replace a killed or injured queen, or in a queen production operation. Just as the worker bee sacrifices her life when defending the colony with her barbed sting, the drone bee sacrifices his life when successfully mating with a queen. A climactic end to an apparently mundane existence.

Depending on your location in the Northern areas of the United States, September through November will herald the end of the season's drones with what Maurice Maeterlinck called in his book, *The Life of The Bee*, "the massacre of the males." Denied access to the food stored up for Winter, the drones in their weakened state are unceremoniously pulled, pushed, and shoved out the hive's entrance and barred from returning by the ever vigilant female guard bees. The honey bee long ago learned the lesson and value of cooperative living which greatly increases a group's ability to survive as compared to the efforts of an individual trying to make a go of it alone. As a result, the drones deprived of the collective efforts of the group die within a short time and it is only the female workers and queen that live through the Winter. There also seems to be a good lesson in there somewhere for the individual who does not contribute actively to the group's work load and leaves all the effort to others.

It's common for the bees to fill holes in regular comb with drone comb.

The "massacre" that occurs in each bee hive just prior to the long dearth of Winter is perhaps the most dramatic of examples that illustrates the important role that the male honey bee plays in addition to mating with the queen. For the humble drone is to the hive, as the tail is to certain salamanders who can make their tails fall off when it is in the clutches of a predator, allowing them to scramble off to safety and regenerate a new tail over time. The sacrificial role that is embodied by the drone should not be overlooked in its importance in helping to increase a colony's resilience in the face of adversity since the male honey bee may not only choose to end its life in sacrifice through mating, but may potentially be sacrificed by his sisters from the beginning of his existence as well.

Observe the brood in a hive and you will notice that the drone brood tends to be located on the outer edges of the brood nest. In Langstroth style hives this means that most of the

Drone brood cells are generally found on the periphery of the brood next, as on the bottom of this brood frame.

drone brood will be found along the bottom or sides of the comb. In top-bar hives where the bees are allowed to build their comb without foundation, frames of drone brood will tend to be found between the honey and pollen frames and the rest of the brood area, in effect insulating the frames of worker brood from potential temperature fluctuations that may work their way into the brood area from the outside.

The placement of drone brood around the outer edges of the brood nest rather than being more centrally located is a strategic choice that the hive makes. This decision insures that should the hive experience a period of cold weather and the cluster must contract in order to conserve heat and maintain the brood nest temperature at around 94-95°F, it will be the developing drones rather than the worker brood that will be exposed, get chilled, and die. An additional form of sacrifice that the male bees may be forced to make during their initial development stages comes during times of low food availability. It is during times of nutritional scarcity that the unfertilized drone eggs, and developing drone larva tend to be the first to be cannibalized by the workers in an effort to conserve and recycle protein and nutritional resources within the colony when there is simply not enough food to maintain the existing colony.

The instinctive urge to raise drones during the swarming season when conditions are favorable serves to improve the colony's chances of survival, as well as provide males to mate with new queens. The instinct to raise drones is so strong that in hives where the bees are allowed to build comb naturally without the use of foundation as a guide, as much as 30 percent of the comb may end up being composed of larger drone-sized cells. This is in sharp contrast to the typical Langstroth-style hive filled only with foundation which is embossed with worker sized cells. In a desperate attempt to find a place to raise drones, such a hive will build drone-sized burr comb between the top bars and bottom bars of the frames in adjacent supers or hive bodies. This is the reason that the larva exposed between the frames when two supers are separated is almost always drone larva. On average though, a healthy colony devotes about 15% of its brood rearing area to productive drone comb.

As beekeepers, we tend to focus on the workers and queen who are responsible for the production of comb, honey, and brood. When we overlook the drones, or treat them as an inconvenience and not make adequate accommodation in the hive for raising them, we are not only denying the colony the ability to naturally express itself, we also may be limiting that colony's ability to respond effectively to thermal and nutritional stress. Without unfertilized male eggs and larva to sacrifice, a hive undergoing such stress would end up using up the precious sperm that the queen stored during her mating flights at a greater rate. Such sperm is a commodity that a hive is unable to obtain more of without going through the risky and uncertain process of queen supercedure. The hive that is able to conserve and make the most efficient use of the sperm collected by the queen through the sacrificing of drone larva and unfertilized eggs when a reduction in the brood nest is necessary, is the colony that is more likely to reach its fullest potential during its lifetime.

Rather than solely focusing on the limited role of the drone as the provider of male DNA during mating, holistically oriented beekeepers will keep in mind the more common sacrificial role that the drone has within the colony. Drones that survive to maturity rather than get cannibalized or die prematurely, get a chance to sacrifice themselves in the process or mating. For those drones that survive their developmental days and do not manage to mate with a queen and are still alive when the colony is preparing for winter, being unwillingly ejected from the hive to die becomes the male's ultimate sacrifice on behalf of the colony.

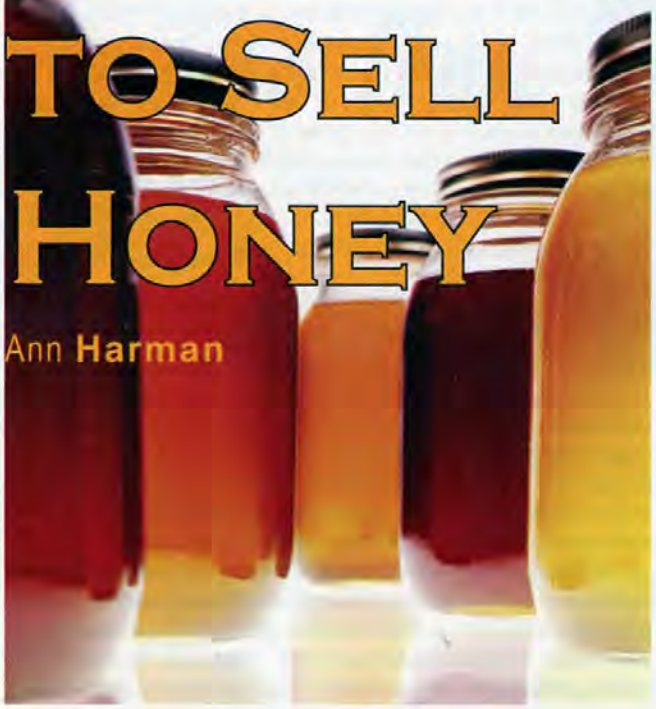
One way to honor the sacrificial role of the drone is to position frames that contain significant amounts of drone comb on the outer edges of the brood nest. Such frames would include drone comb used to attract and remove *Varroa* mites from a colony, or damaged frames that have holes in the comb since repairs to the comb are likely to be fashioned out of drone-sized cells rather than the worker cells most often found in conventional Langstroth hives outfitted with nothing but frames of foundation embossed with worker-sized cells.

Like the chess player who recognizes the value of the pawn despite its limitations and takes full advantage of the various qualities and attributes of these pieces in order to win the match, beekeepers may do well to consider utilizing drones in ways that mimic what the bees will do naturally. Long-time readers will be familiar with the *Varroa* mite trap that I built years ago at a time when I was not comfortable purposely killing sealed drone brood in order to reduce *Varroa* levels in my hives. The more I consider the way a hive naturally sacrifices the relatively few drones in their population when necessary in order to help ensure the survival of the much more numerous workers and their queen, the more comfortable I become with the concept of culling some of the drone brood from a hive when necessary in order to kill the *Varroa* mites reproducing in the sealed drone cells. BC

You can reach Ross Conrad at ***dancingbeegardens@hotmail.com.***

It's Time to Sell Honey

Ann Harman



You just turned a page on the calendar and saw – September. Where did the Summer go? Autumn is on its way. It will be here officially in a few weeks. Market trends as discovered by the National Honey Board have shown that people buy honey in Autumn and Winter. Summer is probably the time of year when the least amount of honey is used in the home. I guess colder weather brings the sniffles and sore throats that need the soothing care of honey, even though honey should be used throughout all the seasons for many reasons. Those who have been drinking ice tea (and didn't use honey to sweeten it) have switched to hot tea where honey seems the perfect sweetener.

Guess what? September is officially National Honey Month! A perfect time for you to increase your honey sales and do some honey promotion. In some ways honey does sell itself. It's a pure, natural product. But there are still many people out there that do not understand that honey is honey, nothing else, nothing added. The problems of honey bees seem to be well known throughout the land but many are still scared of being stung when they see or hear a bee. Any time or place honey bees can be promoted as beneficial, helpful, important, and gentle is a perfect opportunity for beekeepers to reach out to the non-beekeeping public.

You need to take advantage of the information produced by the National Honey Board. Just go to **www.honey.com** and spend a few minutes cruising through the site. There you will gain some honey facts; find out what makes a legal label; see useful promotional material; print out some recipes; and have a very good time indeed.

To help you for National Honey Month the National Honey Board can send you a Media Kit that you can take to your local newspaper and radio station. Perhaps you have visited there before. That means those people are familiar with you, your bees and your honey. If you have never visited those two it is very important that you go, with container of honey in hand, and introduce these people to the wonders of honey.

If you belong to a local beekeepers association perhaps several members can go with you. Now your local media know that beekeepers really do exist in the area. You have laid the groundwork for future media coverage – your meetings, activities, work with 4-H or other youth groups, and participation in the local farmers' markets. Be sure to take with you a copy of your club's newsletter, if it has one, and your honey business cards.

Since this may be the first year you are being prodded to celebrate National Honey Month you can probably think of a few things you could do in your community for educating the public and increasing their interest in using honey.

Have you ever been contacted by the service organizations (Lions, Rotary, etc.) in your area? If not, you might wish to contact them. Let them know it is National Honey Month and see if you can create an interest. You need to contact the local Garden Club and Master Gardeners. This time you can mention conservation and pollination but keep the emphasis on honey and its uses. Yes, their schedules may well be too filled to do anything about National Honey Month. Now what you need to do is start making a list of people to contact, and when, *for next year.*

The National Honey Board has some very attractive pamphlets for children. Small private schools would be happy to have a real beekeeper come and talk about honey and give out honey stix. Don't forget the home schoolers. They are always very enthusiastic to hear about honey and honey bees. The pamphlets are quite inexpensive so you could order plenty for handouts.

You may well find that the Honey Month activities you have thought of are just too much to do at this late date. It is already September, after all. But now that you know that September is always designated National Honey Month, there is a whole year to make plans for next year.

Next year can be the year to have a Honey Festival in your area. You will find these occurring around the world and in some places in the U.S. Planning and making a Honey Festival is a big job. If your local association is small and hesitant to take on such a big event, ask a neighboring local association to join yours as co-host. Just one Saturday afternoon in September is all you need for your festival.

First, fill your pockets with those wonderful little two-ounce bears filled with local honey. These will serve very nicely as a "thank you" for all the favors you are going to ask for in your communities.

The first decision you need to make – and now is the time to decide for next year – is where to have the festival. In a city community building, a park, village street, county fairgrounds? Think about events in your area, such as a Christmas festival, and decide if your Honey Festival would fit that place. Please find out

Next Year Can Be The Year For *YOUR FIRST* Annual Honey Festival

if you need a permit to hold a small festival. If so, what are you allowed to do? Could you sell honey? Give away honey stix? Give taste samples from tiny spoons? Try to think of lots of things that you *might* want to do just to make certain what is permitted or not. You really do not want to get in trouble on your first attempt at a honey festival.

You know best about the weather in your area. In a large part of the country September is a dry month except around the equinox when it seems to be unsettled. An outdoor festival is the most fun and the easiest but if you live in a rainy climate you may have to hold it indoors.

At this point you have to stop and consider money. If you will be allowed to sell honey and honey stix then it would be nice if a small amount of the sale goes to defray any expenses. It might be possible to ask for sponsors. For example, if the local hardware store makes a contribution as a sponsor then you need some nice big posters listing sponsors and set those posters in very visible places.

Now that you have a whole year ahead of you (yes, it will go too quickly) how about someone creating some bee costumes. They do not have to be elaborate; all they need to do is resemble a bee. Most honey bee costumes are black with yellow stripes. That is perfectly acceptable even if they look like yellowjackets to the purists. Club members can wear their veils, bee jackets and coveralls. It is perfectly acceptable for the bee jackets and coveralls to be spotted with propolis and stained. That is what beekeepers really look like. Do give jackets and coveralls a wash first.

Posters and displays will attract attention and are an important part of the educational value of a festival. Give a demonstration of opening a hive using a real hive with frames but no bees. In addition it might be possible to have a screen tent with a live colony. Some clubs do demonstrations at county fairs and may have a screen tent. An observation hive, with plastic instead of real glass, is always popular but might be unsuitable for your site. Posters can be made of bees, flowers, beekeepers, honey and anything else you can think of having to do with honey.

Some small pieces of equipment attract attention. A small extractor, smoker, a straw skep, and the Teaching Hive can all be used. However, some beekeeper will have to explain such items to the public.

An interesting display could be made with products that contain honey or beeswax. A display of candles with different shapes would be enhanced with a frame with comb, and some candle molds. Cosmetics made with honey or beeswax would also make an interesting display.

Since honey is the purpose of the festival how about a display of foods that can be made with honey – a loaf of bread, some cupcakes, a bottle of salad dressing, a bottle of mead, a jar of barbecue sauce, and some cookies. Have a few honey cookbooks with the display and have some recipes for handouts.

Another important display would be the various forms of honey: liquid, creamed, a jar of chunk honey, some cut-comb and round sections. Here again someone should be able to answer questions about how these are made. One common question concerns honey in comb. Many have asked me what to do with it. Some even tell their stories of putting it in a microwave and the resultant mess. I encourage them to try comb honey again and reassure them that the wax is perfectly edible.

Although this is a festival centered on honey, it would be wise to include a display and some information on pollination. After all it is part of the bees' work. Posters and handouts are available from the Pollinator Partnership, **www.pollinator.org**. You can find out what fits in your expense budget. A display could certainly be simple with a selection of fruits and vegetables that are pollinated by bees. Some that are not available could have a photo as a substitute.

Although all the planning and work will be done by your local beekeeping clubs it would be good to include some children, such as from school or Junior Naturalists or 4-H and FFA. The kids might be very happy to dress up in a bee costume and help at displays.

Yes, a honey festival is work but it can be as large or as small as you wish. You can involve the newbees in your club. Although they may feel they do not know enough to answer bee-related questions they certainly know the answer to one question – "do you ever get stung?" So get the newbees involved. They are certain to have some good suggestions.

Now the last and most important group of volunteers from the clubs is the clean-up crew at the end of festivities. Do a good job of it and you will be welcome to hold the Second Great Honey Festival the following year. Let me know where it will be and I'll try to visit. BC

Timber Crops For Bees

Connie **Krochmal**

Yellow Tulip Poplar

In addition to nectar and pollen, certain species of bee trees can provide supplemental income for beekeepers. Some kinds of bee plants are in demand as timber crops. The most promising nectar/pollen species that also provide lumber include the following. Generally, these trees are grown from seeds. Seedlings are sometimes available from state forestry or commercial nurseries.

Basswood (*Tilia spp.*)

Also called linden, these are members of the linden family. Around five species are native to America. These fast growing trees can reach 100 feet in height.

The species with the widest distribution is the American linden (*T. americana).* It is found in the Eastern and Central regions southward to Alabama and westward to North Dakota and Texas. Hardy in zones three through eight, it has a medium growth rate. Reaching 50 to 80 feet tall with a spread of 20 to 50 feet, this has a broadly spreading or pyramidal crown. The large, alternate, heart-shaped, toothed leaves are four inches across and five inches or more in length.

With large bracts that resemble leaves, the richly scented, small blooms are ½ inch long. These appear in late spring to early Summer. They're pale yellow-green to cream with five petals. These emerge in small, drooping clusters after the leaves begin to unfurl.

Basswood nectar flows are best during calm, clear, hot, humid weather. The flow can be so heavy that a colony can add 60 pounds in a day. The blooms can last three weeks or more. On average these trees give reliable honey yields three out of five years. The honey adds a rich fragrance to the apiary.

Basswood honey is a premium quality table honey. The flavor can range from mild to strong. This is white to water white with a slight aroma. The trees also yield pollen.

The basswoods do best in full sun. The young trees require protection from rabbits. They will need watered during prolonged dry spells. Adapted to well drained situations, these thrive in rich, moist, deep soils. Potential problems include Japanese beetles, chewing insects, and borers.

Catalpa (*Catalpa spp.*)

Catalpas are members of the bignonia family. Two species are native to the U.S. There are also several cultivated types. These fast growing trees are 30 to 60 feet tall. They're important honey plants in some locations.

Before the blossoms emerge there is a rather characteristic fragrance around the trees. Opening in May and June, the perfect blooms, sometimes scented, are bisexual. The seed pods resemble beans.

Southern catalpa (*Catalpa bignonioides*) is the most widespread species. Originally native to the South, it has naturalized throughout the East. This is recommended for zones five through nine. It is usually 30 feet or more in height with a slightly smaller spread. Southern catalpa has a rounded, upright, broad spreading crown. The simple leaves are three inches or more across and eight inches or so in length. They can be heart-shaped or rounded. The leaf arrangement ranges from opposite to whorled.

Blooming reliably every year, this has showy, white, terminal blooms with dark dots and yellow highlights. The two-lipped flowers appear in large, pyramid-like, branched clusters, a foot in length. These have four to five petals that fuse to form a two-inch-long bell. The blossoms are large enough for bees to land inside. Little information is available on the honey yield, flavor, and appearance.

Catalpas have large numbers of extrafloral nectaries on the backs of the leaves. These produce lots of nectar for about a month after the blossoms have faded. Unaffected by rain, this special nectar generally flows best during warm, humid weather.

Red Maple.

Northern catalpa (*C. speciosa*) is rather similar to its Southern counterpart. It isn't quite as widely distributed. Originally native to Illinois and Indiana to Tennessee and Arkansas, it has naturalized in some areas of the U.S.

Catalpas thrive in partial shade and full sun. Tolerant to a range of growing conditions, moisture levels, and soil types, they prefer rich, moist soils. These can experience damage from mildew, leaf spots, and caterpillars.

Maple (*Acer spp.*)

These vigorous trees are fairly fast growing. The native species are widely distributed over much of the country.

Some are hardy to zone three, while others are recommended for zones four and five. Most species native to the West won't withstand cold climates. The height varies greatly from one species to another. While smaller ones are only 15 to 20 feet tall, others reach 80 to 100 feet or more.

These have opposite leaves, often lobed. The blooms, which come in various colors, open in pendant umbels or clusters. The bloom time varies according to the species and location. It ranges from late winter to June either before or after the leaves appear. The male and female blossoms are found on separate plants.

The preferred growing conditions can differ slightly from one species of maple to another. For the most part, these are adapted to full sun and partial shade.

These generally thrive in well drained, rich, deep, moist soils. Sugar maple (*A. saccharum*) and Norway maple (*A. platanoides*) are adapted to a range of soil types.

The preferred elevation varies from one species to another. For those areas with adverse growing conditions, such as poor compacted soils and air pollution, Norway maple is ideal.

The red maple (*A. rubrum*) is one of the most highly recommended species. This is a relatively pest-free, fast growing honey plant and timber tree. Suited to zones three through nine, it is the most widespread Eastern species. This very adaptable maple tolerates dry and poorly drained soil, and swamps. In the South, the red blossoms open during late Winter.

Certain diseases and insects can attack maples. The most common ones include fungal leaf spot, tar spot, Verticillium wilt, caterpillars, scale insects, aphids, and gall insects of various types.

Maples provide nectar and pollen. Some species also yield honeydew. The nectar is very important for brood rearing. A surplus of 20 pounds or more per colony, particularly in the East, is possible. Several of the maples are very important nectar sources. These include red maple and Pacific maple (*A. macrophyllum*).

With a mild aroma, maple honey can vary slightly from one species to another. The flavor, which can be distinctive, improves over time. The color ranges from light amber to amber, possibly with a greenish tinge. It usually crystallizes very slowly with fine granules.

Most maples are sources of maple syrup. Beekeepers can lease the tapping rights to obtain extra income.

Maple (Acer).

Paulownia (*Paulownia tomentosa*)

Native to China, this is also called royal paulownia and empress-tree. Depending on one's source, this is a member of the foxglove or bignonia family. With a fast growth rate, this tree has escaped and naturalized, mostly in the East. It is recommended for zones six through nine. Though the tree will survive in zone five, the flower buds sometimes experience winter damage. This medium sized, upright tree is usually 30 to 75 feet tall with a spread of about 25 feet. With spreading branches, it has an open, round crown. It is tolerant of air pollution.

The large, opposite, simple leaves will be the largest on the young, vigorous growth. They're typically four to eight inches across. Sometimes with three shallow lobes, these are heart-shaped at the base. The foliage is coarse textured with hairs on the underside.

The showy, scented, perfect blooms open before the leaves unfold. These emerge in large, upright, pyramid-shaped, terminal clusters, over a foot in length. The individual flowers are nearly 2½ inches long. The fused petals form a bell-like or funnel-shaped corolla. Appearing in mid-May, the blue to purple blooms have dark purple spots on the inside.

P. fortunei is a related species that is sometimes found in cultivation. It is similar, and reaches 45 feet in height.

Paulownias are excellent honey plants. When in bloom, the trees are humming with bees. Little data is available on the honey.

Paulownia trees can experience powdery mildew and canker. There are few pests other than chewing insects. Easy to grow, these trees achieve their best growth with long, hot summers. Full sun is generally best. They prefer a reasonably moist soil neither wet nor dry. They adapt to a pH range from acidic to nearly neutral.

Tulip poplar (*Liriodendron tulipifera*)

A member of the magnolia family, this floriferous, fast growing tree is known by many other names, including yellow poplar. Suitable for zones four through nine, this is the tallest hardwood in America – 50 to 100 feet or more with a spread of 20 to 40 feet.

Catalpa.

With a rounded to cone-like crown, it grows to 4500 feet elevation.

The alternate, lobed leaves are almost square. These are up to six inches in length with a matching width.

The bell-like or cup-shaped, lightly scented, perfect, large blooms are orangish-green to greenish-yellow. With three sepals, these have six petals, nearly 2½ inches long. These solitary, terminal flowers are held erect. Unaffected by weather, the nectar is so plentiful it drips from the trees and is blown by breezes. Considered one of the best nectar plants, this is a favorite plant among bees. They also gather pollen and honeydew from tulip poplars.

The good to excellent quality honey can be light to dark amber, or red. It becomes darker with age. This has a strong aroma and a pleasing, distinctive, spicy or quince-like flavor.

Basswood.

Tending to granulate, the honey is thick bodied like molasses. The trees often give a surplus of 100 pounds of honey per colony.

Requiring good drainage, this tree prefers deep, rich, moist soils. This Eastern species extends from Michigan and Vermont to Florida westward to Louisiana. This does well in sun and partial shade. Potential problems include gray mold, leaf spot, and aphids.

Tupelo (*Nyssa spp.*)

These native trees belong to the tupelo family. Three species occur in the East. They have alternate, thick, leathery leaves that are simple and entire. Sometimes the foliage is toothed. The small, whitish-green or green blossoms usually open in Spring with the leaves. The blooms can be male, female, or bisexual. Different types can appear on the same plant. The female blossoms emerge in long-stemmed clusters from the axils. The males form large clusters or heads. With a medium growth rate, these trees are tolerant of sun and shade. They thrive in a rich, acid, moist soil. The tupelos are generally free of pests and diseases.

The most important tupelos in terms of honey production are the following. Water tupelo (*N. aquatica*) is found in the Southeast westward to Texas and northward to Missouri, Illinois, and Tennessee. With a straight trunk, this species reaches 50 to 100 feet in height with a cone-like or rounded, narrow crown. Over four inches long, the glossy, alternate, deep green leaves can vary slightly in width. These can be heart-shaped to round. This grows in bottomlands and areas that are often flooded or swampy. They also thrive in well drained bottomlands.

Ogeche tupelo (*N. ogeche*) is found along the Coastal Plain from South Carolina into Georgia and Florida. It does best in areas that usually remain wet or flooded. The flowers can appear as early as January or as late as May. It is 40 to 60 feet tall with a rounded, narrow crown.

The tupelos can yield 70 to over a hundred pounds of honey per colony. On average, these bring a heavy honey crop three out of five years. The yield never falls terribly low even in the worst years.

The honey brings a premium price. It can differ slightly from one tupelo species to another. The color, which becomes darker with age, ranges from white to chartreuse and light amber. It is heavy bodied and very reluctant to granulate. With a mild aroma, it has a pleasing flavor that becomes stronger as it ages. Ogeche tupelo honey is the most popular of the group. With a mild, distinctive flavor, this honey doesn't granulate if it is from a single flower source. BC

Connie Krochmal is an award winning garden writer and a beekeeper in Black Mountain, North Carolina.

A Day In Wisconsin

John & Dan Piechowski of Henry's Honey Farm

Kim **Flottum**

John Piechowski does the paperwork for an order to be picked up later in the day.

In July we spent a day with John and his son Dan Piechowski, in Redgranite, Wisconsin. Redgranite is in the eastern part of the state, just a bit west of Oshkosh.Together they operate Henry's Honey Farm there. Henry was John's father and the founder of the outfit, so Dan is the third generation in the family to keep on keepin' bees. Dan's young daughter isn't far behind.

For much of the day we visited Dan was away, so we worked mostly with John, but later Dan took us on a tour of the cranberry bogs they pollinate.

There are some things you see over and over when visiting successful commercial beekeeping operations, and I saw all of them that day. It starts with what appears to be an unorganized office, but you soon realize that John knows exactly where everything is, and it turns out everything is where it should be. Orders get filled, cases of honey get stacked, papers get filed . . . it looks chaotic, but it's as smooth as clockwork. Part of the apparent chaos is that both John and Dan play active roles in local and state beekeeping associations, holding offices in both. Plus, John is involved in local city and county administration, and worries about taxes, fixing roads and schools. He is an active part of the community he lives in.

Another trait I've noticed is the relationship a good boss has with employees. John has been in bees his entire life. He has a wealth of knowledge, experience and plain common sense when it comes to keeping bees, but he doesn't for a moment take it for granted that his employees have the same resources. Lee Laudolff and Michael Stertz are two young men working for him and John takes the time to explain what needs to be done, shows them how to do it and then explains why it is to be done that way. Mostly, he only has to do this once because it's the tell me, show me, make me do it learning curve the boys go through and it makes their work a lot easier, safer and better.

The day we were there was to be spent checking colonies that had been too weak to send for early pollination in California and had stayed at home. They send about 1000 out west each year in October with Lance Sundberg, and about 500 stay home for honey production and early pollination. When the almond colonies get back they mostly go to cranberries and cukes a bit later in the season. They had a lot in cranberries when we were there and were getting ready to move some of those and others into cukes in a few days. Most of the colonies we looked at were building on a great Wisconsin honey flow and needed to be checked for queens, brood, food and adding honey supers if necessary. It was pretty fundamental beekeeping, but with bees and young employees, you can't be too complacent.

We followed John's truck to each beeyard, then, as the two boys got ready John would start examining each colony. Every yard had eight to 10 pallets (32 – 40 colonies) a bear fence, and an out building (we'll look at those in a minute). John would start with one colony, take a look,

One of the company trucks.

A typical beeyard. Bear fence, several pallets of bees and a storage shed

John takes a quick look at every hive on the pallet. Note the placement of the feeders on the inside of each hive. When feeding a yard, one person slides each cover forward so all four feeders are exposed and can be filled quickly.

Colonies needing more room get a honey super from the storage shed.

move to the next, then the next and finally the fourth on the pallet. He'd check for a queen, look to see how much brood, how much food, and then, to his trained eye, if any of the colonies didn't have what he thought they should, he start moving things around – brood from the strong queen-right to the weaker recently requeened, food from the stronger to weaker, spreading out food and brood to each so that when he was done all the colonies on the pallet were nearly identical in size and strength. Meanwhile, the boys made honey supers appear as if by magic and were placed on those hives needing additional room.

And here's a habit he showed me that I've seen before, but don't get to practice often because I don't have pallets, or enough bees to get to do this. When the honey supers arrived, the boys were instructed to NOT set them bottom down on top of an adjacent colony's cover. They make their own modified migratory covers and many have metal on the top instead of plain wood. That metal gets warm, even when in the shade on a July morning and if you set a super on one a tiny bit of wax and propolis from the bottom of the super will melt and stick to the cover – and then you have a mess. So, set it on the ground, put it on top of an opened hive or on its side. And when putting the super on, double, no triple check to make sure it is square on the super below it. No exceptions.

All in all, John went through about 120 colonies before lunch. And he never hurried, never ran, never got excited, chatted the whole time, giving directions, pointing out this and that to us and to the boys helping, adding queens here and there and noting things in the yard and around the yard. It was incredibly obvious that he has a life time of experience behind him, and that he is as comfortable in a beehive as you or I are in an easy chair at home. It was a pleasure just to watch.

They do have two record keeping systems that you and I could use. One, simply set something on a colony – anything, a stick, rock or clump of dirt. Next time you visit you'll know that 'something' needs attention in that colony . . . usually a queen problem, but not always, just make sure it gets checked. The other technique was a hive staple, pushed in like the photo shows. It won't come out, and when this is used it's something serious

A typical storage shed that comes apart. Some are made of wood, others tin, but each has a floor, front, back, two sides and a two-part roof, and all the parts fit on the company truck.

Another shed, this one made from corrugated tin sheets and lumber framing.

A careful frame placement when using these types of covers keeps bees off the ground, and any loose queens from getting lost.

One way to note that 'something' is going on with a hive is to put 'something' on top...a stick, ro or whatever is handy.

The hive staple wedged underneath the top board of the migratory cover is a note for something more serious. When corrected, the staple is easily removed.

Each super is branded.

. . . usually a health problem that will need attention as soon as possible. When attended to the staple is easily removed. It's a good trick.

But I want to tell you about those out buildings they use. With nearly 1500 colonies they have between 40 and 50 beeyards in several counties, some quite distant from home. Hauling honey supers back and forth for extraction is one thing, but providing a place large enough to store them all at home is another thing completely. And then there's the exposure to fire – one fire, no supers.

To solve that problem they have one of these buildings in every outyard. Though made of different materials, they are all similar in construction, size and ease of use. They come apart – front, back, two sides, the two part roof and floor – seven pieces total. The door locks if necessary. If a yard is moved or abandoned the building can be quickly disassembled and all the pieces fit on the company truck. Honey supers are harvested, extracted, the boxes cleaned to within an inch of their life bacl at the farm so there is no wax, propolis, honey or other residue on them, then taken back to the beeyards and cleaned by the bees, and finally stacked in the building for the winter. All the buildings, though different in materials, are the same size and hold about 200 supers each. Though not perfectly mouse proof, they mostly are and damage each season is negligible. Since they aren't brought back until Wisconsin's winter gets going wax moth is a non issue, and they get set out on colonies next summer before they can get going.

Having these in each yard means never forgetting a super and always having another when you need one, smoker fuel, hive tools or other necessary equipment . . . everything is there if you need it. Vandalism is essentially zero . . . actually, the way some of their yards are located, I'm amazed they can find their way back each trip, let alone someone looking for trouble. They are bear proof, weather proof and inexpensive to build with essentially no maintenance.

For the life of me I can't figure out why more beekeepers don't use this technique. CC Miller talked of this 150 years ago, and it worked then, and it still works.

Henry's Honey Farm still makes a lot of honey, of course. They keep 500 or so colonies dedicated to that crop. They started pollinating in 1950, but honey is still a good part of the business. Their honey house is full of Cook & Beals equipment so it runs efficiently. They sell much of their crop to other beekeepers who have accounts they can't fill because they are short or have expanded. Pails and barrels are common for this. They also work with several distributors who sell their honey for them at stores and farm markets. This works well enough that it keeps them hopping just keeping orders filled.

The locations their beeyards occupy straddle two soil types – sandy loam, and clay. Not enough beekeepers study soil maps when locating beeyards I think. Because there are two areas, whatever the weather throws at them honey plants somewhere will do OK. Wet years favor the sandy loam, while dry favor the clay areas. Regular years and both thrive.

When the almond colonies return they get recondi-

The wagon the bees are hauled on to cranberries and then to cucumbers showing how the pallets are loaded and the amount of room available to stand, and of course the solar charger for the bear fence.

tioned – that is equalized and standardized – and about 1000 get ready for cranberries. This crop takes two colonies per acre of bog, and over the years they've developed very good relationships with the growers. Their biggest customer, when expanding his operation, made sure the roads between bogs were more than adequate to accommodate a large truck and the trailer the bees sit on. Later in the day Dan took us out to this bog which was winding down bloom.

Dan drove down one of these wide roads, wide enough to drive by one of the bee trailers there. This makes life convenient for beekeeper and grower. The trailers are made for this task. They are fenced for bear and solar charged, and large enough to be able to work the bees. They are easily transported and when finished with cranberries can be moved directly down the road to the cucumber fields they pollinate. If you've worked cukes, you know that growers stagger their plantings so there's always pollinating, growing and harvesting going on somewhere. When one crop is done needing bees, the trailers can be moved to another field just starting to bloom. Moving bees brings in additional income without a lot of extra work. Cukes aren't the best honey crop in the world though, and you need to pay attention to food levels in these colonies. They will stay on cukes until first frost, then get ready for the move to California.

And it starts all over again. BC

Cranberry bloom...if you look close you'll see bees down in amongst the foliage and blossoms...it's amazing they can find the flowers.

Wild Brood Comb Box

Peter **Sieling**

SAVING BROOD: A simple way to transfer brood to a standard hive.

Pushing pogo stick into position.

Beekeepers who remove colonies from buildings and install them in standard hives face two major problems. First, how do you prevent damage to the brood comb when removing, transporting and installing them in a moveable comb hive? The second difficulty is the additional labor and brood loss when trimming combs and fitting them into frames, then, later, removing those irregular combs from the hive.

I used to try to save brood comb by leaning it upright in a bucket, or laying a box on its side and stacking the comb horizontally with 3/8" (9mm) shims between combs. When done, in theory at least, I could tilt the box upright. The comb would become vertical. Then I could take it home and fit into frames the next day. In practice, the combs sagged, twisted, and ruptured, crushing bees and creating a mess.

A simpler solution reduces time, bee deaths, and labor. Cabinetmakers sometimes clamp boards in position with "pogo sticks", wood sticks cut just longer than the distance between two surfaces. The pogo stick is flexed into position and the natural spring of the wood presses the board against a flat surface.

Brood combs are held in place with pogo sticks.

Flex the stick and press down and toward the comb.

Preparing the Hive Body

I assemble brood boxes with Titebond III waterproof wood glue and spiral threaded nails because 20 or more pogo sticks, pushing the corner joints could add up to over 100 pounds of tension over an extended period of time. Make a screened top. It should be easy to fasten for transporting and easy to remove. I screened an inner cover frame and attached it to the hive body with drywall screws. Fasten a plywood floor to the bottom.

Make 20 pogo sticks for each box, 3/8"x3/8"x18½" (9x9x470mm). The length should be 1/8" (3mm) longer than the inside dimension of the hive body. Use straight grained knot-free wood to prevent fracturing. The 3/8" dimension provides a bee space between the combs and the pogo sticks are flexed into position as the combs are placed in the box.

Using the Box

To use the box, press two sticks against one side of the brood box. Tilt the box so combs lean against the pogo sticks and don't flop over. Trim the bottom of the comb flat and parallel to the top. Add all of the comb that will fit in one row. Press two pogo sticks in place to hold them. Continue across the box until you can't fit your fingers into the remaining space or until you run out of brood. Brush in a few more bees to care for the brood and maintain the proper temperature. Fasten on the lid.

Once back at the beeyard, let the bees move themselves out of the box. If you caught the queen while removing the colony, place the box of bees and brood on a hive stand. Remove the screened cover and replace it with a queen excluder. Use 3/8" shims to create an entrance above the excluder and add a box with frames of foundation or drawn comb, along with the queen and any extra bees not in the bottom.

If the queen is somewhere in the box of brood comb, you have two alternatives.

The easiest way is to set an empty box with foundation on top with 3/8" shims on three sides to create an entrance. Over time, the queen should work her way up into the upper box. Once she is laying upstairs, put a queen excluder between the two boxes. When the brood has hatched, remove the bottom box and set the hive on a bottom board.

The faster method requires a little more effort. Puff a little smoke in the lower box, place a box containing frames of foundation or drawn comb above and drum the bees up by pounding rhythmically with sticks, hammers or fists for 15 or 20 minutes. In most cases, the queen and most of the workers will move into the upper box. Insert a queen excluder between the boxes, plus shims to provide an entrance. Three weeks later, the brood will be hatched and the lower box can be removed.

Transferring bees places a lot of stress on a colony. If you can save more of the bees and the brood, the hive has a better chance of recovering from the move into a hive. It's a win/win for both bees and beekeeper. BC

Peter Sieling rescues wild honey bees in upstate New York. Read more at www.makingbeehives.com.

Wild brood box with space for one more comb.

Wild brood box with the screened lid.

Catawampus Combs In A Top Bar Hive

Ross **Englehart**

One way to fix this problem

My wife and I started beekeeping in 2010. We started with two colonies, and, if all went well our first year, we planned to expand the following year to include a top bar hive. We wanted to observe the bees building comb as they would do in the wild. Since our first year of beekeeping was successful, even our weak hive made it through the Winter, we placed the top bar hive (constructed in my basement) in our apiary this Spring.

Our four-pound package of bees was ready for pick-up sooner than we expected. It was still March and the temperature was in the low forties. We installed the package in the top bar hive on March 24th. Concerned about the outside temperature, I sectioned off the hive with a division board. This allowed the bees to cluster in a more confined space to keep warm. In order to observe them, I had constructed the top bar hive with a Plexiglas viewing window on the side. A hinged door covering the window gave the bees their privacy as they went about building their combs.

As they expanded their comb construction on progressive bars, I freed up more bars by moving the division board. When the weather warmed, I removed the division board to give them access to the entire hive. We were amazed at how fast the comb building proceeded. The bees built comb after comb keeping to the straight line of each top bar. All was going according to my plan. Little did I know that the bees had a plan of their own. After 13 perfectly parallel combs, the bees built four combs at a 45 degree angle across the top bars! You could see the problem through the window.

I consulted a more experienced beekeeper as to why the bees changed their minds from going with the 'grain' and then decided to build across the 'grain'. The answer was, "This is the natural way for the bees who don't have to worry about a tidy harvest. They can use the honey no matter which way the combs face." I also learned that a follower board might have prevented this.

Faced with the prospect of trying to remove and inspect the combs without destroying them, I had to figure out a way to remove the four catawampus combs as one unit. Being a gadgeteer, I designed a system that would allow me to remove the four bars/combs together to keep them intact. I constructed lifting bars made from folding door tracks and with handles that had been drawer pulls. I used no. 6 one-inch sheet metal screws to attach the lifting bars to the top bars. I also constructed a display rack for hanging the top bars/combs for inspection and observation once they were removed from the hive.

In late June I put my Multiple Comb Removal Device and Display Rack, and my 'reputation' to the test. I carefully cut between top bars # 17 and #18 to isolate the bars I wanted to remove (I decided to remove five top bars to make sure I did not destroy the catawampus combs). Next,

Lifting bars.

Attaching lifting bars

45 degree angle combs.

Display rack.

Lifting top bars/combs.

the bars needed to be freed from the propolis gluing them to the hive body. This was accomplished with a thin-bladed knife. Since some of the combs were attached to the sides of the hive, I cut them loose with a special long-handled hive tool.

The lifting bars were attached to the top bars perpendicular to the direction of the five top bars. I used a battery-operated drill to set the sheet metal screws. The multiple comb display rack was set up ahead of time. Carefully, I lifted the five bars with the angled combs out of the hive and gently placed them on the display rack. I was amazed that all went according to plan and that the beautiful combs were not damaged. BC

Combs on display rack.

My wife, Leslie Englehart, and I started with two colonies in 2010 and now have four colonies including the top bar hive. We are members of the Howard County Beekeeper's Association in Howard County, Maryland.

Using A Dummy Board

The dummy board keeps the empty space free from comb.

Colin **Taylor**

Easy To Make, Easy To Use, And God For Your Bees

I use dummy boards regularly in my UK beekeeping. A dummy board is simply two pieces of wood that mimic the size and shape of a brood frame. They are easy to make although one of our suppliers has produced a plastic version.

Inspection – The type of hive I use holds 11 Hoffman brood frames. When these are pushed together there is a gap between the last frame and the wall of the brood box. A dummy board is placed in this gap and pushed up against the last frame. The dummy board prevents build up of brace comb between the last comb and the wall. There is some brace comb build on the dummy board but it is manageable. To start an inspection the dummy board is levered away from the frame and carefully lifted out. The last frame can be levered into the space and away from the next frame. If required, the last frame can be lifted out for inspection or the next frame levered back. To provide working space, the first frame inspected can be placed on top of the unexamined frames, leaned against the hive entrance or placed in a holding box.

Swarms – I use a dummy board when moving a swarm into a brood box. I set up an empty brood box with a small entrance on a hive stand. To help reduce absconding the old tip of loosely blocking the entrance with tufts of grass is used. The swarm is shaken into the box and given one frame of drawn comb and sufficient frames of foundation for the swarm to cover. A dummy board is placed up against the last frame. If the bees have sufficient room on the frames they don't usually build in the void behind the dummy board. ITwo or three days after the swarm was taken they are given a contact feeder of 1 to 1 sugar syrup via a hole in the crown board (inner cover) immediately above the cluster. Feeding is continued as long as the bees are building up. As the foundation is drawn and the colony expands the dummy board is moved back and more frames of foundation or comb are added.

Nucs – The frames of a nucleus are lifted into a brood box. Again it is a small loosely blocked entrance. Since the bees will be on several frames of comb they are given a couple of extra drawn frames to expand onto – one on each side. Next comes the dummy board. As the colony grows further frames are added. The presence of a slow contact feeder of weak sugar syrup allows the colony to build up steadily.

Foundation/Build-up – With a colony on an Open Mesh Floor (OMF) (SBB), often the bees will not draw foundation at the bottom of the frame. To draw foundation I use a double brood box set-up. The boxes each hold five or six frames plus a dummy board with a contact feeder above. One or two of the frames in the upper box are foundation. The heat of the colony helps the bees to draw the foundation out. As the frames are drawn, the frames can be re-configured and further frames of foundation put in the top box. Normally a colony will expand horizontally in the brood box. By using a double brood box with dummy boards the frames in the upper box benefit from the heat of the bees below and the colony can grow quicker. BC

Starting a swarm using a dummy board. Be sure to feed.

Place a nuc in a full sized hive and add your dummy board. Be sure to feed.

GLEANINGS

SEPTEMBER, 2011 • ALL THE NEWS THAT FITS

OBITUARIES

O. T. Atkins Stroope, age 87, a resident of Garland, Texas passed away Tuesday, June 21, 2011. He was born August 28, 1923 in Nash, TX to Annie Cole (Atkins) and Garland O.T. Stroope. He grew up along with nine brothers and sisters in Waxahachie, TX, where he learned beekeeping from his father. After serving as a Marine in WWII, he reared six children and operated Stroope Bee and Honey in Frisco, TX. He later married Imogene Gibson Jordan of Garland, TX on February 14, 1977 and continued his beekeeping until his health declined.

Survivors include his wife of 34 years, Imogene Stroope of Garland; his children, Catherine Hughes, Jerry Stephen Stroope, Garland Ray Stroope, Deborah Francis, Mary Beth Stroope, and Nancy Lee Bartel; his stepsons, James Ralph Jordan, Mark Henry Jordan and William Thomas Jordan; 30 grandchildren, 14 great grandchildren and one great-great grandchild. O. T. was preceded in death by his parents, Annie and G.O. Stroope; one son, Hershel O.T. Stroope; five brothers, Thomas William Stroope, James Rhea Stroope, Bobby Joe Stroope, John Miles Stroope and Jewel Edward Stroope.

Walter (Bud) J. Diehnelt passed away Monday, July 4, at the age of 89 years. He was born in Wauwatosa November 25, 1921, the son of Walter and Anna (nee Glaettli) Diehnelt. Walter was a second-generation owner and beekeeper of Honey Acres Farms. He is survived by his wife Patricia of Ashippun and their family. A private service was held for the family.

Wally was president of the Wisconsin Honey Producers Association, member of the original national Honey Board, and the Wisconsin Advisory Board. He was actively involved in the ASF and other civic organizations.

Wally was a good friend of the beekeeping world. He was willing to help the third World countries with his expertise in handling bees and marketing honey. He traveled to six countries and helped them and had many stories how he was welcomed in the different cultures.

Bud was instrumental in developing the bee blower in the 1960s which many use when removing their honey crop.

Wally was a promoter of the Wisconsin Honey Producers Association. He was especially helpful with the booth at the Wisconsin State Fair. He was named Beekeeper of the Year in 1993 for the WHPA, the Pioneer Award in 2001, and a Special Recognition Award in 1992.

Honey Acres was honored with the WHPA Friendship Award in 1997. Wally was the owner and president of Honey Acres.

WHEN TO GERMINATE, AND WHEN TO FLOWER

The genetic wiring that helps a seed to decide on the perfect time to germinate has been found by scientists.

Plant biologists at the U of Nottingham, UK have discovered the same mechanism that controls germination is responsible for another important decision in the life cycle of plants – when to start flowering.

The discovery throws light on the genetic mechanisms that plants use to detect and respond to vital environmental cues and could be a significant step towards the development of new crop species that are resistant to climate change and would help secure future food supplies.

Seeds in the soil sense a whole range of environmental signals including temperature, light, moisture and nutrients, when deciding to germinate or to remain dormant.

To ensure the decision for a seed to germinate is made at the perfect moment to ensure survival, evolution has genetically wired seeds in a very complex way to avoid making potentially deadly mistakes.

The Nottingham researchers compiled publicly available gene expression data and used a systematic statistical analysis to untangle the complex web of genetic interactions in a model plant called Arabidopsis thaliana or thale cress.

The plant is commonly used for studying plant biology as changes in the plant are easily observed and it was the first plant to have its entire genome sequenced.

The resulting gene network, or SeedNet as it was dubbed, highlighted what little scientists already know about the regulation of seed germination while being able to predict novel regulators of this process with remarkable accuracy.

"To our surprise, the seed network demonstrated that genetic factors controlling seed germination were the same as those controlling the other irreversible decision in the life cycle of plants – to start flowering," team leader George Bassel says.

"The induction of flowering, like germination, is highly responsive to cues from the environment."

Another finding from SeedNet was that the same genes that leaves and roots use to respond to stress are used by seeds to stop germination.

Given that seeds were evolved long after plants developed their ability to withstand environmental stress, this indicates plants have adapted existing genes to fulfill a different role.

The work could lead to identifying important factors controlling stress response in seeds and the plant itself, contributing to the development of new crops producing increased yields under extreme environmental conditions such as drought or floods.

– Alan Harman

BEES & POLLUTION & AIRPORTS

Squadrons of honey bees will be flying environmental protection patrols around Berlin's airport.

Operator Berlin Airports gave the go-ahead for a study to be carried out to monitor the situation regarding airborne pollutants and quality of honey in and around the airport prior to and following the opening of the new capital airport Berlin-Brandenburg International Airport due to become operational next year.

The company operates Schönefeld Airport and Tegel Airport.

Airport environmental department head Jochen Heimberg says over the course of several years, a process of "honey monitoring" will take place to examine honey, honeycombs and bees for any residues from air traffic.

"The process of honey monitoring complements our system of monitoring air quality," he says. "Besides honey, bees and honeycombs will also be monitored, in order to gain a comprehensive overview of the situation regarding pollutants."

The monitoring will see Berlin Airports work with beekeepers from the region, whose bees fly in the area of the airport. – *Alan Harman*

FUNNY JELLY NETS FINE

A New Zealand company that imported Chinese powdered royal jelly and sold it in capsules claiming it was "Made in New Zealand' has been fined NZ$11,400 (US$9,317).

Honey New Zealand (International) Ltd. admitted two charges of breaching the Fair Trading Act in relation to the marketing and distribution of the royal jelly Capsules through stores in Auckland and Christchurch.

The Commerce Commission withdrew a third charge that the royal jelly was not of the potency claimed.

The Commission says Honey New Zealand arranged for Chinese powdered royal jelly to be mixed with white beeswax and inserted it into capsules.

The product was labeled as Made in New Zealand, carried an image of the New Zealand fern, and a statement, "Honey NZ has over a 90 year history working with premium honey bee products gathered from the heart of untouched native forest and wild field areas of New Zealand."

A commission statement says in fact the only part of the product that was genuinely from New Zealand was the white beeswax the royal jelly was mixed with and the water in the capsule shell. Honey New Zealand admitted that six out of eight of the raw materials in its royal jelly were sourced from overseas.

In the judgment, Judge Allison Sinclair said "In my view the statements made on the label departed significantly from the truth." She commented further, "the label led consumers to believe they were buying a superior New Zealand made product when in fact they were not."

Once caught, Honey New Zealand stopped distributing the royal jelly product and relabeled its products.

The latest court hearing is one of several similar cases taken by the Commission. – *Alan Harman*

A MATTER OF PERSPECTIVE

The British Beekeepers Association says apiarists had bee losses of 13.6% last Winter and while this is the fourth straight year of declining casualties, the incidence remains unsustainable.

The association says it remains a continuing puzzle why bees die during the Winter.

Last Winter's weather was a mixed blessing for UK honey bees. Unlike humans, they like cold and dry Winters when they stay clustered tightly in their hives, saving energy for exploratory Spring foraging when mild Spring days raise the temperature above 12°C.

But over the six month period from October 2010 to March 2011, the weather office reports November was coldest for nearly 20 years, December the coldest in 100 years and February the mildest and March the driest in recent years.

The association says its 4th annual survey of its members Winter colony survival shows that continued regional differences of dead hives can't just be explained by fluctuating weather.

The highest losses of 17.1% were in the northeastern England, while the lowest losses at 9.9% were in western England. The north had a 16.6% loss, the southwest 16.8%; the east 14.1%, the southeast 14.0% and the southern 15.3%.

The latest winter losses represent an average 3.5 hives per beekeepers. This is down from 4.7.hives the previous Winter, but down only slight lower than the 3.9 hives in 2008-09 and 3.7 hives in 2007-08.

"This is the fourth consecutive year when BBKA members have reported unacceptably high colony losses which is especially puzzling when the weather should have been in the bees favor," the association says.

"It does show how fragile the health of honey bees is."

The association says periods of poor nutrition within the active season from February to October remain a likely cause of weakness in adult bees that could cause them to succumb to diseases they would otherwise shrug off.

"It is critical that we don't allow our honey bees to go hungry," association president Martin Smith says. "Everyone who gardens, however small their plot, can provide the food desperately needed to feed bees."

"It is really important that there are flowering nectar- rich plants around in August, September and October to provide the nutrition that's needed so the bees can top up their stores of honey in the hive to see them through Winter."

The association says the government should not forget that investment is still vitally needed for applied research addressing the everyday problems beekeepers face such as the lack of no effective bee medicine currently available to cure the problem of endemic diseases such as those associated with the *Varroa* mite.

"This year's losses may show an encouraging downward trend though still above the acceptable rate of 7%-10 %," Smith says. "If they were measured against similar losses in livestock and other areas of farming they would be seen as disastrous and there would be great concern on the knock-on impact on food prices.'

Alan Harman

USDA FOREST SERVICE BOOKLET TOUTS VALUE OF NATIVE BEES

When I was a kid, there was one category for bees – "the stinging kind." Fear of being stung wouldn't allow me to consider variations among the swarms that patrolled playgrounds. The only thing that made bees tolerable was . . . the honey.

Youthfully ignorant, I didn't know that there are thousands of bee species (and some bee species are stingless) or that those bees on the playgrounds were more life saving than threatening.

The USDA Forest Service, along with Pollinator Partnership, has produced a booklet called Bee Basics: An Introduction to our Native Bees to educate the public and encourage people to help protect these essential insects.

The 40-page booklet primarily focuses on bees native to North America, of which there are 4,000 species, found in forests, farms, cities, wildlands and deserts. Although honey bees may be most noted for producing honey, the booklet explains that native bees are valued for pollinating plants.

"Much of the produce we eat is pollinated by bees," said Larry Stritch, a USDA Forest Service National Botanist. "They pollinate about 75 percent of the fruits and vegetables grown in the (United States) and 80 percent of flowering plants. Take away bees and you greatly decrease our food source and food for animals."

According to "Bee Basics," ground nesting bees provide food to wildlife and aerate and enrich soil.

The North American bumble bee, characterized by their relatively large, black, furry bodies and bright stripes, may be most familiar to Americans. There are about 50 species of bumble bees, which are important pollinators of tomatoes and clovers, a forage crop for cattle.

Bumble bees are among the Apidae family of bees, which also include native carpenter, squash and cuckoo bees, and nonnative stingless, orchid and honey bees.

Honey bees are the only natural source of honey that's healthy for humans. Brought to America from Europe, honey bees don't pollinate native plants as effectively as native bees.

Along with information about a variety of bees, "Bee Basics" also contains pages of glossy, color illustrations of bees and plants. The booklet's key message warns of the threat to native-bee survival that is posed by pesticides, competition for nectar from honey bees, and environmental destruction.

To learn more about native bees, read "Bee Basics" on the Forest Service website.

Reggie Woodruff, U.S. Forest Ser.

HONEY – BEST NEW FOOD!

Island Abbey Foods Ltd.'s Honibe brand is the winner of the 2011 Canada Brand Business Award at the international food tradeshow Salon International de l'Alimentation (SIAL) Canada held this year in Toronto.

The award recognizes the efforts of Honibe to promote the Canada brand and the use of the Canadian maple leaf on the packaging of the pure dried honey products that are exported to foreign markets. The maple leaf is used for consumer recognition in international markets to represent high quality, healthy, natural products from Canada.

Island Abbey Foods is a specialty honey producer based in Prince Edward Island.

Honibe brand honey is its line of all natural, specialty honey including products such as Honey Drop, described as the world's first 100% pure, no mess, non sticky honey-based sugar cube. The company also sells a 100% pure honey candy called Honey Delights, granular honey called Honey Sprinkles and Honey Lozenges for coughs and sore throats.

The Honibe brand has received major international recognition in recent months with the Honey Drop named as the Global SIAL d'Or Winner 2010 for the best new food product in the world. The Honey Drop was also named as the best new product in the Grocery Sweet 2010 and best of Canada Country Award 2010 categories.

SIAL Canada is an international tradeshow dedicated to food industry professionals which targets the North American market. Each year, more than 530 agri-food exhibitors and 12,000 professionals come together for the event.

"The Canada Brand Award recognizes our Honibi brand for upholding the strong Canadian image that Canadian food products have become known for around the world," Island Abbey Foods president John Rowe says. "We have been working hard the last number of years to build our Honibe brand internationally and this award recognizes that hard work.

"We prominently display the maple leaf on the front of all our lines of retail packaging as we know the value that is associated with the Canadian brand and are proud to continue to support this image."

Alan Harman

PREDICTING LOSSES ANSWER: RAISE BROOD

Australian researchers looking at colony collapse disorder (CCD) develop a model that could hold some of the answers to predicting bee populations at risk.

Researcher Andrew Barron at Macquarie University developed the model in collaboration with David Khoury and Mary Myerscough at the University of Sydney.

They point to a report released by the UN Environment Program recently saying the disastrous decline in honey bees over the last few years is unlikely to stop without a better understanding of the reasons behind the decline.

"While an enormous amount is known about honey bee sociobiology, comparatively little is know about the social responses of bees to population stresses on a colony," Barron says.

In the new research, Barron has discovered links between rapid population decline and chronically high forager death rates, suggesting that by examining forager numbers in a colony this new model could help predict colonies under threat.

The research also looks into one of the most mysterious aspects of CCD, the disappearance of bees from colonies leaving abandoned brood and food stores.

"Our model suggests that the response of bees in a stressed colony is to go out and forage, but this just increases the stress on individual bees and makes the problem worse," Barron says.

The model also suggests strategies to rescue failing colonies.

"Treatment strategies to restore failing colonies need to focus on supporting bees in the hive, and encouraging them to raise brood to boost the colony population," Barron says. "We're currently testing some ideas how to do this."

Barron says the research aids better understanding of the multiple threats facing bees around the world which unless addressed could lead to serious long-term consequences for food supplies.

"By identifying colonies at risk, this research can help scientists better understand the process of catastrophic colony failure, and how best to intervene to restore failing colonies," he says. – *Alan Harman*

ONTARIO BEEKEEPERS NET HEFTY GRANT

The Canadian government gives C$244,000 to the Ontario Beekeepers' Association to help it develop new strategies to respond to the decline in honey bee colony populations, Ontario Member of Parliament Patricia Davidson announced on behalf of Agriculture Minister Gerry Ritz.

The association is getting the money from the Canadian Agricultural Adaptation Program through the Agricultural Adaptation Council (AAC), a non-profit, grass roots coalition of 66 agricultural, agribusiness and rural organizations dedicated to providing financial resources to help Ontario's agriculture and agri-food industry remain profitable, grow and maintain its economic strength.

"Ensuring a more profitable and sustainable future for the bee industry will benefit farmers, industry, and the ecosystem," Davidson says. "This project will help farmers and the entire industry increase profitability and find ways to improve breeding while developing good management practices."

The project aims to help beekeepers secure sustainable honey harvests and provide essential pollination services to the fruit and vegetable industry.

Association tech transfer program lead specialist Les Eccles says the partnership formed between the AAC, and the association will ensure beekeepers are able to manage genetics, pests and nutrition according to their business objectives.

"Providing management strategies specific to the beekeepers goals will give more sustainable and consistent results," Eccles says.

AAC chairman Jim Rickard says the funding provided through AAC will greatly advance the association's efforts to ensure the beekeeping industry has quality and consistent honey bee stocks.

"It is critical that beekeepers have access to the technology they need to maintain healthy bee colonies," he says.

During the last four years, beekeepers in Ontario have been losing high numbers of honey bee colonies due to disease, pest resistance to treatment methods, and increased demand on honey bee colonies to provide pollination services.

Led by the universities of Guelph and Manitoba, the new project will develop a breeding program that will result in honey bees that have the ability to resist pests and diseases.

It will also screen new products for pest and disease control and develop best management practices relating to pollination colonies. Beekeepers in the province of Ontario have identified these issues as priorities for the industry.

Ultimately, the project will provide beekeepers with the ability to have better control of colony genetics and health in order to have consistent honey production and pollination services.

Alan Harman

ASIAN BEE: STILL SPREADING, AND STILL DEBATING IN OZ

An Australian Senate inquiry has found the city-centric federal Labor government's efforts to eradicate the Asian honey bee in the far north of the country were insufficient and the decision to end the funding was based on inadequate science.

The senate's rural affairs and transport committee, which examined the science behind the decision not to eradicate the potentially *Varroa*-carrying bee, says it could become one of Australia's costliest pests.

Federal funding for the eradication program was cut last year, but in May the government budgeted A$2 million over two years for a containment program.

When the eradication effort under the emergency response arrangements ended as a direct result of a 6-4 split decision that the bee was not eradicable, the Queensland state government continued funding the eradication efforts in place at that time.

The bee was first found in Cairns in far north Queensland in 2007 and while more than 350 colonies have since been detected and destroyed, the incursion is still spreading.

This resulted in the United States "suspending" imports of live Australian bees.

The committee says the Asian honey bee is an invasive species which adversely affects populations of European honey bees by competing for floral resources, robbing managed hives and transmitting disease.

The strain of Asian honey bee found in the Cairns region is the

Continued on Next Page

Java strain, which is common in Asia, particularly in Indonesia and Papua New Guinea where it was introduced in the 1970s and 1980s.

"Because it is a vector for the Varroa mite, the Asian honey bee represents a significant threat to Australian beekeeping industries and industries that depend on managed honey bees for pollination," the committee's report says.

The committee identified a number of concerns regarding the adequacy of the scientific evidence drawn on to support the conclusion that the bee is not eradicable, and noted that the opinions of the members of the national management group were divided on this question.

The committee concluded that, in view of this uncertainty and the potential spread and environmental, economic and social impacts of the Asian bee in Australia, "there were no reasonable grounds on which to favor the conclusion that the pest was ineradicable."

It is also concerned the risk assessment in relation to the Asian honey bee incursion did not include an assessment of the impact on Australia's biodiversity. The committee considers that an understanding of the biodiversity consequences for any incursion should be understood and considered early in the development of a response strategy.

On this basis, it made three recommendations.

• It asked the Consultative Committee on Emergency Plant Pests (CCEPP) to reconsider the question of whether the Asian bee is eradicable and, following this, to make a fresh recommendation to the national management group on the incursion response.

"The CCEPP should specifically consider this question in light of evidence relating to the potential for the insect's spread and resulting environmental, economic and social costs; the CCEPP should specifically apply the precautionary principle to areas of scientific uncertainty in its reconsideration of these issues," the committee says.

•The committee also recommended the national management group reconsider the feasibility question, specifically applying the precautionary principle to areas of scientific uncertainty in its reconsideration of this issue.

• Finally, the report said in the event the full Asian bee eradication program is reinstated, a scientific program of data collection concerning the detection, spread and eradicability of the bee from Australia be initiated to properly inform future decision making regarding this emergency plant pest.

As a result of the report, CCEPP reconsidered its decision but stuck with its finding against a further eradication attempts.

"The failure of the CCEPP to change its finding that the Asian honey bee is not eradicable means that future efforts will be focused on containment activities," the report says.

"The committee regrets that there has been no reversal of the decision that the Asian honey bee is not eradicable from Australia … and that the government's focus has now shifted to containment, rather than eradication, of what could become one of Australia's most damaging and costly pest species," the report says.

"However, the committee notes that there remains potential for the question of the eradicability of the Asian honey bee to be revisited and reviewed in light of the results of Queensland's draft containment program, which will be finalized in the near future.

A cross government/industry group has met on two occasions to consider what management actions can now be taken, and to what level, to minimize the impact of the bees.

"The current effort to contain the Asian honey bee should, in the committee's view, attract the highest priority of governments, given the potential benefits of successful containment, and the potential of this effort to inform any future effort at eradication."

"The committee considers that the current emergency response system relies too heavily on a 'combat' state to conduct and assess the effectiveness of initial eradication efforts, and that the attendant risks of this approach are that initial efforts are not sufficiently well planned, resourced and carried out with sufficient national and technical oversight," the report says. "Given this, there is a real risk that Australia's initial responses to emergency pest or disease incursions are not maximally responsive and effective."

The committee says it is particularly concerned Australia should be adequately prepared in the event of an incursion of *Varroa* mite.

"The committee is aware of the significant economic impact and ongoing control costs incurred as a result of the New Zealand incursion of Varroa mite and understands that there is potential for such impacts to be greater in the Australian context," the report says. – *Alan Harman*

Meanwhile, back in Kansas . . .

Meanwhile, Aussie Queens Coming to the U.S.?????

Queen bees from the Western Australian bee breeding program are being used in a research trial in the U.S. that is seeking to test honey bees' (apis mellifera) tolerance to the *Varroa* mite.

State Department of Agriculture and Food senior apiculturist Bill Trend says 50 queen bees, bred using stock from the isolated mating breeding program on Rottnest Island, were sent to Kansas in May, along with 125 queens from queen breeders located in Australia's eastern states.

This provided a good cross section of bee genetics in the U.S. *Varroa* trial from right across Australia.

The bee breeding program on Rottnest Island, 11 miles off the coast of Western Australia near Fremantle, was started by the department in 1981 and was taken over by industry's Better Bees group in 1991.

Better Bees group chairman John Davies says the U.S. *Varroa* trial is being coordinated by Ben Oldroyd from the University of Sydney.

"It is part of a research project funded by the Rural Industries Research and Development Corp.'s (RIRDC) honey bee program, and it is examining the level of tolerance Australian queen bee genetics have to the *Varroa* mite," Davies says.

All the Australian queens along with three lines of queens from the U.S. were successfully introduced into hives in the U.S. and the trial is underway.

Davies says the trial hives are being monitored at regular intervals through the northern summer to determine the level of tolerance of each queen to the mites.

Australia is the only major honey producing country in the world without *Varroa* mite.

"It's hoped current research efforts will find ways to breed bees with stronger resistance to the *Varroa* mite," Trend says. "If we can achieve this through cooperative research, Australia can develop stronger protection against the mite if it comes to our shores.

The mite is closing in on Australia with neighboring Papua New Guinea and New Zealand already invaded by *Varroa*. – *Alan Harman*

NATIONAL DROUGHT SURVEY

August 9, 2011 – The discussion in the Looking Ahead section is simply a description of what the official national guidance from the National Weather Service (NWS) National Centers for Environmental Prediction is depicting for current areas of dryness and drought. The NWS forecast products utilized include the HPC five-day QPF and five-day Mean Temperature progs, the six to 10 Day Outlooks of Temperature and Precipitation Probability, and the eight to 14 Day Outlooks of Temperature and Precipitation Probability, valid as of late Wednesday afternoon of the USDM release week. The NWS forecast web page used for this section is: http://www.cpc.ncep.noaa.gov/products/forecasts/.

Summary: Exceptional drought continues its hold on the southern states of Texas, Oklahoma, New Mexico and neighboring states. Recent extreme high temperatures have combined with below average precipitation over the last few weeks to create drought impacts in the Corn Belt states of Iowa, Illinois and Indiana.

Northeast and Mid-Atlantic: An area of abnormally dry conditions is expanded in the states of Vermont and New Hampshire. Over the last 30 days, rainfall totals of one to five inches below average have been reported across much of the northern tier of these states. Streamflow data is averaging around 20% of normal in some area creeks and rivers for this time of year.

Southeast: Abnormally dry conditions now exist in the mountains of western North Carolina and eastern Tennessee. This area has not received as much rainfall as normal for this time of year, particularly over the last 30 days, and streamflow data in the area are also beginning to show signs of less surface water flowing through the mountain creeks and rivers. In the Charlotte area, as much as six inches of rain feel this week, but primarily on the already drought-free area. Elsewhere in North Carolina, some improvement is warranted in the north central part of the state, with a change from D1 to D0 status. Hydrological impacts persist, however, and that is indicated as the primary impact.

A swath of heavy rain through east central South Carolina is cause for a one-category improvement from Columbia to Charleston. Local totals were one to two inches or more above normal for the week. An area of extremely heavy precipitation centered in northeastern Georgia was also beneficial. Scattered thunderstorm activity in Florida was considered, but no changes were made on the peninsula. The impacts of previous extreme drought in the Florida panhandle have subsided, and D3, or Extreme Drought, conditions are removed.

South: Texas continues to suffer from unprecedented drought. Climate data show that the Lone Star State is in its driest ten-month period ever on record, in over a century of data. This is unprecedented territory, as the precipitation deficits mount, and triple digit temperatures continue to increase water demand. Significant, ongoing impacts related to agriculture, water supply and natural vegetation conditions have been reported. Widespread Exceptional Drought (D4) is maintained in large part across the region.

The western edge of the D4 area in the Oklahoma and Texas Panhandles continued to erode thanks to monsoon rainfall amounts of nearly an inch in some areas. Boise City, OK, received 0.95 inch in the last seven days, compared to an October 1 - July 31 total of 3.78 inches. Elsewhere, D3 was expanded eastward across the remainder of southeastern Oklahoma, over the Red River and into western Arkansas due to a combination of short-term dryness with excessive heat, residual effects of moderate drought from the preceding year, and local impact reports. The Oklahoma Biological Survey reported that streams in southeastern Oklahoma were going dry, threatening up to three endangered mussel species.

Elsewhere, a large area of six to eight inches of rainfall across northeastern Mississippi and northwestern Alabama removed dry conditions and no drought is depicted on this week's map. In northwestern Louisiana, drought impacts and precipitation deficits are accumulating, resulting in an increase in the D4 area. Much of the Exceptional Drought is due to shortages of two to three feet of rainfall over the last 18 months. At the opposite corner of the state, rain was a welcome sight and gave reason for one-category improvement from Baton Rouge and New Orleans, LA to Biloxi, MS.

Central and Midwest: Drought impacts have developed quickly in the Corn Belt states of South Dakota, Iowa, Illinois and Indiana. Multiple days of 100+ degree temperatures have combined with below average precipitation over the last few weeks to stress the corn plants, particularly in areas with sandier soils or areas with delayed planting due to a wet spring. This "flash drought" is depicted as D1, moderate drought, in southeastern South Dakota, and from southeast Iowa to central Indiana. The soybean regions have not reported similar conditions thus far.

A storm track across northeastern Kansas and into southwestern Missouri produced locally three to eight inches above average precipitation for the current Drought Monitor period. One-category improvements are made in several counties, approximately from Manhattan to Lawrence, KS, and also over part of the Ozarks between Kansas City and Springfield, MO.

West: Very few changes were made in the western region of the United States. Widespread rainfall south and southeast of Denver, CO, have improved the drought conditions and a one-category improvement is made in Jefferson, Park, El Paso, and Lincoln counties and the surrounding area. Drought impacts to producers in this area are not as severe as were reported in July. In the San Luis Valley in south central Colorado, exceptional drought impacts continue despite recent precipitation over the last few weeks, and this area remains in D4 status.

Hawaii, Alaska and Puerto Rico: The Big Island is suffering from lack of rainfall in the agricultural areas of north, west and central regions. D2 was expanded to include a larger area of north central Hawaii, and moderate drought conditions now encompass most of the western half of the island.

The abnormally dry areas in Alaska held steady this week. Despite widespread reports of precipitation across the state, they did not alleviate the current D0 regions and were below normal for the period. Many stations are maintaining rainfall deficits of up to three inches below average for the last month.

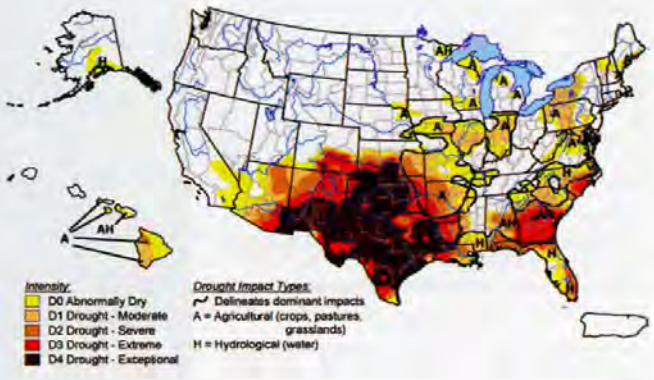
In Puerto Rico, residents continue to be bombarded by above average precipitation this summer, and no drought conditions are depicted on the map. For the last 30 days, rainfall totals of more than eight inches above normal are common across the island.

Looking Ahead: The first few days of the next U.S. Drought Monitor period will bring scattered showers throughout the monsoon region, centered on New Mexico. A swath of this scattered convective activity may be found from north to south, just east of the Rocky Mountains, but may not alleviate the severe to exceptional drought conditions in the Great Plains states. A strong system will move the middle part of the country, centered on Arkansas. Texas will continue to be "high and dry," with little drought relief in sight over the next week.

The extended outlook over the next six to ten days calls for continued above normal temperatures across throughout the central U.S., from Arizona to Mississippi and north to the Great Lakes. This area has already been affected by extremely high maximum temperatures, and the heat trend will continue. Cooler than normal temperatures are expected across Alaska, the Pacific coast and along the Atlantic coast from Virginia to northern Florida. Below normal precipitation pattern will persist as well throughout much of the most severe drought areas, and above normal precipitation projected over the northern High Plains states and far Pacific Northwest and Northeast.

Laura Edwards,
Western Regional Climate Center

And What About The 2011 Honey Crop?



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With 80 honey beehives spread over six yards, a job on Aspen Mountain, and a girlfriend who insists on taking time off for "fun," I've been busy this Summer. I punch the clock three days a week and sleep in the locker room, but I log close to 40 hours, and when I finally get a day off on Sunday, I'm generally a wreck.

A few Saturdays ago, I was scheduled to get off work at 5 p.m. This is early for me. The day before I'd worked from 9:30 a.m. until 2 a.m. So I was thinking I'd let Marilyn drive the 55 miles back to New Castle, while I napped.

She had a gig as a sound technician at the Aspen Ideas Festival. When she called at 4:00, she said, "Bill Clinton is giving a talk at 5:15. I can get us in."

"Wonderful!" I said, "But I just hit the wall."

"But this is a once-in-a-lifetime opportunity!" she countered.

I try to be a good sport, because if you're not a good sport, girls will dump you in a heartbeat. So I said, "O.K., where do we meet?"

"Where you dropped me off for work," she said.

Marilyn is rarely on time for anything. And I don't own a cell phone, so after waiting at the rendezvous for half an hour, I decided I'd been stood up. I drove home. She could take the bus. I was so tired I couldn't think straight.

This all turned out to be a misunderstanding. Marilyn was waiting in one place at the Aspen Institute and I at another. I'd dropped her off on more than one occasion, but at two different locations. Hence the confusion. She was waiting in the parking lot, not a hundred feet from my parked car, which she didn't see. I was waiting so close to the auditorium that I could hear Bubba speaking inside. Why Marilyn and I didn't see each other when I walked back to the car remains a mystery.

I patched things up with my sweetheart, but when I went back to work, I was immediately on center stage. My co-workers wanted to hear me talk my way out of this one. Some of the crew were still on duty when Marilyn called the job to report me missing the night of the botched rendezvous. Our paramedic Randy monitors the police and medical radio channels. He'd been convinced I was either in the car wreck on Highway 82 or that I'd died of a heart attack at an Aspen restaurant.

Meanwhile, Marilyn had called the sheriff.

This was only the beginning. On my days off at the farm, a woman phoned the president of the Aspen Skiing Company to protest my new apiary on the mountain, and a hiker panicked by a bear following him down the trail on Aspen Mountain had fallen and broken his collarbone. Tongues wagged that my nearby bee yard must have attracted the bear. Was the company going to order my little darlings off the hill? Finally we all had something to talk about!

You see what I mean about a busy Summer, right?

At least Marilyn's been a big help with the bees. She collects pollen, supers, and monitors mites. She's no cream puff. She's a real gal. And with her along, I don't have to talk to myself.

What she doesn't like is getting stung. But she insists on working in shirtsleeves without gloves, so what does she expect?

The other day she took a sting on the back of the hand. By the next day it looked like a prizefighter's, and it stayed swollen for two days. It kept her awake at night. "I don't get it," she muttered. "I thought the bees and I had come to an understanding!"

Her dramatic reaction to bee venom is a "major localized reaction," a response suffered by about 10 percent of the population. Kissing it better doesn't help.

But Marilyn's a trooper. Since the hand sting, she's had a bee up her blouse and one of those nasty fingertip stings, but she didn't swell up like she did before.

And she's getting really good with her sugar shake for mites. Here's how she does it: She brushes the bees (but not the queen!) off some brood comb into a shallow plastic tub. Then she gives the tub a sharp rap on one corner, so all the bees fall into that corner. Next she bangs them into a quart mason jar. She quits pouring when the bees are a little less than an inch deep in the jar. That's your magic 300 bees, but she's not too picky about the exact number. She just wants to know if we have a lot of mites or just a few in our sample.

Then she screws on the Mason jar ring, but instead of using a lid inside the ring, she uses a circular piece of number 8 hardware cloth. Then she uses her hive tool to give the bees in the jar a dollop of powdered sugar. She shakes the sugared bees a time or two, sets the jar down by the hive, and comes back after a few minutes.

Now she holds the jar in both hands and does a little Latin salsa routine as she vigorously shakes the inverted jar up and down, scattering the sugar onto a sheet of white paper on a clipboard. She shakes until it seems like a good time to quit. Then she counts the mites on the paper. You know it's a mite if its little feet twitch.

Why would you do an alcohol wash and kill 300 bees for the same result? The sugar shake is easy and accurate, and you won't kill the queen if you give her a shake.

So do like Marilyn and monitor, monitor, monitor your mite levels. Then you can decide which hives to treat for *Varroa*, and when. You're not guessing about mites anymore! You're in control!

Now rest easy, and next time I'll tell you the story of what happened to my bees on Aspen Mountain.

Ed **Colby**

A Simple Misunderstanding