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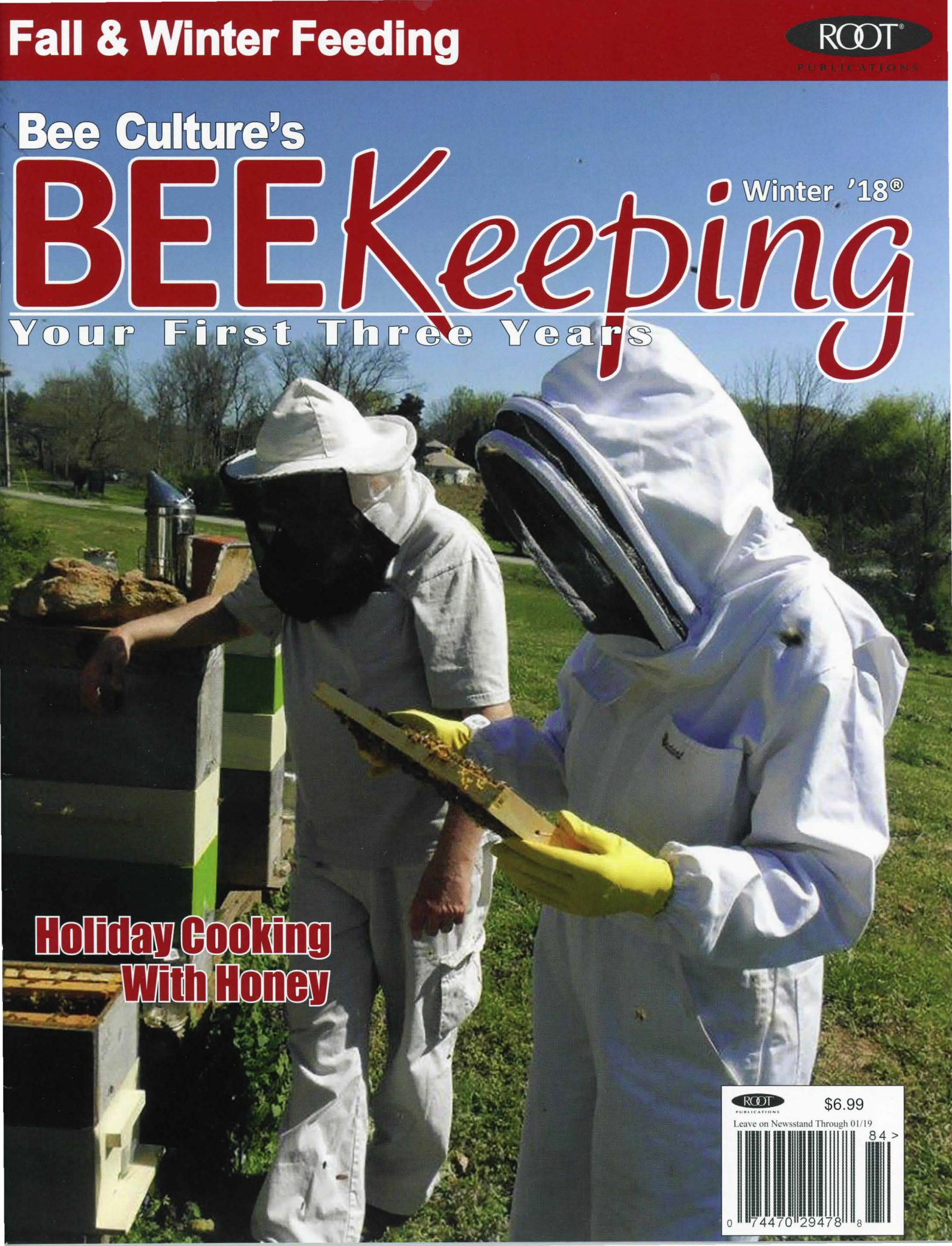

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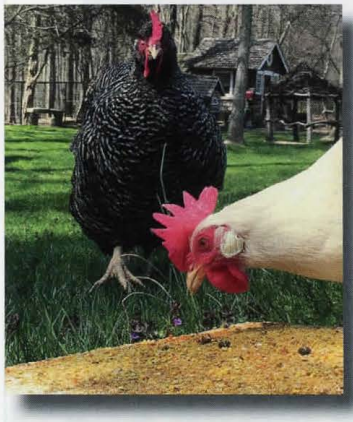

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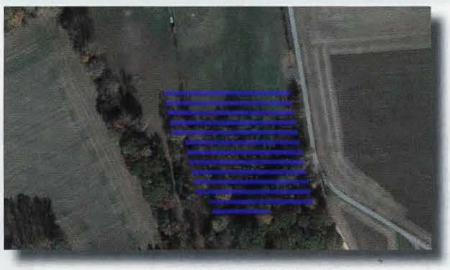

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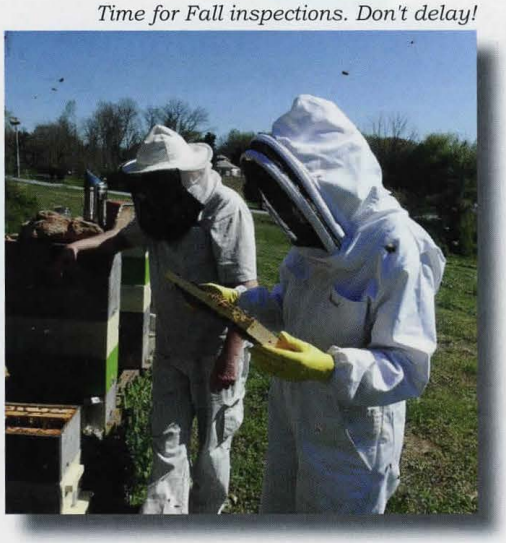
Time for Fall inspections. Don't delay!



800.289.7668

Executive Publisher – John Root

Associate Publisher, Senior Editor – Kim Flottum, Kim@BeeCulture.com, Ext. 3214

Assistant Editor, Design – Kathy Summers, Kathy@BeeCulture.com, Ext. 3215

Social Media & Event Specialist – Amanda DeSimone, Amanda@BeeCulture.com, Ext. 3255

Advertising – Jean Newcombe, JNewcombe@BeeCulture.com, Ext. 3216

Publications Assistant/Subscriptions – Kelsey Kelly, kkelly@rootcandles.com, Ext. 3220

Design/Layout – Brenda Tharp Bray

Contributors

Clarence Collison • James E. Tew • Ann Harman • Phil Craft • Larry Connor • Toni Burnham • Ross Conrad • Jennifer Berry

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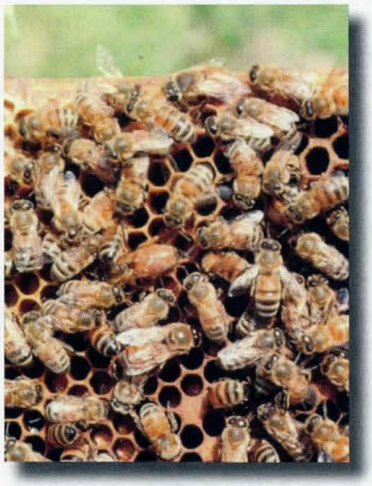
BEEKeeping

Your First Three Years



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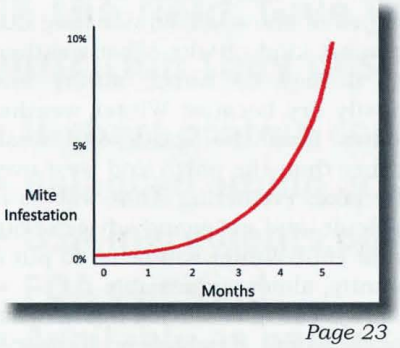

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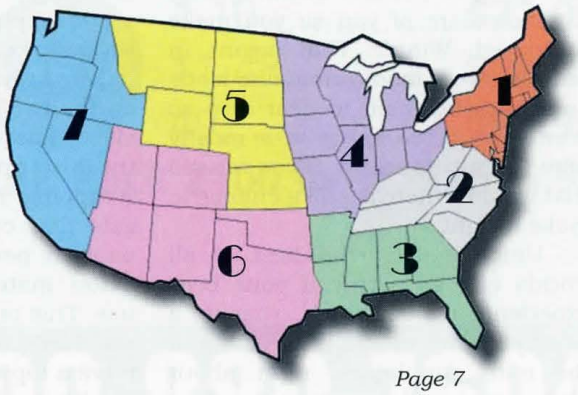

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The Editor's Hive

The Hardest Season. Winter.

Winter is the hardest season, except in the very, very southern part of the U.S. where there are plants blooming all year long. When bees have access to nectar and pollen on a continuous basis, life isn't quite as tough as those in the far north have to experience each season.

However, even those southern bees can face hardships with a dearth, storms, pesticide exposures, removal of forage or even late season swarms and of course, other reasons.

But for those who live above the Mason/Dixon line, Winter is not for the faint of heart, or for bees who are not managed for this kind of stress.

A well-prepared hive generally has little to worry about for the months it must deal with no fresh food coming in, with daily flights pretty much out of the question but enough food stored for the Winter adults and the kids coming in the Spring.

Your job, even this late in the season is three-fold – mites, food and protection. Much earlier this season, starting in July, you began this task by taking care of the bees that take care of the bees that go into Winter. Taking care of your grandparents means they can take care or your parents meaning they can take care of you so you make it through Winter. That means in July you were monitoring mite loads and reducing them to near zero so Winter could be spent in a mostly mite-free environment. If you missed that window there is still a chance to make it right.

Unfortunately, the best of all worlds can go astray if your bees experience a mite bomb...that is, a nearby colony wasn't prepared, and the mite population, right about now, gets way ahead of the bees and the virus and the mites take their toll. Bees die younger and younger and eventually the colony absconds, looking for a better home. They leave behind brood and a queen perhaps, but most of the workers leave for better digs...where there's food, and not as many mites. But they take their home mites with them, and suddenly your once clean hive is loaded, again. Right now.

A quick test, even this late in the season can help. If your alcohol wash shows more than 2 mites/100 bees you can treat with one of the organic acids. Both work this time of year because you have little or no brood for the mites to hide in. And, besides those mites that just came are all exposed and are exceptionally vulnerable to these treatments.

Food. You'll need to make sure there is enough food. If you live where you get snow and ice and are overwintering in 2 deeps, bottom board, inner cover and cover, along with food and bees, the entire unit should weigh in at about 165 – 180 pounds, minimum. If less, you need to get some food in there. You can get this weight using a hand-held Spring scale. Weigh the front, the back and add the two numbers together. If not enough feed, feed. Feed heavy sugar syrup, at least 3:1. Better, use fondant or a candy board. Easy to get to for the bees and they don't have to get rid of any water.

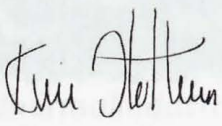
Wrapping or at least wind breaks are always a good idea. Use some pallets or hay bales to stop the wind on the two most common windward sides, about a couple of feet from the hive and a third again as tall. Wrapping is always good when it gets that cold. Regular roofing felt paper is perfect, and there are even better materials on the market to use. This provides a wind break and some level of insulation. Be sure and leave a top entrance.

Winter. The hardest season. Make it easier for your bees...

The end of the calendar year has special meaning for beekeepers certainly. Holidays, vacations, football games, parties, friends and family get-togethers. I encourage you to add a few additional activities to your festivities this season though. If you haven't already, find and join your local beekeeping association, and then, attend the meetings. This time of year speakers and discussions tend toward what happened last season, and what should I do next season. If this is your first Winter you probably don't have a lot of background in what to expect and when to expect it. Talking to seasoned (bad pun, sorry) beekeepers will give you a feel for what happens when where you live.

And that is exactly why keeping bees is both a challenge and an adventure. My bees live in northeast Ohio, and no two winters here are alike. We may have inches and inches of snow, all Winter long due to some kind of lake effect weather, or, it may be warm, sunny and mostly dry because Winter weather comes from the south and west, rather than the north and west over the lake. Predicting what will be is difficult, and me giving advice about what your Winter will be is, to put it bluntly, almost impossible.

We can give advice about what to do when, if whatever happens, but if it doesn't happen, then what? All beekeeping is local. Very local. Backyard local. Experience is the best teacher. A local beekeeper is the next best teacher. Good luck, Merry Christmas and Happy New Year from all of us at BEEKeeping, Your First Three Years!!

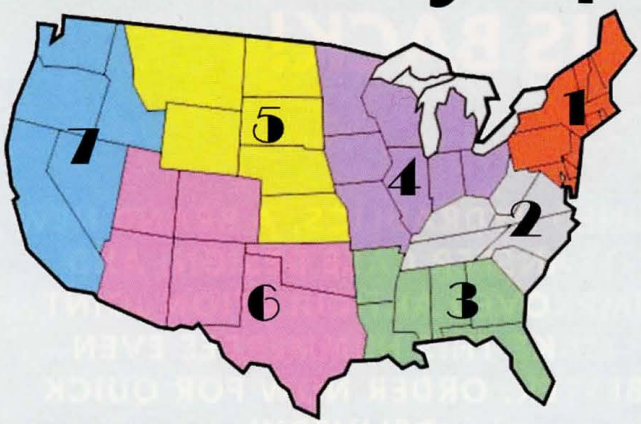


1ST YEAR HIVE TASKS

Ann **Harman**

- The bee year is winding down – Winter is approaching.
- October First – the day to install mouse guards
- Queens decrease egg laying – brood diminishes.
- Use broodless period for *Varroa* intervention until day temperatures lower below 57°F.
- Bees start their cluster at 57°F.
- Keep small hive beetle under control until weather becomes cold.
- If you are in bear country, make certain bear fence is working. Bears need to fatten up before hibernation. They are looking for brood.
- Bees need adequate Winter stores: Warm climate 40 pounds
  Temperate climate 60 pounds
  Cold climate 90 pounds
- Frames of stored honey can be moved if colonies are disease-free. Look carefully – do not move the queen.
- If feeding is necessary, mix two or better three parts white granulated sugar (or slightly less) to one part water.
- Do not feed liquid syrup when temperatures are below 67°F.
- Do not leave queen excluders on the hives. Clean them on a cold day when wax will snap off.
- When cleaning queen excluders inspect for any damage and discard. Queens find bent rods and torn plastic.
- Inspect all equipment for damage. Set aside for repair – or – fix it now!
- Inspect stored comb for damage, excessive drone comb, pieces of cross comb
- Protect all stored equipment, including plastic queen excluders, from mice
- To kill wax moth eggs, woodenware and brood combs can be placed in plastic bags and frozen for a week. Leave in plastic bags and protect from mice.
- Clean up the beeyard (and find that lost hive tool). Do not leave pieces of equipment lying around.
- Clear weeds from hive entrances so bees can take cleansing flights.
- Wash all bee clothing – veils, jackets, coveralls, gloves. Replace household gloves with new ones.
- Clean up the smoker and make sure it is free of ashes under the grid.
- Check hives once a month to see if food stores are adequate. Do not break the cluster!
- The holiday season is coming – use honey in cooking!
- It's a good time to read bee magazines and books.
- Santa is waiting for your list of equipment and books so he can load his sleigh!

Winter Honey Report



Honey Production 2018

We asked our reporters to sum up the honey crop this year, including Spring, Summer and any Fall crop they were able to harvest. Coupled with that we asked about the weather for those crops in their regions. Take a look and see what went on this year. And better, what do you think the U.S. honey crop will be this season?

Region 1. Average production per colony overall all was 48 lbs., using 72% of the colonies they had available. About 2/3 thought it was better than last year, but some didn't have that kind of season this year. Spring weather was cool and wet, Summer warm and about right for moisture, and Fall warm and wet.

Region 2. Average production was 43 lbs, using only 63% of their available colonies. The crop this year was better than last season. Spring weather was wet, but temps were avg., Summer weather was warm and wet and Fall weather still warm and wet.

Region 3. Average production was 62 lbs, using 75% of available colonies. The crop this year right about the same as last year. Spring weather was generally warm and wet, Summer weather the same and Fall still warm but not quite as wet.

Region 4. Average production was 56 lbs, using 91% of their available colonies. The crop this year was just a little bit better than last year's crop. Spring weather was cool and wet, Summer warm and wet, and Fall weather was about the same.

Region 5. Overall average production was only 44 lbs, probably because only 55% of all colonies were used. This is much worse than last year's crop. Spring weather was cool and wet, Summer's was about average temp but much wetter than normal, and Fall's weather about avg temp but still, wetter than normal.

Region 6. Average honey production per colony was 60 lbs, using 74% of all the colonies owned. For almost everybody, this was better than last season, which is refreshing. Spring weather about average for that time of year in this region, with some reporting hot, some cold, and some dry. Summer weather was too warm, and too dry for almost everybody, and Fall weather has been still hot and still mostly dry.

Region 7. Average production out west was 66 pounds per colony, using fully 80% of the colonies available. Three to one this was worse than last year, but some did OK. Spring weather was about average but a bit on the dry side, Sum- mer weather still warm and dry and Fall weather about avg temp but dryer than most would like.

We took this a bit further, making some educated guesses. Overall production per colony, across all regions boils down to about 55 lbs/ colony. Last year overall production per colony was, according to ERS, about 55 pounds/colony, for a total of 147.6 million pounds. The top 5 producing states last year were ND, SD, CA, MT and FL. This year those regions overall averaged just under 60 pounds/colony, so the totals this year seem to be similar to last year's for overall honey crop. Time will tell. Stay tuned.

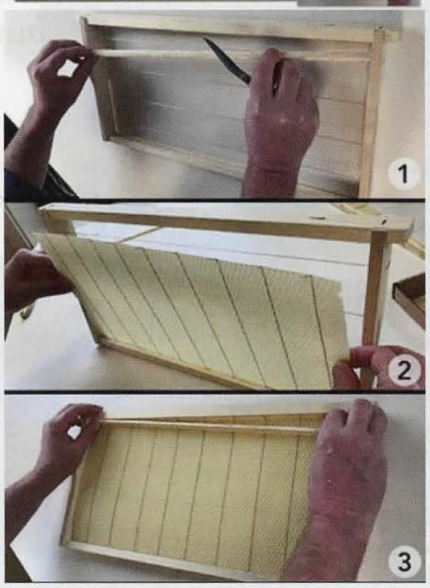
	REPORTING REGIONS							SUMMARY			History	
	1	2	3	4	5	6	7				Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS								Range	Avg.	$/lb		
55 Gal. Drum, Light	2.14	2.19	2.10	2.50	2.25	2.24	2.14	1.74-2.50	2.16	2.16	2.19	2.24
55 Gal. Drum, Ambr	1.99	2.17	2.01	2.35	1.99	2.08	1.99	1.35-2.50	2.06	2.06	2.10	2.14
60# Light (retail)	196.70	186.67	190.00	159.00	159.00	191.44	200.00	150.00-250.00	193.41	3.22	205.03	203.98
60# Amber (retail)	194.53	187.50	183.00	157.33	194.53	179.19	200.00	145.00-250.00	191.57	3.19	203.95	205.81
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	91.43	77.20	84.26	74.50	91.43	84.00	91.43	57.60-134.40	86.86	7.24	84.58	84.22
1# 24/case	138.63	109.00	128.67	106.60	127.16	133.32	128.40	86.40-211.20	128.45	5.35	121.81	122.85
2# 12/case	123.51	95.70	112.10	101.80	97.44	112.80	114.00	73.43-192.00	114.31	4.76	110.65	109.23
12.oz. Plas. 24/cs	105.83	106.25	82.48	85.00	74.40	108.48	103.20	52.99-172.80	98.77	5.49	96.62	94.50
5# 6/case	134.47	106.00	118.37	117.83	102.30	126.00	134.47	71.50-210.00	128.19	4.27	126.22	120.25
Quarts 12/case	155.96	152.81	128.86	109.20	155.32	138.72	144.00	109.20-222.00	146.33	4.06	149.90	138.85
Pints 12/case	107.82	96.75	76.60	107.82	111.00	81.58	84.00	65.00-174.00	96.14	5.34	90.85	96.52
RETAIL SHELF PRICES												
1/2#	5.30	4.67	4.75	4.75	3.60	3.54	5.30	2.08-9.00	5.07	10.13	4.95	4.38
12 oz. Plastic	6.93	5.23	6.09	4.95	4.85	6.53	5.90	3.50-12.00	6.12	8.15	5.97	5.73
1# Glass/Plastic	8.30	6.89	7.68	6.20	8.10	6.12	8.00	4.00-14.00	7.59	7.59	7.35	7.33
2# Glass/Plastic	13.94	10.69	13.47	11.10	13.30	9.33	14.50	6.99-23.00	12.88	6.44	12.37	13.02
Pint	11.60	9.43	8.79	11.60	12.00	9.56	9.20	6.00-20.00	10.20	6.80	9.76	10.43
Quart	18.19	16.54	15.54	12.00	14.71	17.45	16.15	8.00-32.00	16.38	5.46	16.57	17.34
5# Glass/Plastic	26.34	26.00	31.00	25.00	20.83	22.66	26.34	11.00-42.00	26.17	5.23	26.62	28.40
1# Cream	10.26	8.25	9.66	9.40	7.00	8.50	9.00	6.00-16.00	9.53	9.53	9.22	8.78
1# Cut Comb	13.49	9.63	10.14	11.12	15.00	10.50	14.00	6.00-24.00	11.99	11.99	11.44	10.37
Ross Round	8.56	6.82	8.56	8.50	8.56	10.50	12.49	3.50-13.00	8.88	11.83	8.55	8.29
Wholesale Wax (Lt)	7.15	5.08	5.99	6.50	6.00	4.50	6.00	2.50-13.00	6.54	-	6.29	6.84
Wholesale Wax (Dk)	5.74	4.84	3.76	5.00	6.00	3.17	5.74	2.00-10.00	5.48	-	5.55	6.02
Pollination Fee/Col.	97.73	72.50	81.67	90.00	97.73	90.00	97.73	50.00-160.00	90.45	-	84.25	72.92

WHAT'S NEW

The Millerbees Bucket Tilter is for tilting three to five gallon buckets with bottom gates, to get the last few bottles of Honey or other liquid out without getting the debris floating on the top or the debris that sank to the bottom. The bucket should not be tilted until the honey or other liquid has been emptied to just above the bottom gate. Then the center of gravity will be low enough to tilt the bucket and get the last of the honey or other liquid out, but not the debris. Three versions are offered. Bucket not included. One version fully assembled ready to use $45. Another version, all parts included except nails. Assembly is required by the purchaser $25. Also, a hardware kit that includes the "nine-ply", plywood part that has the precision radiused slot already cut, all the hardware (except nails), detailed drawings and instructions on how to make the other wood parts; which can all be cut on a table saw. $10.

More information **www.beetle-jail.com** or call 731.695.6960 Dealer inquiries welcome.

New from GloryBee – Pre-wired 9⅛" Wood Frames
Tradition with Efficiency



Wood frames with wired foundation are the preferred combination of frames and foundation for traditional beekeepers. However, due to how time-consuming and laborious it can be to install and wire beeswax foundation onto wooden frames, this combination has grown less popular over the years as new, more efficient forms of frames and foundation have been developed.

From our experience, it's not only more natural but also much easier to get a newly installed pack-age of bees going on 100% pure beeswax foundation. Since they produce it, bees prefer pure beeswax foundation over any other type. Now there's a way to have the best of both worlds with GloryBee's Pre-wired Wooden Frames!

Features:

- High quality, pre-assembled, wooden wedged top bar, grooved bottom bar frames
- Pre-wired horizontally with stainless steel wire
- Use with 100% pure beeswax 8½" crimp wired foundation with hooks
- Bees will draw foundation out faster with more uniformity and few irregularities such as bridge comb

For more information and a video, visit **https://glorybee.com/beekeeping/wood-frames-frame-parts/pre-wired-wood-frames-9-1-8**

Bees On Board Stickers

Looking for a bit more space on the road? Worried about leaving your hive tools in the car some-times? Perhaps we can help!

Car-friendly weather resistant vinyl laminate stickers, looks great on windows or bumpers, available in two sizes: 5" x 5" and 3" x 3"

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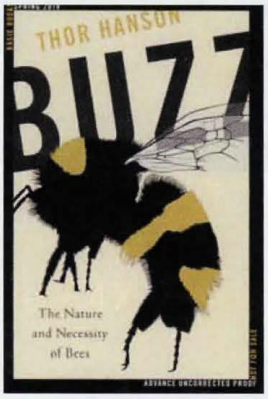
Order online at **www.dcbee-keepers.org/stickers**

BUZZ: The Nature and Necessity of Bees. By Thor Hanson. Published by Basic Books ISBN-10: 0465052614, ISBN-13: 978-0465052615. Hard-cover: 304 pages, black and white, Publisher: Basic Books (July 10, 2018), 8.5"x 6"



From the Publisher...

Modern bees are marvels of engineering, with unique aerodynamics, antibiotic spit, and seven distinct sensory organs on their antennae. Evolving alongside flowers, bees brought new shapes and colors to our landscapes. And we humans were not left behind in the playful process of co-evolution, either: the practice of keeping domestic bees proliferated, enabling the agricultural revolution, as we carried hives from field to field from the Ancient Nile to rural America.

In *BUZZ*: The Nature and Necessity of Bees Thor Hanson takes readers on a journey that begins 125 million years ago, when wasps began feeding pollen to their young. From honey bees to bumblebees to lesser-known diggers, miners, leaf-cutters, and masons, bees have long been central to our harvests, our mythologies, and our very existence. The human relationship with bees goes far beyond crop pollination and the production of wax and honey. Bees have taught us about decision-making, brain function, addiction, and architecture.

BUZZ is a book of wonder, where conscience comes from curiosity, and the irresistible urge to get out-side, find a bee on a flower, and settle down to watch.

Thor Hanson is a conservation biologist and Guggenheim fellow. His previous books include The Triumph of the Seeds and Feathers. He lives with wife and son on an island in Washington State.

The men of experiment are like the ant; they only collect and use. But the bee...gathers its materials from the flowers of the garden and of the field, but transforms and digests it by a power of its own. - Leonardo da Vinci

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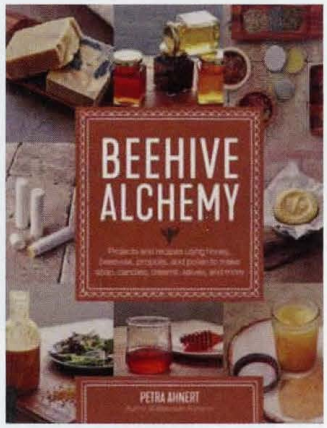
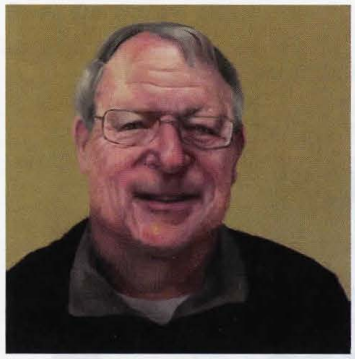
Beehive Alchemy: Projects and Recipes Using Honey, Beeswax, Propolis, and Pollen to make your own soap, candles and more. Petra Ahnert. Published by Quarry Books. ISBN 9781631594915. 160 pages, 8" x 10.5", color throughout, paperback, $24.99.



Petra Ahnert's name might be familiar because she is the author of *Beeswax Alchemy*, available everywhere and an excellent book on using beeswax for anything beeswax can be used for. Her new book expands even further on the uses of beeswax, but now she brings in a whole new set of tools – propolis and pollen. Introductory chapters include how honey, beeswax and propolis are made by the bees and harvested by beekeepers, just for background. Then there are chapters on the Alchemy for the body - making soap, lip balm, body butter, beard balm, salves, lotions and creams. Plus propolis toothpaste and lozenges are explored. Then there's Alchemy of Light, where she looks again at candles, but through a different lens, making hand dipped candles, tapers, tealights and votives and pillar candles. Alchemy for the home includes furniture polish, wood conditioner, food wraps, scented melts and sealing wax. Plus encaustic painting and batik fabrics are made up, too. Cookies and candies, desserts, ice cream, appetizers, fermented foods and beverages round out the rest of the book. There's something for everybody here, and if you teach classes, this works well as a text. Get one and see. – *Kim Flottum*



QUEEN PHEROMONE

QUEEN PHEROMONE IS COMPLEX AND IS PRODUCED FROM MULTIPLE GLANDS.

Clarence **Collison**

Honey bee queens produce a sophisticated array of chemical signals (pheromones) that influence both the behavior and physiology of their nest mates (Beggs et al. 2007). This pheromone blend is complex and is produced from multiple glands including mandibular glands, tergal glands and the Dufour's gland (Grozinger 2015). In the colony, division of labor and productivity are carefully regulated by the wide array of glandular pheromones produced by the queen (Kocher and Grozinger 2011; Le Conte and Hefetz 2008; Slessor et al. 2005). These pheromones regulate many aspects of colony organization.

Queens produce pheromones that function in both releaser and primer roles such as attracting a retinue of workers around her, attracting drones on mating flights, preventing workers from reproducing at the individual (worker egg-laying) and colony (swarming) level, and regulating several other aspects of colony functioning.

In terms of reproduction, queen mandibular pheromone (QMP) inhibits the production of new queens (Melathopoulos et al. 1996; Pettis et al. 1997; Pettis et al. 1995b), suppresses the activation of worker ovaries (Butler and Fairey 1963; Hoover et al. 2003), and serves as a sex attractant for drones during mating (Brockmann et al. 2006: Gary 1962). In workers, QMP stimulates pollen and nectar foraging (Higo et al. 1992; Pankiw et al. 1998; Pettis et al. 1995a), delays the age-of-onset for foraging (Pankiw et al. 1998) and lowers juvenile hormone titers (Pankiw et al. 1998). Furthermore, QMP elicits a "retinue response," a behavioral suite in which workers surround the queen, antennate, groom and lick her, all while collecting QMP pheromone to share with other nestmates (Slessor et al. 1988; Pankiw et al. 1994; Pankiw et al. 1995; Kaminski et al. 1990). Dissemination of QMP among workers enables nestmates to recognize the queen's presence without the need for all workers to come in direct contact with the queen (Seeley 1979).

Kocher et al. (2009) investigated the role of mating and reproductive state on queen pheromone production and worker responses. Virgin queens, naturally mated queens, and queens instrumentally inseminated with either semen or saline were collected two days after mating or insemination. Naturally mated queens had the most activated ovaries and the most distinct chemical profile in their mandibular glands. Instrumentally inseminated queens were intermediate between virgins and naturally mated queens for both ovary activation and chemical profiles. There were no significant differences between semen and saline-inseminated queens. Workers were preferentially attracted to the mandibular gland extracts from queens with significantly more activated ovaries. These studies suggest that the queen pheromone blend is modulated by the reproductive status of the queens, and workers can detect these subtle differences and are more responsive to queens with higher reproductive potential. Furthermore, it appears as if insemination substance does not strongly affect physiological characteristics of honey bee queens two days after insemination, suggesting that the insemination process or volume is responsible for stimulating these early postmating changes in honey bee queens.

Niño et al. (2013) examined the long-term impact of different factors involved during queen insemination on the chemical composition of the mandibular and Dufour's glands, two of the major sources of queen pheromone. Their results demonstrate that carbon dioxide (an anesthetic used in

instrumental insemination), physical manipulation of genital tract (presumably mimicking the act of copulation), insemination substance (saline vs. semen), and insemination volume (1 vs. 8 ml) all have long-term effects on mandibular gland chemical profiles. In contrast, Dufour's gland chemical profiles were changed only upon insemination and were not influenced by exposure to carbon dioxide, manipulation, insemination substance or volume. These results suggest that the chemical contents of these two glands are regulated by different neuro-physiological mechanisms. Furthermore, workers responded differently to the different mandibular gland extracts in a choice assay. Although these studies must be validated in naturally mated queens of varying mating quality, their results suggest that while the chemical composition of Dufour's gland is associated with mating status, that of the mandibular glands is associated with both mating status and insemination success. Thus the queen appears to be signaling both status and reproductive quality to the workers, which may impact worker behavior and physiology as well as social organization and productivity of the colony.

Rangel et al. (2016) investigated differences in the chemical composition of the mandibular glands and attractivenss to workers of "high-quality" queens (i.e., raised from fist instar larvae; more queen-like) and "low-quality" queens (i.e., raised from third instar worker larvae; more worker-like). They characterized the chemical profiles of the mandibular glands of high quality queens and low-quality queens using GCMS and used the worker retinue response as a measure of the attractiveness to workers of high-quality queens vs. low-quality queens. They found that queen quality affected the chemical profiles of mandibular gland contents differently across years, showing significant differences in the production of the queen mandibular pheromone (QMP) components HVA and 9-HDA in 2010, but no significant differences of any glandular compound in 2012. They also found that workers were significantly more attracted to high-quality queens than to low-quality queens in 2012, possibly because of increased attractiveness of their mandibular gland chemical profiles. Rangel et al. (2016) found that the age at which honey bee larvae enter the "queen-specific" developmental pathway influences the chemical composition of queen mandibular glands and worker behavior. However, these changes are not consistent across years, suggesting that other external factors may play important roles in modulating queen quality.

Queen honey bees are attractive to their workers, due partially to the pheromonal bouquet they secrete. Queen mandibular gland pheromone is a powerful attractant to worker honey bees but it is not solely responsible for eliciting retinue behavior. The attractiveness of virgin queen tergal gland secretions and queen mandibular pheromone to worker honey bees was tested using a retinue bioassay. The number of workers attending the treated pseudoqueen lures was videorecorded in order to allow for the quantification of attractiveness. Queen mandibular gland secretions were more attractive than tergal gland secretions, and both queen tergal gland secretions and mandibular gland secretions were significantly more attractive than the control treatment. This laboratory bioassay indicates that queen tergal gland secretions have a releaser effect that evokes retinue behavior from worker honey bees (Wossler and Crewe 1999).

In honey bee queens, the production of tergal gland alkenes was found to be stimulated by natural mating and not by instrumental insemination (Smith et al. 1993). Carbon dioxide, physical manipulation of the sting chamber and vagina, presence of sperm in the spermatheca, egg production and chemicals transferred via drone semen were demonstrated to not initiate the synthesis of the tergal gland alkenes. The compounds probably do not function as sex pheromones. However, the circumstances and timing of the initiation of production of the tergal gland alkenes strongly suggests a communication role for the compounds within the hive.

Honey bee workers develop from fertilized eggs, but those reared in a queenless colony develop into 'rebel' workers, which are more queen-like than typical workers. Rebels develop after an old queen leaves with a swarm and before a new queen hatches. Woyciechowski et al. (2016) hypothesized that larval food lacking queen mandibular pheromones trigger the rebel phenotype. Larvae reared under queenright or queenless conditions were additionally fed with water or a drop of macerated queen mandibular glands. After following development of the bees and subjecting them to dissection, they found that those reared with a queen or fed the macerated glands under queenless conditions developed into typical workers. Only those workers reared without a queen and without macerated glands added to their food developed into rebels; these rebels had more ovarioles, smaller hypopharyngeal glands, and larger mandibular and Dufour's glands than did typical workers. This is the first evidence that larval perception

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of the presence or absence of queen pheromones causes an alternative developmental strategy.

Pheromones produced by the queen are responsible for determining the reproductive state of the workers. Until recently the proximate molecular mechanisms underlying facultative worker sterility were unidentified. Studies into worker oogenesis in the honey bee have indicated that programmed cell death is central to the regulation of oogenesis. Ronai et al. (2016) investigated how queen pheromone, age of the worker and ovary state affect both programmed cell death and cell number in worker ovaries. They described a novel method to simultaneously measure programmed cell death (caspase activity) and live cell number (estimated from the amount of adenosine triphosphate) in an insect tissue. Workers exposed to queen pheromone have higher levels of caspase activity in the ovary than those not exposed. Their results suggest that queen pheromone triggers programmed cell death at the mid-oogenesis checkpoint causing the abortion of worker oocytes and reproductive inhibition of the worker caste. Nonetheless, high caspase activity is present in activated ovaries from workers not exposed to queen pheromone. This caspase activity is most likely to be from the nurse cells undergoing programmed cell death, in late oogenesis, for normal oocyte development. Their study shows that the social environment of an organism can influence programmed cell death within a tissue.

Queen rearing is suppressed in honey bees by pheromones, particularly the queen's mandibular gland pheromone. Pettis et al. (1995b) compared this pheromonally-based inhibition between temperate and tropically-evolved honey bees. Colonies of European and Africanized bees were exposed to synthetic queen mandibular gland pheromone (QMP) for ten days following removal of resident queens, and their queen rearing responses were examined. Queen rearing was suppressed similarly in both European and Africanized honey bees with the addition of synthetic QMP, indicating that QMP acts on workers of both races in a comparable fashion. QMP completely suppressed queen cell production for two days, but by day six, cells containing queen larvae were present in all treated colonies, indicating that other signals play a role in the suppression of queen rearing. In queenless control colonies not treated with QMP, Africanized bees reared 30% fewer queens than Europeans, possibly due to racial differences in response to feedback from developing queens and/or their cells. Queens development rate was faster in Africanized colonies, or they selected older larvae to initiate cells, as only 1% of queen cells were unsealed after 10 days compared with 12% unsealed cells in European colonies (Pettis et al. 1995b).

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

The World Is Run By Those That Show Up.

FALL FEEDING, A ONCE-A-YEAR CHANCE TO GET IT RIGHT

BY LES ECCLES

MOST BEEKEEPERS WE HAVE SPOKEN TO THIS YEAR HAVE been reporting a good honey harvest, which is very welcome news after the dismal honey crop of 2013. Bees also seem to have built good brood, and splits have come along to provide healthy populations for overwintering. Now that we have made it to the time of year to harvest the remainder of the honey crop we have farmed, it is time to look at how we need to feed our livestock to ensure they have consistent, nutritious and plentiful food stores to make it through a long Fall, Winter and Spring.

Although we could be blessed with a "late" Fall with flowers in bloom, it is rare that colonies are able to store excess food past the middle of September. The honey left in the brood chambers after harvest is usually enough to last a colony a short time into late Fall, however beekeepers feeding colonies should take place much sooner in order to ensure colonies have time and environmental conditions to store all of the resources necessary to make it through the rest of the overwintering period. Beekeepers will debate the method and exact date of when you should begin feeding. The method however, is largely what dictates of feeding how early or how late you can feed colonies. This article will discuss different overwintering options and what the benefits are to each.

Before feeding begins, there is a choice to be made on the type of feed you will use. It is strongly encouraged that sucrose be purchased over other options such as high fructose corn syrup HFCS). Sucrose based sugar syrup has been shown to be the most consistent supplement to ensure the honey bees have the carbohydrates needed to keep the cluster warn in the Winter, and encourage colony build up in the Spring. HFCS, although cheaper, has been shown to form a toxin, hydroxymethylfurfural (HMF), that can increase honey bee mortality rates and colonies fed HFCS do not seem to build as strong populations in the Spring when compared to sucrose.

Although honey may seem to be the logical and healthier feed to leave colonies, some thought needs to be put into this to understand why it may not be the best option for overwintering colonies. What it comes down to is providing consistent feed to the bees to achieve consistent overwintering. Every season is different in the nectar source and conditions available for colonies to collect nectar from various flowers; this also means that the natural honey left for a colony overwinter will vary in source, quality and quantity every year. This is important to consider because there are some honeys that, given certain conditions, do not provide honey bees with the sugars and energy needed to successfully make it through the Winter. For example, Fall floral sources, such as aster honey, crystallize quickly in the comb. If Winter temperatures do not allow honey bees to access water to liquefy this honey they could actually starve, even though there is an abundance of honey in the comb. The other point to consider is that there are components in honey that are not digestible by honey bees, resulting in increased defecation, which has the potential to increase the rate of disease spread in a colony. Correctly feeding overwintering bees is one of the most important aspects that differentiate "having bees" from "keeping or farming" bees, by reducing their risks from nothing more than exposure to the natural elements of their environment. This is not much different than farming cattle by providing healthy feed over the Winter rather than forcing them to stay outside to forage on the limited resources under the variable condition of that season and hoping for the best.

Overwintering colonies require about 15 liters of supplement syrup to achieve the desired overwinter colony weight of approximately 45 kg. This has been

shown to be the optimal weight to significantly reduce overwinter mortality due to starvation. This amount is also based on Ontario stock that has been bred for an optimal Winter cluster of about eight frames of bees. Older varieties of bees such as Italian honey bees that had much larger Winter clusters, required more food reserves over Winter and is the origin of why Ontario beekeepers overwintered the majority of colonies in double brood chambers. Current Ontario honey bee stock in most regions are now equally able to overwinter with food stores in a single brood chamber.

HIVE TOP FEEDERS

Top feeders are probably the most traditional form of feeding colonies. This consists of providing a container of sugar syrup on the top-bars of brood chambers to give bees easy access to feed that requires minimal environmental conditions to allow for foraging and storage. Honey bees generally need external temperatures above 13 ˚C to forage for food outside of the colony. However, when a feeder is placed on top of a colony, the bees can use the temperature released from inside of the colony to move to the feeder and collect the feed to bring it back and store in the brood chamber. The advantage to this over barrel feeding is that if environmental conditions in the Fall are too cool or wet for foraging, the colony can still access the feed from a hive top feeder to complete their Winter stores. The disadvantage is that it requires more time to feed colonies individually and may require refilling if the feeders used cannot hold the required amount to fill a brood chamber.

BARREL FEEDING

Barrel feeding is a relatively recent option for feeding colonies and is generally favored by beekeepers that have larger numbers of colonies and require more time and labor to feed individually. This method simply requires calculating the amount of syrup needed to feed a whole beeyard and placing bulk amounts of sugar syrup outside of the hive in large containers (usually barrels) that allow the colonies to rob the syrup from these containers and bring it back to the hive to store. Because one barrel of sugar syrup generally holds 150 liters, and a colony requires 15 liters of feed; one barrel is enough to feed 10 colonies.

The advantage to barrel feeding is that it requires only one trip to the bee yard to drop off the feed, open the containers and put straw or alternate material on top of the syrup in the containers for the bees to crawl on and access the feed. Although this requires more effort by the foragers to compete and rob this feed, resulting in dark, hairless, worn out bees, some beekeepers claim that this is a good thing because these are the oldest bees in the colony and is a method of ensuring they do not live too long into the Winter and use resources that should be saved for the younger workers that will rejuvenate the colony in the Spring. The disadvantage to this is method is that if it feeding is delayed in the Fall or the conditions are poor for foraging, the colony can run out of time to obtain this feed and store it properly. Another disadvantage that is not often discussed is that if disease is an issue in a bee yard, barrel feeding encourages mass congregation of feeding in one location, allowing for increased risk of disease spread between colonies. The saving theory in this biosecurity hazard is that the diseases that we would be concerned about spreading i.e. Nosema and American Foulbrood, are not of concern in the survival of overwintering colonies, however precautions should be taken the following Spring to monitor the potential development of disease originating from barrel feeding the previous Fall.

Despite which option you use to feed your colonies, there are environmental conditions that can hamper feeding management that are mostly out of the beekeeper's control. Low temperatures that prevent the collection and conversion of supplemental feed into stored honey is one that can usually be avoided by early feeding, starting no later than late September in most parts of Ontario. However, a humid Fall combined with low temperatures can cause another issue by reducing the ability of a colony to lower the moisture content of the feed, which can result in fermented honey stores. This will cause digestive issues in honey bees, with diarrhea symptoms that are often confused for Nosema infections in the Spring.

From my personal experience working with honey bees in different regions of the Americas, feeding is probably the most diverse management practice that requires taking into account environ-mental differences, types of honey bee stock used, flowering Seasons and overall beekeeping goals. We only have one chance per year to get feeding right, so gaining experience to improve feeding management is slow and demands a lot of consideration.

Les Eccles, B.Sc, is the Tech-Transfer Program Lead

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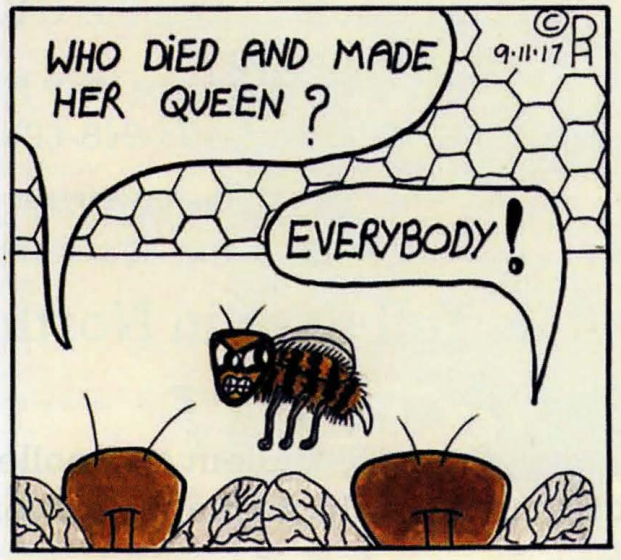


Getting Ready For A Southern Season

David E. **MacFawn**

Good well thought planning is required in the Autumn to ensure success the following Spring and Summer. Now, October and November, is the time to get ready for the next bee season. The beekeeper needs to decide:

- Generate or update your business plan.
- Colony growth plan.
- Financial plan.
- Sales and marketing plan.
- What type of products will you produce: honey, beeswax, pollen, propolis, NUCs, and pollination services for what type of crops.
- How many hives/colonies are needed to support your business plan.
- Purchase, assemble, and paint the woodenware.
- What type of bottom board will you use? A solid or Integrated Pest Management (IPM) open screened bottom board. An IPM open screened bottom board is recommended in the south due to the heat and moisture.
- What type of cover will you use. A telescoping cover, a migratory cover, or a sheet of exterior plywood cut to size? Will an inner cover be required?
- What type of frames and foundation are you going to use in the brood chamber and honey supers?
- How will you feed and with what type of feeder? Division/Frame feeder, bucket/pail feeder, etc. Boardman feeders that fit into the hive entrance is only recommended for water.
- How many bee yards and other locations (like equipment yards) will you need. Yards may be different for honey production than pollination services.
- How many packages, NUCs, existing colonies you may have to purchase (if any).
- How many queens you may have to purchase and when.
- Your bee build-up and splitting strategy.
  - Feeding strategy.
  - Colony maintenance and tending strategy.
  - Should you split in the Autumn when queens are readily available or wait until Spring when queens may not be available when the drones start flying.
- If you will have outyards.
  - Where will they be and impact on colony buildup and splitting.
  - Make necessary land arrangements.
  - Survey area for forage, and bee blooming plants.
  - Financial analysis and impact, cash and time required to maintain the outyard(s).

Figure 1: Bee Yard in West Columbia, SC Courtesy of Larry Coble

Figure 2: Award Winning Beeswax. Courtesy of Larry Coble

Figure 3:Screened Pallets. Courtesy of Danny Cannon

A business, financial, and marketing plan needs to be developed or updated. This should include things such as colony growth and the resulting equipment and bee needs, supporting financial plan with cash flows identified, and marketing plan. The cash flows should determine the amount of money needed each month; expenses and revenues. The marketing plan will determine what venue you plan to sell your honey and the resulting jar and labels. What quantity will you sell your honey, pollen, etc. will determine jar size and profitability. Also, how many colonies are needed for pollination requirements.

What type of bee products produced will determine equipment needs. If you are going to produce honey, the beekeeper needs to determine the typical honey flow quantify to match their supers to the flow amount. This will

help ensure full supers. Will you produce extracted honey, comb honey, or section honey? Also, the quantity of purchased equipment needs to be determined with the resulting money to purchase the equipment and time to assemble. Old equipment needs to be repaired and painted.

If you are going to pollinate crops, you may want to use eight frame equipment rather than ten frame equipment. Eight frame equipment is easier to move than ten frame equipment. Are you going to move the hives by hand or palletize the equipment? If you palletize, do you have the fork lifts and trucks available, to move the hives in and out of the fields. What are the colony pollination requirements (number of colonies per acre) and do you have sufficient colonies to support the farmer's operation? How is you bee build-up strategy going to support your pollination requirements? How many packages will you need to purchase, existing hives, NUCs, or colonies split?

Figure 4: Exterior Plywood Covers. Courtesy of Danny Cannon

Financial planning is also required to determine your cash needs for equipment, mileage/gas, feed, treatments, etc. How much will you get for your bee products, like honey, and when will you receive the money? In the south, the nectar flow is during the Spring with the resulting sales in the Summer and autumn. How much will you get for pollination and again, when will you receive the money? Cash flow analysis is critical to determine monthly and weekly cash sufficiency.

Figure 5: Pail Feeders. Courtesy of David MacFawn

Colony management in the early Winter, through Spring is important. Will you start feeding in January to split early (for example first of March in South Carolina). What percentage of bee losses do you anticipate and how will the bee losses impact your ability to service pollination contracts or honey yield. Will you cull weak colonies no later than October? Will you treat your colonies with Oxalic Acid for *Varroa* mites in later part of November first of December, when the brood is at its' lowest point? When treating with Oxalic Acid, will you drizzle or use sublimation. Refer to Randy Oliver's web site (**scientificbeekeeping.com**) for information on using either. Sublimation will cost you more money and time to do than drizzle. When and with what will you treat your colonies during other times of the year? What is your mite monitoring strategy to assess if treating is required? Will you use "sticky boards," alcohol or detergent wash, etc.

Figure 6: Feeder Cover. Courtesy of Danny Cannon

It takes time to assess potential future bee yards. Research needs to be done on-line, in libraries, with contacting local associations, and state entomologist, to determine the suitability of a potential yard for nectar flow. Will you build-up colonies in the outyard with earlier bloom to produce honey at the outyard, or are you going to build up in a distance outyard and move the colonies for a nectar flow? You need to push the financial numbers to determine what is the most profitable. When do the Maples boom for the first pollen and nectar? A yard location that is dry, in the sun, and out of the Winter winds is desired. When are the nectar flows and dearth periods (periods of no bloom) for each of your outyards? In the south, often there is a dearth during the Summer. Land owners need to be researched and contacted. On-line county information can be used to determine land owners. What will you give the land owner for yard rent?

Figure 7: A Five Frame Nuc. Courtesy of Danny Cannon

Should you split in the Autumn when queens are readily available or wait until Spring when queens may not be available, and when the drones start flying. If you split in the Spring, you may have to do a walk-away split, where you split the colony and let the bees raise another queen from eggs/larvae. If you do a walk-away split, it will typically take six weeks for the workers to emerge and another three weeks for the workers to mature and start foraging. How will this time line impact your honey production or pollination requirements? Often, if you split in the Autumn, feed the colonies starting in January, you may be able to get another split in. Use of drawn comb is preferred over foundation.

A lot of thinking and research needs to occur in October and November to ensure success the following year. What you will produce, colony count, equipment needs, cash flows, management and treating strategy, outyard requirements, and more needs to be thought through. Careful planning in the Autumn will ensure success the following bee year.

DOWNTOWN

It's Harder For You, Urban Newbee

Toni **Burnham**

The most experienced beekeepers I know tell me of golden years some three decades ago, before *Varroa* made its landfall in Florida in the 1980s. My friend Ken once said, "It was almost as if you could just throw some bees in some boxes behind the barn, then just grab the honey come August." Then it got harder. A lot harder.

A lot of beeks like Ken threw up their hands in those days–they hadn't signed up to *kill* bees, after all–and the numbers of sideliners declined. Urban beekeeping is one of the reasons that the number of beekeepers may be rising again, but it seems that may present some challenges in the city, too.

If I were a new beekeeper facing some of today's hurdles, I might soon be in the bleachers with Ken. You can actually get to blue skies from here, now, though.

Hitting the Jackpot

There is absolutely no question that I've been lucky, both when and where I started (though my bees have taken a bunch of shots along the way). My first bees overlapped mostly with feral colonies, since beekeeping hadn't become hip yet, and the mites weren't packing the horrid viral cocktail they are serving now. There were simply no Small Hive Beetles. Only one *Nosema.* There's a colony on my roof that has wintered every year since 2005/6, and it has produced glorious healthy bees, honey and the occasional swarm right up until now.

The Golden Years Are Gone.

But it's not because of me. Things I have done wrong: feeding 2:1 at below freezing temperatures, leaving a honey super on the porch in August ("It was just a few minutes!"), storing (unfrozen) brood boxes in a dark basement, procrastinating until October for mite tests and treatments, failing to secure the upper entrance while moving a hive (down a spiral staircase!) . . . oh, the comedy goes on and on. You can learn how to fix a wide range of emergencies when you trigger a lot of them.

Bottom line: my bees survived because the urban world around them was a more forgiving place.

A few years of skill-building before facing the deluge has mattered for the long term. When I took a September mite count for the 2018 Mite-a-Thon, it was 2/100 even with brood in two deeps and a medium, the way they have been running all Summer. I've split it, twice. Did I mention the 3.5 supers of honey?

When I look at my wonder hive and my haphazard management, I wonder why it has been so difficult, in recent years, to help many of the new beekeepers here to get to this place I call "Cruising Velocity."

What is this "Cruising Velocity?!"

To me, this means a state of equilibrium where the city bees have become well-adapted to the place they live: adjusting their populations in synch with local Seasons and signals, foraging well, splitting every Spring, managing mites and beetles without much help, needing feeding support only occasionally, being polite neighbors.

The cool thing about this Zen state of beeing is that the interventions the bees need are not huge/emergency/high stakes/life-or-death magnitude events.

Big interventions, even when desperately needed, are high risk/high reward, and nature prepares critters for more normal stuff. Nature's favorite number is "average:" average temperatures, average rainfall, average colony size, average forage availability. Everything has evolved to know what to do with what usually happens. It's the outlier events that test the odds.

Those super successful bees on my roof have (mostly) *got this,* and if I maintain a modest glimmer of a clue (the best I can muster some days), I'm there when they need me, and not as a superhero.

But our urban newbees have no reason to believe they will encounter luck like mine. It is luck, too: my major contribution to local beekeeping has been to make every error or succumb to every bad idea. Until the next one.

Why is it harder to get to equilibrium?

It's especially harder for folks here who have started in the past five years to get to Cruising Velocity, I think. Beekeepers are now thick on the rooftops (and the community gardens, and the campuses, and every patch of urban green-space they can find). We have nearly 500 registered hives in the 68 1/3 square miles of Washington DC today (I could find only a dozen or so in 2005).

This means that newly established urban honey bee colonies will be exposed to every existing threat without exception, just because there will inevitably be a hive within foraging distance which is succumbing already. We

also bring in bees constantly to meet growth that outstrips the capacity of our relatively new local nuc producers, and to replace high losses. That's a potential conveyor belt carrying pests and pathogens from other regions to our doorstep on a regular basis, too.

This is not because someone is awful or at fault: it is the odds.

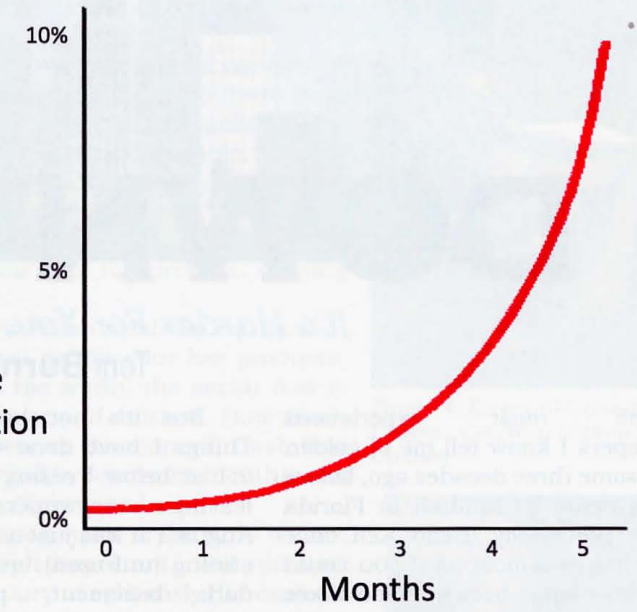
It works like this: do you know the rule of thumb that only one out of four uncaptured swarms survive to establish a new colony? How would you do this math?

If you have 100 other honey bee colonies within flying distance of your apiary, all have been exposed and some significant number are weak from a *Varroa* vectored illness. Some are also weak because a queen is in decline and perhaps Small Hive Beetles are finding a way in (I've had this happen while a decent colony was just requeening). Some of your neighbor colonies have inevitably robbed a hive that dwindled away due to *Nosema*; some are competing for dearth-time forage in places so crowded with bees that pests can practically jump from thorax to thorax. Those dearth periods may have effectively gotten a whole lot worse when (no exaggeration) ten times as many colonies are competing for the resources to survive a few critical weeks, so nutrition ain't great.

"OK, prove it."

Many of our new beekeepers here tell me, at some point, that none of this could be true for their bees. For example, they have never "seen" a mite on a bee. After I finish slapping my forehead, I like to show them one of the graphics from the *Honey Bee Health Coalition*:

If you have an urban colony with a near-zero level of *Varroa* mite infestation, your bees will not stay clean forever. According to work by Meghan Milbrath at MSU Extension, if you have even one mother mite in your colony, she is capable of exponential growth that can put you at 12,000-14,000 mites within 10 brood cycles. In your city, there is a mother mite somewhere, with her legs extended on top of a flower in a patch of high-demand dearth-time forage, just waiting for her ride back to your place.



As part of the annual Mite-A-Thon (now in its second year), *nvv Pollinator Partnership* has also shared a recap graphic from last year's survey. Here, you can see that the place where I live is a potential red-hot zone for *Varroa* mite density.

This map is based the number of reporting locations from 2017s first-ever survey program, so many areas (especially in the West) may look light on mites when there were really just no participants. But there were LOTS of reports where I live, and the story was sobering.

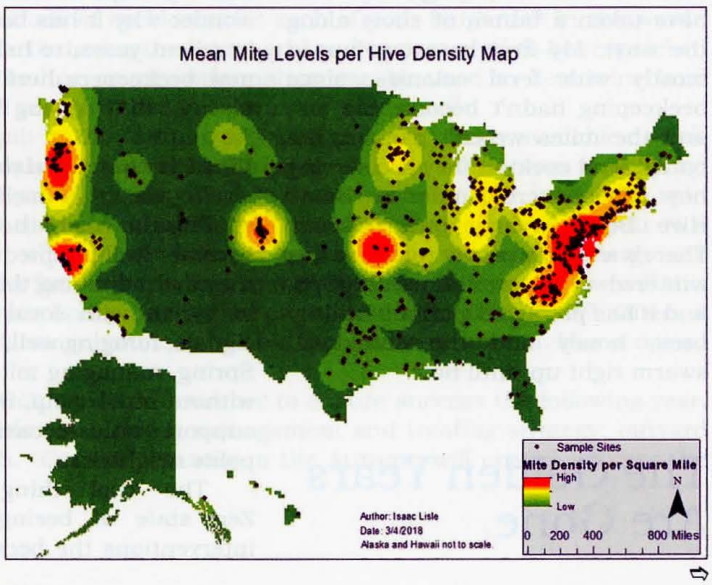
The path to blue skies

A Master Beekeeper once told me that the recipe for successful beekeeping is this: a good class, a good mentor, and a good community. Many urbanites like me live around a lot of people but starve for that kind of community.

Well, that will starve your bees, too: join a club, take *their* course, work with people who have been doing this–in your area–for a while. Even if you are shy. Even if you are the smartest person you ever met. Even if the bees you have purchased were promised to be pure as the driven snow and immortal.

The best start you can get for the bees is a local nuc, too, but you can get to strength even if you start with a shipped-in package. We have been experimenting with Oxalic acid vaporization on incoming packages and supporting just about anyone

This map is based on the number of reporting locations from 2017's first-ever survey program, so many areas (especially in the west) may look light on mites when there were really no participants. But there were LOTS of reports where I live and the story was sobering.



who is willing to graft queens from overwintered local stock. This is meant to knock down loads, then get a healthy new colony ready to take a readily-available, well-mated local queen.

And requeen that package. Just do it. Pinching your first queen (who may not yet have done anything wrong) seems like a heartlessly cruel thing, counter to your goal of *raising* rather than *killing* bees (I still cry inside when I do it). But every single bee in that colony would take one for the team, and they are not averse to making new mommies on their own, either.

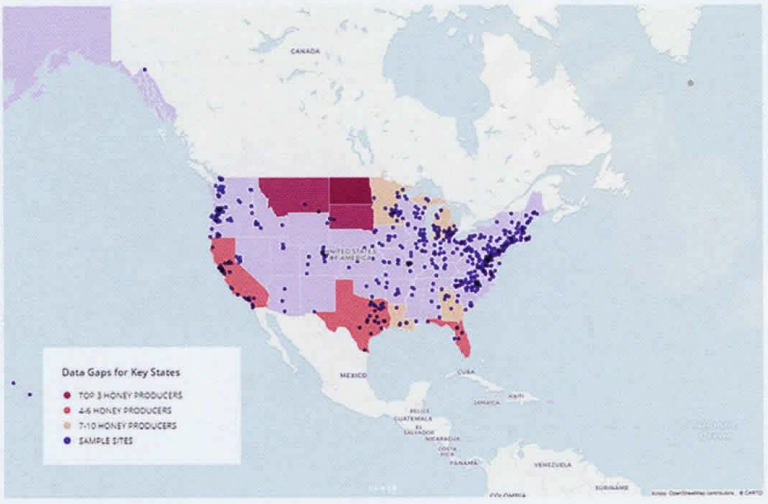
Buy one of the increasingly easy to use mite testing kits and learn to use it as soon as you have a couple of frames of capped and some mixed brood. Go ahead and do a small (less than 300 bee) sample if you are worried about losing too many bees too soon. Write down your result. Do it again after another brood cycle (21 days, plus or minus). Use an alcohol wash if you have become as worried as I am, do a sugar shake if you can't bring yourself to kill the sampled bees (but do it really, REALLY, well). Go to the *Honey Bee Health Coalition* website **(http://honeybeehealthcoalition.org)** and grab a copy of their mite threshold matrix to analyze your results. After you have done this a bunch, you get a tremendous eye for what looks right (or wrong) even before you pop the top of a hive.

If you spot your problems early, even if you have not gotten to a truly established colony yet, you can still do easier, less risky interventions.

And ask for help: this is just a lot to learn, and I am still learning shamefully basic things every year. Almost all of us will help you newbees if we can and you are trying hard, too. I'd love to think that there are more of us up on our roofs, drinking morning coffee and watching the first pollen packs of the morning fly in.

What Is the Mite-A-Thon?

In 2017, *The Pollinator Partnership*, the *BeeInformed Partnership*, and an impressive number of partner organizations from across the commercial and academic bee worlds launched the Mite-A-Thon, an effort to collect mite infestation data and to visualize

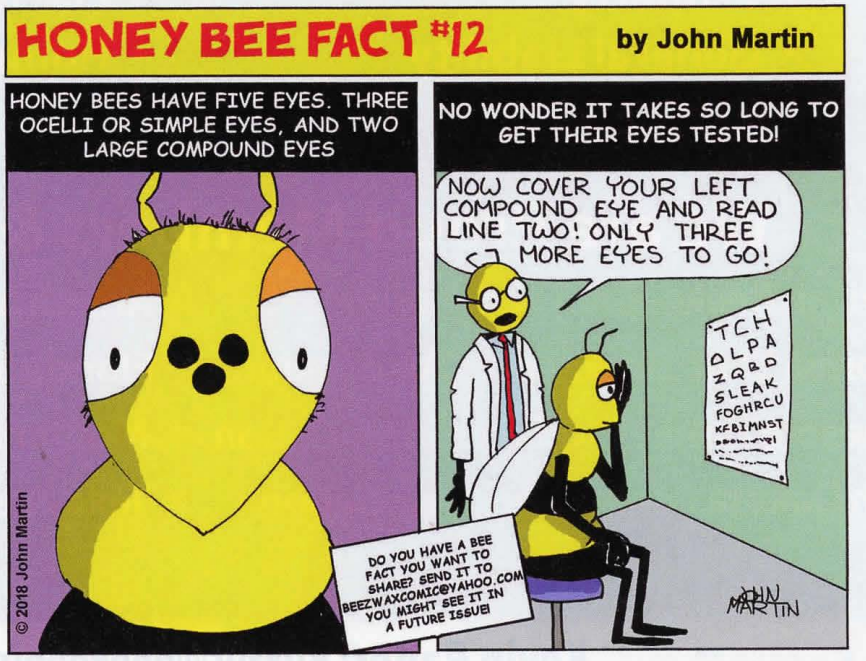


Reporting data gaps in 2017 Mite-A-Thon

Varroa infestations in honey bee colonies across North America within a one-week window each year. The idea is that beekeepers will become more aware about infestations and better able to monitor and address them. Later, the partners will make management strategies available for discussion within bee organizations using information and outreach materials they develop.

It's easy for individual beekeepers to participate: do a *Varroa* mite sampling test during the annual sampling period (a week in September), then go to ***www.mitecheck.com*** and report your results (mites per hundred and apiary location). You can see graphics displaying survey information as it comes in!

In 2018, the Mite-A-Thon provided recap data for the previous year that compared mite densities among reporting locations, giving beekeepers an idea of infestation levels they might confront in the areas where significant numbers of beekeepers participated in the survey.



ASK AN EXPERT: LES ECCLES ON SUPPLEMENT FEEDING IN THE WINTER AND SPRING

QUESTION:

I was watching some YouTube stuff on feeding bees and came across mid-winter feeding of sugar cakes made of cane sugar, water and vegetable oil, plus another ingredient. On a mild day, a piece of cake would be put under the inner cover. I do not recall anyone in Ontario talking about such a feeding method. What's your opinion?

HOMEMADE PROTEIN SUPPLEMENT RECIPE

PARTS	QUANTITY	INGREDIENT	SPECS	PRICE
8	100 lbs	Granulated Sugar		$38.00
2	25 lbs	Brewer's Yeast	48% protein	$39.25
1	12 lbs	Dried Whole Egg	47-48% protein	$26.40
	5 litres	Water		
	3 cups	Veg Oil		$1.75
	3 cups	Lemon Juice		$1.25
TOTAL	150 lbs		11.2%	$106.65

Visit the OBA website for full instructions: www.ontariobee.com

ANSWER:

It's hard to make it through winter without thinking that there's something you could be doing to help out your colonies. Feeding is usually the number one concern as you watch the temperature drop to -30 C and wonder how much feed the colony must be munching down to stay warm (that cold weather feeding feeling hits a little too close to home, to be honest).

Hopefully, all of the fall supplement feeding needed to get through an Ontario winter was done by late October, and a small amount of spring feeding may be in order by mid-April. There are a number of reasons why colonies may need supplemental spring feeding, including:

1) Overly strong populations that could be draining resources.
2) Cold winters with little snow cover to insulate colonies.
3) Poor fall feeding conditions.
4) Insufficient winter wrapping.
5) An early spring that stimulates colony build up, followed by a cold spell that depletes the last of their resources before sufficient spring nectar and pollen availability.

Sugar cakes are more commonly referred to as fondant in Ontario. The catch with this sugar supplement is that bees need moisture to take down the fondant and make use of it. There is also a misconception that fondant is stored by honey bees – but it is likely only used while it's being consumed. If there is adequate moisture and temperature for the bees to work the fondant, it can help to get them through a short stretch in the spring, before a nectar flow begins to get them on their way. It will not, however, help them through midwinter when the temperatures are too cold to "liquefy" the fondant and provide access to the whole cluster.

Another method of spring feeding is to top-feed with 1:1 sugar syrup. This supplements the colony that's running short on feed, and also provides moisture for them to re-process stored honey that may have crystallized over the winter. This can be done using the baggie feeding method – fill a large zip-lock bag with 2 L of 1:1 syrup, then lay it across the top-bars; cut two slits into the top side of the bag, then add a rim spacer to give the bees enough space to feed. Depending on the season, a second 2 L feeding may be necessary to sustain the colony, as this type of feeding will also stimulate reproduction and growth.

Spring feeding should be a last resort to rescue colonies that did not receive enough feed in the fall to make it through to the spring nectar flow. Ideally, the goal of spring feeding is not to prevent starvation, but to stimulate the colony to start reproducing and increasing populations quickly to get a jump on the first nectar and pollen flow. It also gives the anxious beekeeper an excuse get out of the house and see how the colonies fared through the winter.

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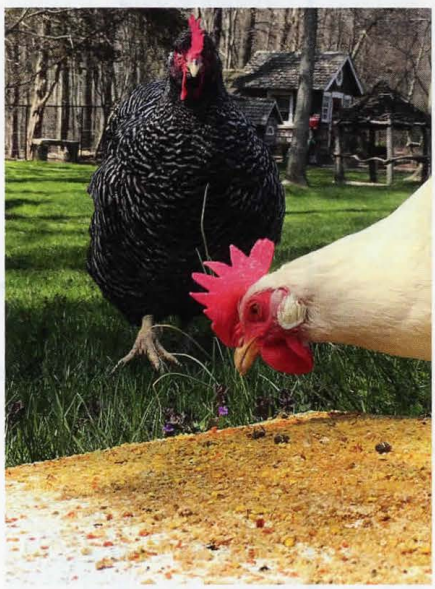
THE CHICKEN CHICK IN THE BEEYARD

Gail **Damerow**

Kathy Mormino inspects one of her hives. Photos © Kathy Shea Mormino

Getting into beekeeping accidentally isn't always the best approach, but it worked out well for Kathy Shea Mormino, better known for her chicken keeping skills. Kathy is recognized online as The Chicken Chick (**ChickenChick.com**). Her popular Facebook page has a following of more than 808,000 chicken enthusiasts who, since 2017 have followed Kathy's venture into beekeeping.

The thought of becoming a beekeeper (or "beek," as she calls it) didn't enter Kathy's mind until her horticulturist neighbor and frequent sidekick Julie the Garden Fairy (**juliethegardenfairy.com**) mentioned her interest in beekeeping. Kathy acquired a complete beekeeping starter kit from Harvest Lane Honey (**harvestlane.com**), planning to document her friend's foray into bees online. Julie, however, in her eighth month of pregnancy, suddenly realized beekeeping was going to be too complicated an endeavor to take on with a new infant. *Someone* was going to have start keeping bees, Kathy reasoned, and that someone was Kathy.



***Somebody** has to clean off the bottom boards.*

Before Kathy's first flock of chickens arrived she felt fairly well prepared. Her neighbor had chickens and asked her to collect eggs while she was on vacation. Upon her return, they discussed the idea that Kathy might like to keep a few laying hens of her own. The neighbor gave her a copy of *Storey's Guide to Raising Chickens* by Gail Damerow, which Kathy studied thoroughly until she convinced herself she could handle the challenges of chicken keeping.

But, says Kathy, "Honey bees are such foreign creatures – creatures with reputations for inflicting pain at times." Up to that point, she says, "I had no interest in keeping bees. I don't use honey often. And I wasn't looking for another hobby." Still, she began a self-guided crash course in beekeeping.

Her first order of business was to immerse herself in the beekeeping blog **HoneyBeeSuite.com** and three books: *Backyard Beekeeping: We Take the Sting Out of Beekeeping* by Waite & Wells; *Keeping Bees & Making Honey* by Benjamin & McCallum; and, of course, *The Backyard Beekeeper* by Kim Flottum.

In May Kathy got around to unboxing the hive components and equipment, and was fortunate to find a seasoned local beekeeper to show her how to set up a hive and put on a bee suit. By this time Kathy had learned that Spring is not the right time of year to source bees; ordinarily people order bees in Winter for Spring delivery.

However, she also learned that beekeepers often catch and sell swarms. As it turned out, a backyard chicken keeper and full-time beekeeper who lives not far from Kathy posted a video online of a swarm she had caught on the deck of her house. Enter Brenda Nye of Waggle Dance Apiary (**www.waggledanceapiary.com**).

Kathy contacted Brenda and arranged to purchase the swarm.

Worker bee on a coneflower in Kathy's garden.

The day Kathy went to collect her nuc, Brenda spotted a small swarm hanging from a tree behind her chicken coop and asked Kathy if she wanted to help catch it.

"Swarm catching," observes Kathy, "is something of a right of passage in the beekeeping world. The goal is usually to experience a swarm catch within one's first year, not the first day! I was game, so we suited up and headed to the tree with a cardboard nuc box and a pair of pruning shears."

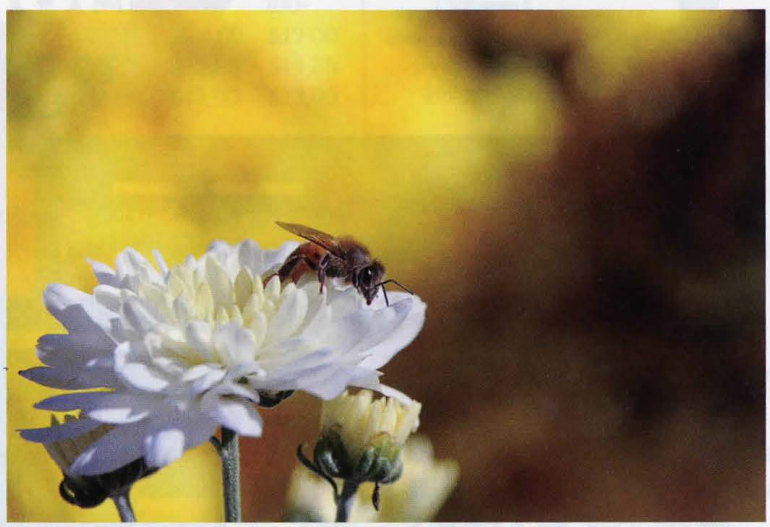
Kathy's hives and wildflower garden.

To Kathy's surprise, "Catching this swarm had no big *gotcha!* moment. Everything proceeded in a calm, deliberate manner. Brenda sent me home with double the number of colonies I was expecting. That sounds a lot like chicken math, doesn't it?"

Chicken math, Kathy explains for the benefit of the uninitiated, "is a force of nature that creates the perceived need to increase the size of one's existing flock of chickens. The Force is formidable, undeniable, and knows no boundaries." A lot of beekeepers can relate.

Chickens and bees "are both addicting hobbies and they're both easily propagated," says Kathy. "It seems wasteful not to hatch fertilized chicken eggs, and wasteful not to split hives and nuc frames with capped queen cells." Another similarity Kathy sees is the keeper's need to be knowledgeable about healthcare management, and disease and parasite diagnosis and treatment.

Although some chicken-and-beekeepers locate their hives inside or near their chicken runs, Kathy does not. With plenty of space in her backyard, she chose to position her hives in the best location for the bees. "I took into consideration the position of the morning sun, afternoon shade, flight patterns from hive entrances, known water sources (including a neighbor's swimming pool), access to natural screening from tall evergreen trees along the property line, and proximity to my wildflower garden."



Busy worker bee in Kathy's wildflower garden.

Each of Kathy's four dozen or so chickens has a name, and so do her bee queens. Her first queens from Waggle Dance Apiary swarms came with names: Ginger and Summer. "I liked the idea of being able to identify a hive by the name of its reigning queen," says Kathy, "so I have carried on that tradition. I select my queens' names based on what fits them.

"Sometimes their name relates to their landing board color. For example: Rosita reigns over the pink hive; Lean Jean, a skinny queen, resides in the green hive; and Jane reigns in the plain, unpainted hive. Sometimes I name my queens after the queen marking color for the year. Since Queen Summer was a 2017 queen, she was marked yellow; when Summer swarmed, I named her 2017 successor Buttercup. Buttercup's name tied into the yellow marking on her thorax and the name of the title character in my favorite movie, *The Princess Bride*. Not all queens are named immediately – the name must fit Her Royal Beeness. I don't like to rush into these weighty decisions."

Kathy finds beekeeping much more challenging than chicken keeping, although she admits "That may be a function of the number of years I've been caring for chickens (9) versus not quite two years with bees. But it seems bees have many more moving parts. The condition of the bees themselves and the state of the hive aren't as plainly observable as chickens, which makes trouble-shooting more difficult. I can see a chicken preening excessively from inside the house at the kitchen window, tipping me off to the need to investigate whether mites or lice might be afflicting the bird, but

observing the condition of bees is an intentional and more complicated undertaking."

One of Kathy's biggest challenges as a new beek is "Keeping my hands off the hives. It's a lot like incubating eggs: the more one opens the hive or the incubator, the more disruptive it is to the population inside.

"I'm curious. I want to see what's going on inside my hives and I enjoy inspections, so I find it difficult to limit my visits to the number an experienced beekeeper might view as 'normal' or 'necessary.' I view inspections as an important part of my ongoing bee education."

Essential to Kathy's beekeeping education is Brenda Nye, who has become her mentor, or as Kathy calls it, Bee Sensei. "Brenda's mentoring has been a terrific way for me to learn as I go. I was surprised that I wasn't afraid going into beehives for the first time with my Sensei. She's a relaxed, patient teacher who made me feel at ease around the bees. The first time I brushed bees off a frame under her watchful eye, she told me I was 'a natural.' That type of encouragement goes a long way toward boosting the confidence of any rookie.

"I have had some amazing first year experiences and new beek proud moments. They include: catching a swarm with my Sensei on my first day of beekeeping; catching a swarm alone (while live-streaming it on Facebook!); successfully overwintering both my first hives; observing a queen piping inside a capped cell; witnessing a queen laying an egg; finding a queen on a landing board with the mating sign intact (which was a crazy cool thing to see!); and rectifying a laying worker hive by re-queening with a queen I had produced from a swarm frame."

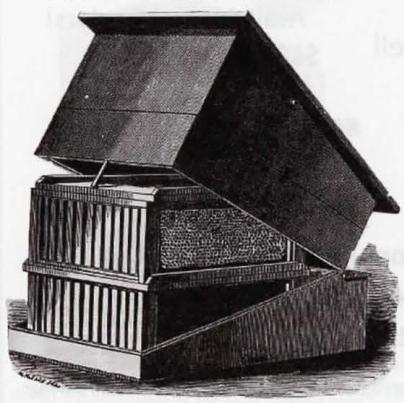
Kathy regrets that she went into the endeavor woefully under prepared. "I wish I had known I was going to begin keeping bees more than two months before diving in. Admittedly, attending formal classes would have been preferable. But, I began with two swarms last Summer and now I have five bustling hives. I'm either doing something right or my bees are working overtime to fix my mistakes!"

Gail Damerow is the author of *Storey's Guide to Raising Chickens*, *The Chicken Encyclopedia*, and a flock of other books on poultry and related subjects including *The Backyard Homestead Guide to Raising Farm Animals*, which includes a chapter on keeping bees.

The Evolution of Beehive Covers

Jim **Thompson**

I have found it interesting to look at the types of different beehive covers or tops that have been used over the years. I began my search with the first beehive that was patented in the United States but had a problem because the patent office burned in 1836 and many of the early written patents were destroyed. My records show that there were 1,131 beehives patented up to 2009. Some of these hives were the same hive with improvements to keep the patent in effect. The very first beehive patented was developed by J. Sweet, April 11, 1810, in Bethlehem, MA, but that record was destroyed in the fire. I found patent X 5,872 was granted to Ebenezer Beard in 1830 and most of the written part was recovered from the fire and had a flat attached cover. Sixty eight patented beehives later, in 1853, Lorenzo L. Langstroth was granted a patent for a hive. Reverend Langstroth had actually developed five different models of beehives and most of his hives had flat tops. However his fifth hive was a glass hive within a hive and the outer top could be tipped forward. So it might be classified as a telescoping cover because it covered an inside hive.



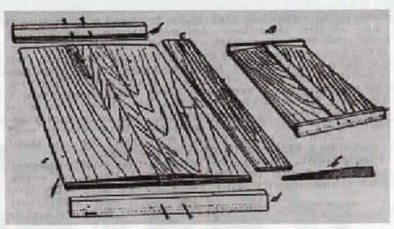
Langstroth's fifth hive design

During the 23 years in between the Ebenezer Beard hive and the Lorenzo L. Langstroth hive there were 44 flat topped hives that had covers that were hinged, attached or simply rested on the beehive. There were four beehives that had covers sloping in one direction and two telescoping covers. Eleven hives had unusual shaped covers with projections and seven hives had pitched or gable tops. When you stop and think about it, it isn't really that unusual, as the trend in the early times was to convert a piece of furniture into a beehive and have drawers or a side panel that could be opened. The lumber in the 1850s was available in wider widths so you could get a single piece that would cover the entire hive. However you would encounter the problem of warping or cupping, allowing the top to have gaps between the bottom side of the cover and the super below. The gaps could be viewed as being good or bad. The gap would provide upper ventilation and an upper entrance to the hive. However, if you wanted to move the hive there was just another place for the bees to escape from the hive. Thus to eliminate the warping, the boards could be cut in narrower strips, the grain reversed and cross pieces used to hold the boards together. This style of cover is very much like the today's migratory cover. A problem arose, what do you do with a flat top once it is removed? You can't just lay it on the ground in the same orientation as it would smash bees. Your best choice would be to prop it up against something else. Once a bee is smashed, the alarm pheromone is released and the other bees are now on alert. If you reverse the top and lay it on the ground, you can't use it to stack equipment on it because it may violate bee space and squash bees.

If the top was attached by a hinge to the side of the hive some of this warping might be reduced. The hinging of the top would mean that the hinges may bind in time and you must have a little over 90 degrees movement of the top to allow frames to be removed. The covers that had projections or finials risk damage if they are reversed and used as temporary bases for supers.

The pitched roof could be set on one side of the roof, but when you go to stack equipment on it, the equipment will be an angle and limit the amount of supers that can be stacked.

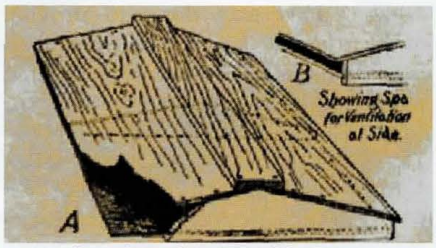
By 1895, there were three types of covers offered for sale by the A.I. Root Company. They were the Higginsville cover, the Root Ventilated Gable Cover, and the Dovetailed Chaff Hive. A Dovetailed Winter Cover was available, but it was similar in construction to the outer part of the Dovetailed Chaff Hive.



Higginsville Cover

The Higginsville cover was the standard cover supplied with the purchase of a hive, unless another type was specified by the purchaser. The Higginsville cover replaced the plain flat cover with two 7¼" x 20-⅞ x⅞" boards that were tapered to ⅜" along their width to allow water to drain off the roof. There was a filler strip of wood between the two side pieces and the entire top joint was covered with a 2" strip of wood. The top boards would be inset to the end pieces of wood. The end pieces of wood would allow the top to lie flat on the ground and supers could be stacked on it.

The Ventilated Gable Cover was advertised as being a cover that could be used in hot climates and places where shade was not available. It also boasted that the use of the 20 pound stone was not necessary. The intermediate top of



Root Ventilated - Gable Cover

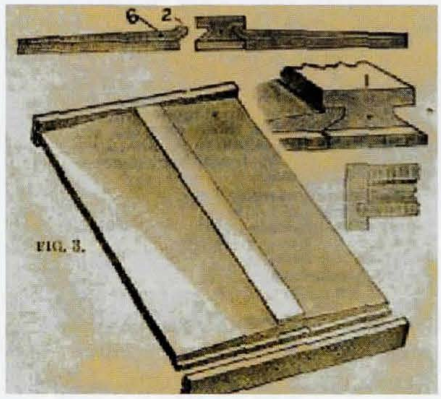
the hive was made of ¼" material and cut into the end boards. The top pieces of wood were of ⅜" material and the highest point of the cover was two inches above the top inside board. The special feature about this cover was the ½" ventilation gap along the sides of the roof.

The Dovetailed Chaff Hive was rather unusual as it was a hive that was encased by another box which allowed the beekeeper to stuff leaves or straw into the gap between the hives from the bottom of the super. The top would telescope down over the hive but it had extra long sides. The long sides permitted an additional "box" to be inserted over the hive that could hold leaves or straw to act as insulation. In 1917 the double walled hive became known as the Buckeye Hive, sometimes it had the insulation box, but usually it was omitted.


Dovetailed Chaff Hive showing the chaff tray

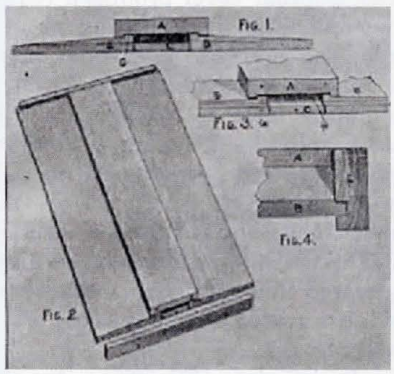
The Dovetailed winter case was simply the shell of the chaff hive that one could purchase to put over a single hive to protect the hive during the Winter. It was made of ⅜" thick lumber.

In 1897 the Danzy Cover was added to the Root line. This Cover was developed by Mr. Francis Danzenbaker and was similar to the Higginsville cover in that it replaced the slopping side boards with two



The Danzy Cover

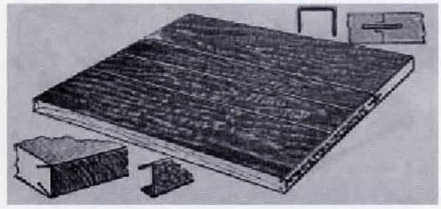
boards that provided a flat bottom and a slopping top. Rather than a filler board and a cap in the center, the center board was grooved to accept the side boards. The end board had a straight dado so the cover would fit on the hive without any adjusting. The recommendation to prevent warping was to use lots of lead paint. It is interesting to read that the center piece was made of fine quality White Pine. When wood is exposed to the weather the softer woods tend to rot faster than the harder woods, so that may be the real reason of suggesting lots of lead paint. Lead paint is not sold today.



The Excelsior Cover

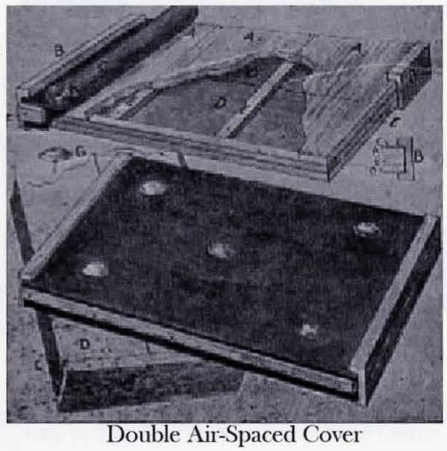
In 1900, the Excelsior Cover replaced the Danzy Cover, because the Excelsior Cover is better suited to warmer climates. It was mentioned that the shrinkage of the wood is less with the Excelsior Cover and that is probably due to the smaller size pieces and the construction that allows less expansion and contraction. It was a much easier cover for the company to machine.

An improvement to the Root Ventilated Gable cover was to put holes near the gable to allow air to circulate within the cover without any other air entering the hive.

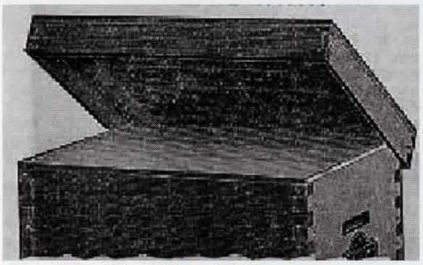

New Danzenbaker Nailless Cover

In 1903, a new Danzenbaker Nailless cover was listed in the Root Catalog. It was a cover that consisted of several tongue and grooved boards that were held together by paint, but for additional insurance, staples were used on the ends of the boards. To keep the boards from warping, a metal strip was inserted in the saw kerfs. These covers were perfectly flat on both sides. Further testing on this top was recommended.

Also announced in the 1903 catalog was the double air spaced cover, which had been in testing for 12 years and was giving favorable results. The cover was made of ⅜" boards which were held together with ⅜" cross boards on both sides. The end cleats were put on for added rigidity. The sides were covered with a special paper and tacked with five large headed tacks. It was recommended that the paper be painted so you would get results similar to what their tests were giving. However for five cents more, you could get metal instead of the paper.


Double Air-Spaced Cover

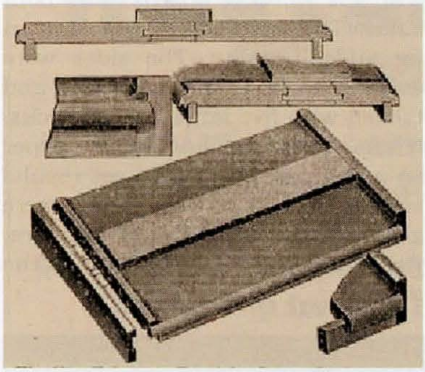
The 1906 catalog stated that many of Root's customers preferred the metal-roofed Double cover. Several beekeepers had expressed concern that the wood in the hive was developing checks and splits so the metal covers were developed to help their situations. An additional inner cover was needed to correct ventilation problems. These tops were available in either 8 or 10 frame hives and are very similar to the telescoping covers of today. The inner cover had a relief cut in the



Metal-Roofed Cover

edge that provided ventilation in the Summer time when the slot was in the up position. In the Winter, the inner cover was reversed to provide ventilation and an upper entrance for the bees.

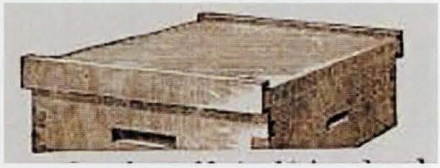
1909 saw an improvement in the Excelsior cover in that sides were added to the top. To avoid confusion the new cover was named the Colorado cover.



New Excelsior or Colorado Cover

By 1915, the A.I. Root Company was offering only four types of covers for the hives. The metal–roofed Double cover was the standard cover supplied with their hives, but the Root Ventilated Gable cover, Excelsior cover and a flat hive cover were available. The Flat Cover had been discontinued years before, because clear lumber was hard to obtain, but it is being made again with three top boards instead of one and an option to have redwood as the top board. In later years the flat cover will be known as a migratory cover.

The Root Ventilated Gable cover was not available in 1924 from the A.I. Root Company, but other companies are making Gable type covers. Some of the hives using the Gable type covers are the decorator hives and the Garden Hive which have copper coverings.



The Flat Cover

The Root Company continued making the Buckeye Hive, the Excelsior cover which became known as the inexpensive all-wood hive cover, and the Metal roofed Double cover which became known as the metal cover up to 1933. For three years a metal top flat cover was offered and then dropped from the line. In 1940 the Buckeye Hive was dropped from the A.I. Root line. In 1944, The Root Company went to making 10-frame equipment only. From 1944 to 1955, the A.I. Root Company sold only the metal top and the inexpensive all wood top. Then the all wood top was discontinued.

It seems ironic that in the beginning of wooden beehives that the least popular type of cover became the most popular type and the most popular in the beginning became the least popular cover produced today. Perhaps I am just looking at this from the hobbyist beekeeper point of view. The Migratory Hive Cover is primarily used by beekeepers that are hauling beehives for pollination purposes and by eliminating the two sides of a cover, allows the hives to be stacked closer together on the truck. The numbers of hives operated by commercial beekeepers far outnumber the hives of the small beekeepers.

It is also interesting to see that the problems that were facing beekeepers long ago keep being addressed today, such as the ventilation, insulation, Gable type cover, and shade issue. I remember seeing beehives that had a ½ sheet of plywood sitting on top of the hive and held in place by two concrete blocks. This was done to provide shade for the hives and ended up being more work for the beekeeper in removing blocks and plywood to get to the hive. Covers were designed so that the use of the 20 pound block wasn't needed, but where are we today? Many beekeepers put blocks and bricks on the top of their hives to hold the covers down. However the placement of the bricks might be an indicator as to the condition of the hive. Some people have designed a catch to anchor the top to a beehive, while others use a banding machine. I have used rocks and sticks to prop up inner covers and covers to provide hives ventilation. When I have used covers with vent slots, I have experienced spiders living in the slots. If a screen is attached over the slots, the bees will fill the screen with propolis.

There is always the search for new materials and sometimes what looks to be a good solution could end up being a disaster. Very wide stable lumber is hard to get and expensive, people have used particle board or plywood in the construction of tops. If you don't have a waterproof glue in those materials, it is just a matter of time until they fall apart. The use of plastic seems ideal, but be careful when you need to move the hive. Plastic tops tend to have many gaps and do not hold up well if you place a hot smoker on them.

It is very hard to beat the telescoping cover as the common practice is to place it top down on the ground to stack equipment on when you are working the hive. If the honey supers drip honey, the honey will be caught by the cover and returned to the hive when you reassemble it. Sometimes you may wish that you had an additional cover or something else to stack equipment on, as you may want to switch supers around. Also there may be a time that you wish that you didn't have to take a heavy super all the way to the ground but had a higher stacking point, like another short hive close by the tail gate of a truck or a raised hive stand.

References

A.I. Root, *Various Years of Bee Supply Catalogs*, starting in 1895 to 1996

L.L. Langstroth, *Langstroth on the Hive and the Honey Bee a Bee Keeper's Manual*, 1853.

TOP BAR PROTEIN

Wyatt **Magnum**

Top Bar hives need a hanger for a protein patty! And Small Hive Beetles just love them, too!

Feeding a pollen substitute helps stimulate brood production during different seasonal conditions.

In my location, Piedmont Virginia (mid-Atlantic), the Fall nectar and pollen flow is marginal (from golden rod and aster). Summer rains help to enhance the pollen coming in by early Fall. Conversely, a dry Summer can easily cause a pollen shortage. Rampant seasonal mowing also destroys these resources (see Figure 1). In late Summer and early Fall, the need for pollen is critical. During this time, colonies produce their long-lived over-wintering bees needed to sustain the colony until the following Spring.

An alarming scenario would be dry Summer conditions, leading to a severe pollen shortage by the Fall. That would damage the production of long-lived bees, increasing colony mortality in the Winter.

Figure 1 *Death on the left meets life on the right. On the left, excessive mowing has destroyed the wildflower diversity, leaving a green desert of grass. On the right, aster, the tiny snow-white flowers, and goldenrod provide nectar and pollen to honey bees, and other insect communities living on nectar: solitary bees, bumble bees, butterflies and moths, even wasps and flies.*

Part of vigilant bee management is planning for pollen shortages. Then in the beginning of their occurrence, the beekeeper can respond rapidly, delivering pollen substitute to the hives, across all apiaries, with an efficient method to maintain colony health.

Frame-hive beekeepers do that. From bee supply companies, they purchase a pollen substitute, prepared as a patty roughly ½ inch thick, sandwiched between two thin papers. A one-pound patty fits snugly between the top and bottom bars of frames in the vertically stacked hive bodies.

Top-bar hive beekeepers need a feeding method too, using the same commercially prepared patties (see Figure 2). However, the top-bar hive requires a hanger to hold the patty, all of which is more complicated compared to just laying the patty on the top bars of a frame hive. In 2015, I began designing patty feeding methods with various wire hangers during dearth conditions.

For the resulting patty feeding design, I paid close attention to the difficulties presented by small hive beetles in the heat of Summer when their invasion pressure is high. I wanted these conditions to be similar to those in the Southeast, as close to the worst case as possible, producing a severe test of my patty feeding design.

In case beekeepers want to change my design, keep these two points in mind:

1) The bees should have continuous access to the maximum surface area of the patty. Therefore, do not put the patty on the floor of the top-bar hive with either a screen or wooden floor. Adult small hive beetles can get up under the patty and produce larvae, which tunnel inside the patty, where the bees cannot evict them (see Figure 3).

2) Be careful about feeding a colony too much patty at one time. I think about the last part of the patty to be eaten by the bees. How long will that take given the local conditions? If feeding too much patty, the last part could remain for too long in the hive. Consequently, small hive beetle larvae would have more time to foul it. Then the bees will reject the remaining patty, leaving the rest for the beetle reproduction (see Figure 4). From my observations, I came to see pollen substitute as a cryptic source of new beetles if not properly applied.

A starting amount of patty that has worked under my Summer time dearth conditions with severe pressure from small hive beetles has been a $^1/_3$ to $^2/_3$ pound. That patty amount is for colonies covering their top-bar combs from the entrance end of the hive extending back for two to three feet long. (I have top-bar hives up to five-feet long, but the colony is smaller than that in the Summer.) As expected, most strong top-bar colonies can consume one-third of a pound of pollen patty quickly, easily in less than a week, especially in a pollen dearth. Surprisingly a few will not. Usually I do not feed a pound of patty at once. Rather, I feed two-thirds of a

Figure 2 *Ready to insert pollen patties into three top-bar hives. I have removed the hive covers and dealt out the patties (pointed out by the yellow arrows). The patties will hang between the combs from homemade wire hangers. I usually feed pollen patties to about 25 top-bar hives at a time. These "pollen patties" are actually a pollen substitute and do not contain natural pollen. Nevertheless, the slang is to call them pollen patties. These top-bar colonies were finishing a pollination contract, pollinating squash.*

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Figure 3 *Small hive beetle larvae hidden under a pollen patty on the floor of a hive. Even propping up in a corner, letting the bees get to both sides, did not work. The patty does not have that much structural strength, and it eventually fell over. Then the patty provided a protected refuge for adult small hive beetles, and they began producing larvae. Conditions were "dry" in this situation and there was no slime.*

pound. Then I reevaluate after the first feeding to see how quickly the bees consumed the patties. On the other hand, if the bees are foraging on some minor Summer source, I will start even strong colonies with $^1/_3$ pound and see how quickly they consume the patties. (I am expecting the consumption to be slower, and overfeeding could provide some of the patty to small hive beetles.)

For smaller colonies, like a nuc, a colony in a one-foot long top-bar hive, or even mating nucs, a pair of colonies in a one-foot long hive separated by a partition, I give them smaller pieces of a patty (much less than $^1/_3$ pound). For the exact patty size, I just estimate it from the cluster size, being careful not to give a small colony too much. The small patties still go into the hangers. With these smaller colonies, I need to make sure the patties stay protected within the clusters for the feeding

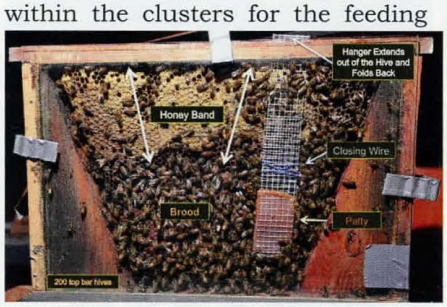

Figure 5 *A top-bar observation hive testing a patty feeding method. The miniature wire hanger works like a full-size one. Ideally the patty position is below the honey bands, where there is a little more space between the brood combs. The hive is in a special bee house with 30 single-comb top-bar observation hives, where I study bees and film their behavior.*

Figure 4 *A small piece of patty infested by small hive beetle larvae. Only about 1½ square inches remained when the other colony had finished their patties from Summer feeding during intense small hive beetle activity. The two white arrows point to beetle larvae, difficult to discern without magnification. Notice the numerous tunnels in the pollen substitute. Red arrows indicate some of the tunnels.*

duration. Otherwise small hive beetles will likely infest them.

Before diving into the details of a full-size hanger (holding one-third of a pound patty), Figure 5 shows a miniature version of the hanger design in a single-comb top-bar observation hive with a small piece of patty. The patty resides in the fold of the hardware cloth. The wire grid doubles over, supporting both sides of the patty, ideally with no hiding places for pests. Several rounds of testing in my apiaries showed patties ($^1/_3$ pound) needed support on both sides by the wire grids. Otherwise, the patty slouched, or flopped over, forming folds, which became refuges for small hive beetle larvae to begin an infestation.

Notice in the observation hive, the hanger, as a *single* grid of wire, extends up (by the honey band) and protrudes out of the hive as a bent-over tab, holding the patty in place and marking the hanger's location for its quick recovery. As explained below, I want the patty at the edge of the brood nest. Figure 6 shows that same edge location as a thermal (heat) image.

Here are the directions to construct a full-size hanger (holding $^1/_3$ pound). I use ¼ inch wire hardware cloth, a common mesh size easily found at hardware stores. The cross section of my top-bar hive dictated the hanger's dimensions. The hanger size should work for similar size top-bar hives; just make a trial hanger and see.

The hanger dimensions aim to lower the patty below a typical (capped) honey band because lower down there is a little more distance between the combs. Between the upper-capped honey bands, which can bulge, the bees leave a minimum of *one* bee space. Lower down, between the brood part of the combs, which do not bulge, the bees leave *two* bee spaces, for nurse bees working back-to-back. I could have made the hanger to hold the patty even lower because in some situations the patty may still be between extra wide honey bands. Two points against that are: 1) a larger hanger is bulky to handle to pack and transport; 2) As the patty approached the lower edge of the comb, it has less protection by bees against small hive beetles.

Using Figure 7 as a guide, the dimensions of the wire rectangle are 15¾" by 4" (63 by 16 mesh holes). If your wire cutting is off a little bit, don't fret. It need not be exact. Now make the bottom fold that cradles the patty. With the rectangle lying on its side like in Figure 7, measure 6 inches (24 mesh holes) from the (lower) bottom and fold it around to the right as shown. When bending the wire grid, it is best to put a little flat stick in the fold so the crease will be wide, helping it to accept the width of the patty as indicated in Figure 8.

Next make the top tab, which sticks out of the hive. Measure 1 and ¼ inches (five holes) from the top of the rectangle. Make a right angle fold by bending that part of the wire to the left as shown in

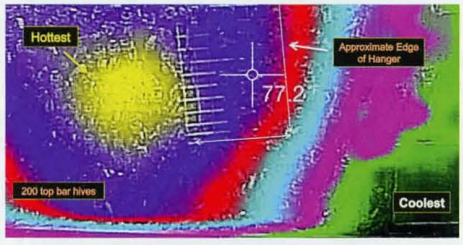

Figure 6 *A close-up thermal image of the observation hive from Figure 5. The pollen patty is at the same location in the color-coded scene (yellow is the hottest and green the coolest). The patty is in the blue, a location of intermediate warmth, near the edge of the brood nest. The patty has plenty of warmth around it from the bee activity, a situation ideal for quick consumption. The 77.2° F is the camera-reported temperature on the outside of the glass, cooler, of course, than inside the hive.*

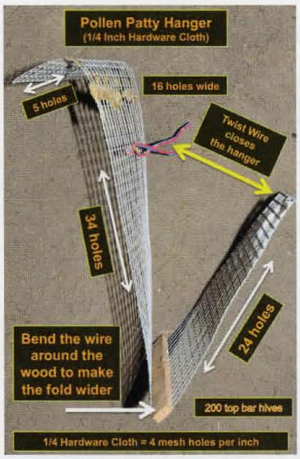

Figure 7 *Bending the wire grid to make the pollen patty hanger. The directions are in the text. The 24-hole side will support the patty vertically against the other side. A vertical patty in the hive environment needs wire on both sides, from top to bottom, for complete support. Otherwise, the patty will slump over and give refuge to small hive beetles. Note the thin red and blue wire. It lines up with the top edge of the wire that will hold the patty, closing the hanger.*

Figure 7. This folded part forms a tab protruding through the top bars, which is bent over and keeps the hanger from slipping down in the hive. The tab also reminds the beekeeper which hives still have hangers in them.

Now make a closure from a scrap of thin wire, which holds the wire grids around the patty. Twist on a short piece, about three inches long of wire to the long side of the hanger,

Figure 8 *Loading a new hanger with a patty in four positions. See the thin red and blue wire about three inches long (position1) to close the hanger. Locate that closing wire where it will close the end of the folded wire grid as shown in position 2. Fold over the closing wire on the long side of the hanger grid. With a patty loaded in the hanger, press the two wire grids together gently. Hook the closing wire tails through to the opposite grid as shown in position 3. Thread the closing wire tails back through to the other grid and make a snug closure from the other side of the hanger, as shown in position 4. The small pink binding clip at the top of the figure can close the grids too. I cut the one-pound patties approximately into thirds with a box cutter or large pizza cutter.*

even with the top of the other wire grid as shown in Figure 7. Figure 8 shows the twist of wire closing a new hanger as it is loaded with a pollen patty.

A good patty location is adjacent to the brood nest, near where pollen combs should be. I try not to put the hanger in the brood nest, and definitely not next to sealed (pupal) brood. (The hanger might block their emergence.)

Warning. Expect the hanger between the combs to be snug fit. Gently nudge the bees out of the way with the hanger and close the combs together slowly around the hanger. I leave a wee bit of extra space between the top bars. Do not leave a gap wide enough to let in bees, because it will form another entrance. Expect extra propolis packed into any tiny crack you leave around the wire tab protruding from between the top bars when done with feeding. I just scrape it off, accepting it as a minor annoyance with the method.

One could put in a thin spacer stick to make an extra gap between the combs for the hanger. I have never done that, mainly because I have many hives. A spacer is certainly feasible for a top-bar hive beekeeper with a few hives. (The foundation cleat from a frame or a half of a bottom bar could serve as a spacer. They could be obtained at a bee club meeting. If the honey bands at the top of the adjacent combs are not capped, and a nectar flow is occurring, expect the bees to bulge the honey bands into the extra space, which eventually must be trimmed back when removing the spacer.)

My top-bar hives have the entrances at one end of the hive. The bees situate the brood nest near that end. That arrangement allows rapid access to the brood nest without moving much honey, most of which is towards the back of the hive. I typically insert the hanger a few top bars from the entrance end of the hive right before the beginning of the brood nest (see Figure 9). Replacing hangers is a quick operation too. For feeding numerous top-bar hives, and driving among apiaries, I first load the hangers with patties on my workbench. Then I pack the hangers in containers. Folding the wire tabs the same way makes the hangers easy to stack and pack in

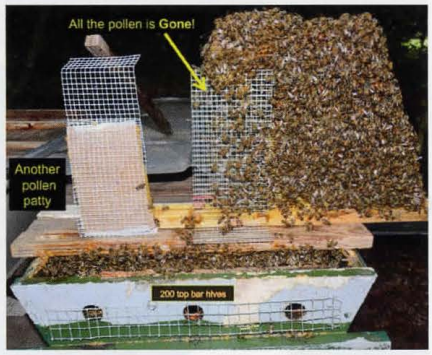

Figure 9 *Feeding another pollen patty in late Summer. This power-house hive was in a three-foot hive and quickly consumed its first patty, which was in the empty hanger on the right. The next patty was the one on the left, propped up for the picture. With bees packing the hive full to the front end, I could certainly feed more than a third of a pound at a time.*

the containers for transport. In the apiaries, I work from the containers, placed on the tailgate of the bee truck (see Figure 10).

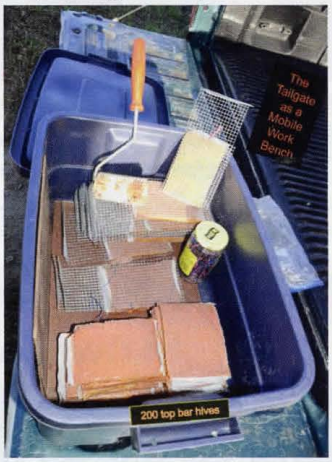

Figure 10 *An efficient apiary work flow centered at the tailgate of the bee truck. Here is a storage container with loaded hangers and some extra patties cut into thirds. Returning from the hives, I drop the empty hangers into another container behind the cab of the bee truck.*

Scientific investigation of honey bee nutrition has gained importance in recent years, leading to the development of pollen substitutes based on the bees' physiological needs. Frame hive beekeepers have benefited from that research using commercially prepared pollen patties. Now top-bar hive beekeepers have a way to use them too, with little risk of the resource being taken over for small hive beetle reproduction.

Acknowledgments

The author thanks Suzanne Sumner for her comments on the manuscript.

Visit: TBHSbyWAM.com

Stingy

Ann **Harman**

Now that you are a beekeeper everyone you encounter will want to tell you their *Sting Stories*. Sometimes they are very long and complicated – but rarely about honey bees. Many people get stung by yellow-jackets when mowing the yard or doing some other garden work. Unfortunately yellow-jackets are sometimes called "ground bees" but they are not bees at all so that nickname seems a bit unfair to honey bees. You may receive phone calls from someone asking if you would like to have the "bees" they just found. After some careful questioning, you may realize that these "bees" are not honey bees. However, the caller may think you can do something about those "bees."

There actually are some solitary bees that do nest in the ground. They are the mining bees, small, usually dark bees that prefer loose, somewhat sandy, soil to dig their nest. When an area of suitable soil is available sometimes quite a number of these bees will choose to nest, not as a colony, but as an aggregation. People do find that a number of these nests together are frightening. These mining bees are very docile, not at all defensive. Although these are bees and have a stinger, that stinger would have great difficulty piercing human skin. If you were digging in their nest site you could get stung if you annoyed them.

The mining bees dig a hole straight down and dig chambers off the hole. An egg is laid and provisioned with a pollen/nectar pellet. The larvae will consume the pollen, become a pupa and spend the Winter underground. Depending on the species, the adult will emerge the following Spring or Summer and mate. The life of the adult bee, again depending on species, will only be four to six weeks.

Mining Bee

The mining bees, like all the other solitary bees, are important pollinators and need to be protected. Fortunately, many people now understand their importance and are becoming acquainted with the solitary bees. The "bee hotels" of various types and sizes are being sold and used. The mining bees will not be using these hotels but many other pollinating bees will.

Perhaps the most annoying ground-nester is the yellow jacket. Most are cavity-nesters but the nest is made of paper inside the chosen cavity. It is a seasonal nest. Used one season, then abandoned. A mated queen who has overwintered in a somewhat warm place will emerge as the Spring weather warms. She will seek a cavity that can be in the ground but also in a wall or perhaps in a piece of seldom-used equipment. The queen will construct a small piece of paper comb, lay some eggs and raise some workers who will then take over the duties of enlarging the nest, caring for the developing larvae and foraging for food. Unfortunately they occasionally select a cavity that creates a problem for us. Yellow-jackets are defensive, quick to sting if provoked. The stinger is smooth so a yellow jacket can sting repeatedly until she runs out of venom, usually after four to six stings.

Yellow-Jacket

The larvae are fed "meat." That meat (proteins) are the insects that are eating up your flower and vegetable gardens! Yellow-jackets are highly beneficial insects! The active workers use nectar from flowers or juices from sweet or rotting fruit for energy. Yellow-jackets can be a nuisance at picnics when searching for soft drinks and beer. At a picnic to prevent getting a mouthful of drink along with an angry yellow jacket, pour the drink into a glass where the insect can be seen and removed. Use caution when picking up fruits, especially slightly rotten ones, that have fallen on the ground. You may be picking up a yellow jacket also.

As Summer is progressing into Autumn, reproductive – queens and males – are produced. As the current workers slowly die, as well as the males, the colony dwindles. Depending on species and climate, the colony will die any time from August into December. Although a number of queens are produced and attempt to overwinter, only about 2% will survive to start the cycle again. One species, *Vespula germanica*, can overwinter in warm climates. This species does prefer nesting in walls of houses and sheds.

Not all yellow-jackets are cavity-nesters. Five species, called aerial yellow-jackets, are scattered across the U.S. and Canada. These yellow-jackets build those gray paper "balls" that hang in shrubs and trees. These nests are also seasonal; the nest usually falls apart during the Winter months. One of these yellow-jackets, common in the east, is called the "bald faced (or white-faced) hornet." It is not a hornet! Its coloring is black with white trim and stripes; no yellow jacket yellow to be seen.

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Baldfaced Hornet nest

Actually only one true hornet lives in the U.S., basically in the eastern half. It is the European hornet (*Vespa crabro*) that arrived in this country in the mid 1800s. It makes a fragile brown paper nest in a cavity, most frequently a hollow tree. Yes, it too is beneficial since

European Hornet

it preys on a number of insects, especially large ones. It may capture an occasional bee. It has an alarming habit of flying to lights at night. If left alone it will return to its nest when the light is turned off. This hornet will chew the bark on some shrubs, sometimes girdling branches.

Asian Hornet

At present parts of Europe (France, Spain, Portugal) and the Channel Islands are having great problems with the Asian hornet, *Vespa velutina*, that arrived recently in France. This hornet preys on honey bees and will actively "hawk" in front of hive entrances to capture honey bees going in and out. It builds huge aerial paper nests that contain a large population of hornets. Honey bee colonies can lose enough foragers that the colony weakens to the point of collapse. Although it does capture other insects to feed its

Paper Wasp on nest

larvae, it is considered a serious pest insect, not at all beneficial.

Wasps are another group of stinging insects that construct their nests in various ways and exhibit quite varied behaviors. Yes, these are beneficial, too, by feeding their larvae "meat." Some wasps are very, very tiny ones that you may never notice. Some of these are parasitic, laying eggs inside a harmful insect. The developing larva feeds on its host, eventually killing it.

The paper wasp constructs an open comb with no envelope or cover over it. The comb hangs down from a strong "stem" fastened under an eave or inside a shed or other shelter. The seasonal population of these is usually quite small. These wasps are generally quite defensive if they sense any disturbance. However you can watch them at work from a safe distance. Do not interfere with their flight path.

The wasps and hornets that make paper nests are actually making paper. Paper for books and newspapers is made from shredded wood mixed with water, poured onto a screen, drained and dried. The insect workers visit unpainted wood, such as fence boards, sheds with unpainted siding or wood from fallen trees. They chew off small bits with their mandibles and mix it with their saliva and stick the wet bits to nest surfaces. When dry it is truly paper.

Mud dauber wasps are solitary ones and are generally quite docile. If you happen to be in their flight path they simply fly around you. These wasps fashion wet mud into pipes – some are upright on a surface and are called "organ pipes;" others make horizontal tubes

Black and Yellow Mud Dauber

and some species clump the pipes together and cover them with a layer of mud. The mud pipes will be found inside structures to prevent being softened or washed away by rain. The beneficial mud daubers are the ones keeping spiders of all kinds and sizes under control. Each larva will be provisioned with an assortment of anesthetized spiders.

Cicada Killers

An interesting wasp is the solitary one called cicada killer. During July and August in areas that have cicadas this wasp can be seen flying low over the ground in search of emerging cicadas. These wasps are one of the digger wasps. The nest is a tube-shaped cavity in the ground. The captured and paralyzed cicada will provide food for the developing wasp larva. The cicada killers are quite docile but the sight of some rather large wasps cruising low to the ground can be alarming.

Bumble bees are spectacular pollinators. The workers range in size from less than half an inch to a full inch. We recognize them from their bright-colored fuzzy hairs, black, yellow and sometimes orange-red. Many species live underground in old mouse nests; some will live in piles of grass, hay or straw. If you disturb the nest you will get stung! The nests are seasonal, begun by an overwintered queen. She will construct the first cells of wax for nectar storage then will lay some eggs in wax pots containing pollen moistened with nectar. When the first adult workers emerge, they will take over the duties of enlarging

the nest by building more wax pots, caring for the developing larvae and foraging, while the queen will just continue to lay eggs. As Summer is ending, reproductives will appear. Mating takes place at this time. Only the mated queens will overwinter.

Bumble bees are important pollinators for tomatoes and sweet peppers because they perform buzz-pollination. They grab the blossom with their legs and vibrate the thorax muscles. The pollen shakes loose and falls into the hairs of the bumble bee and also get circulated within the flower. The bumble bee is also used in greenhouses for pollination. The honey bee does not perform buzz pollination and is hopeless in greenhouses. When a honey beehive is put in a greenhouse, the workers do fly out of the hive but lodge themselves up at the top of the greenhouse in a clump, ignoring the flowers.

Bumble Bee

Another bee, the carpenter bee, is frequently confused with the bumble bee. The size and color and markings may appear similar. You can tell the difference easily – the abdomen of the carpenter bee is hairless and quite shiny black. The abdomen of bumble bees is covered with black, yellow or orange-red hairs. Behaviors are quite different.

Carpenter bees do not form colonies with queens and workers. They are considered solitary bees. Both males and females overwinter then mate in the Spring after emergence. The female is the one that uses her mandibles to chew a hole in wood. Usually this wood is unpainted or has not been treated and may be beams under decks or in open sheds or in other boards of a house or structure. She will chew a tunnel and proceed to visit flowers to collect pollen. Her hind legs are hairy for the collection of pollen. So, although somewhat destructive in their boring of holes, carpenter bees are pollinators.

Only about four to six eggs are laid, one in each cell sealed with a wall of chewed wood. The males will hover near nests and will threaten animals and people who come near. But the males cannot sting. Remember, stingers are modified egg-laying parts, found on females. Many people panic when confronted by a male carpenter bee so his efforts are rewarded. The female, who does have a stinger, is actually very docile and does not defend

Carpenter Bee

the nest. When the female finishes laying her eggs and leaves the nest the male will leave. This generation of carpenter bees will die during the Summer months. In late Summer to early Autumn the eggs laid in the Spring have developed and the bees will emerge as adults. These will overwinter, unmated, and the cycle begins again in the Spring.

Now that you have met some of your honey bees' relatives, you can give some accurate information to the non-beekeepers who may contact you about "those bees."

Let The Sunshine In!

Sun Tribe Solar and Westmoreland County Public Schools partner to develop the first pollinator-friendly solar farm for the Virginia Public School system.

Sun Tribe Solar, Virginia's leading solar energy company, announced that it has been selected by Westmoreland County Public Schools to enter into a solar power purchase agreement to meet 100% of the energy needs of Cople Elementary School. The project pairs solar with agriculture and conservation efforts using pollinator friendly approach. The array will produce an estimated 1,162,644 kWh per year offsetting the buildings carbon footprint by 865 tons of CO2 annually, and saving the school $3.6 million over its lifespan. The array will require no upfront capital investment from Westmoreland, as Sun Tribe Solar will be funding the system through a Power Purchase Agreement.

The pollinator-friendly approach is a recent effort to expand the ecological benefits of solar development. Traditionally, solar farms are positioned along gravel or turf fields. As an alternative, wild flowers and other host plants can be planted underneath or around the panels, offering a multitude of conservational and economic benefits. With increased habitats for pollinator species, bee and other populations are able to grow, thus benefiting surrounding agriculture development. These plants also offer an improved visual aesthetic of solar infrastructure for the nearby school. In this project, the flowers will be positioned right beside the solar array, and Sun Tribe Solar will be planting several different types of seeds mixings in an effort to better understand the most effective methods.

Sun Tribe Solar has been working with Virginia schools to provide affordable alternatives for solar energy and is proud to be working with Westmoreland Schools in offering unprecedented savings with this first of its kind project. This project follows closely on the heels of Sun Tribe's 1.01 MW project with Middlesex County Schools, which meets 95% of the electricity needs of two of their schools. Dr. Michael Perry, the superintendent for Westmoreland County Public Schools, explains "With no upfront costs to the school system or county and substantial lifetime savings, this is a huge win for Westmoreland County Public Schools.

We look forward to integrating this project into our curriculum and providing the students with hands-on learning opportunities. This project also symbolizes the progressive and forward look of our administration and school board."

Sun Tribe Solar, in partnership with the NEED (National Energy Education Development) Project, will offer energy curriculum materials and training to teachers to bring the solar system into the classroom. Sun Tribe's Education Market Manager, Tony Stephan, states "The benefits of clean energy are not only in the savings and carbon offset. When you integrate solar into a school system, there is a vast educational benefit as well. We ensure that teachers are fully equipped to integrate this science into their curriculum, and that students are able to see the first- hand benefits of clean energy."

ABOUT SUN TRIBE SOLAR

Sun Tribe Solar is an industry leader in the engineering and construction of large- scale solar facilities in Virginia. Sun Tribe Solar team members bring over 1 GW of solar PV experience to the market and have successfully built generating facilities for well-known utilities including Dominion, PSEG, Exelon, and Entergy. Sun Tribe Solar engineers and project managers have led the design and construction of projects in 13 different states, and in the past two years, Sun Tribe Solar has successfully delivered 26 solar/solar+storage projects for high-profile clients. Now in its third year of engineering, installing, operating, and maintaining solar systems, Sun Tribe Solar has been responsible for the four largest net metered systems in Virginia and the three largest PPA projects ever submitted to the Virginia PPA Pilot Program.

ABOUT WESTMORELAND PUBLIC SCHOOLS

The Westmoreland Public Schools are located in Westmoreland County, Virginia, which is situated between the Rappahannock River and the Potomac River in the Northern Neck area. Westmoreland County offers many high-quality options for public education. Westmoreland County Public Schools, an independent school division, operates four schools that serve more than 1,600 students in Westmoreland County and the Town of Montross.

Sun Tribe Solar Contact:
Amelia Thomas Marketing Associate
804.658.7957(c)
amelia.thomas@suntribesolar.com
www.suntribesolar.com

Westmoreland Contact:
Dr. Michael Perry
Superintendent of Westmoreland County Schools
(804) 493-8018

https://fresh-energy.org/19302/

Glimmer In A Ditch

Stephen **Bishop**

Somewhere in a ditch guarded by a wall of blackberries, a tangle of honeysuckle, and an unseen army of chiggers is a hive tool. Misplacing and then randomly finding hive tools is a skill I excel in, but this hive tool may be permanently lost. The problem is I'm not sure how far I slung it or the trajectory. It all happened in such a flash. A stinger impaled the skin above my right thumbnail, and the hive tool started sailing to its final resting place. Although alone, I still feel embarrassed—something like a baseball player who unlearned a habit formed in T-ball and slung a bat. I am also experiencing a sense of ridiculousness about crawling around the perimeter of this ditch to peer through its vegetative concealments to search for the hive tool. Upon closer inspection, this ditch is full of pollinator forage. Blackberries, honeysuckle, lespedeza, goldenrod, and asters are plentiful, but no hive tool. The broom straw is good for starting smokers.

After a half hour of climbing through the ditch, I give up. It's getting dark and I hear rustling in the brambles. I'd hate to meet whatever lives in this tangle. That night, as I drift off to sleep, I contemplate the possibility of burning the ditch to find the hive tool. But the hives are too close to safely use fire, and the vegetation makes a good Winter windbreak—plus I already have a warning on my record because of this very ditch.

To specify, my wife, her grandpa Lowry, and I did decide to burn this ditch years ago, well before I kept bees beside it. This seemed like a reasonable idea to knock back its ever-expanding vegetative presence. By 9:00 AM on a Saturday morning, we had successfully burned the ditch. We had also created flames head high and a two-fronted blaze traveling across a field and down the roadside. For whatever reason, my neighbors doubted our trio's ability to keep it contained with rakes and loads of water hauled in the front end loader of the tractor. A neighbor called the fire department. I'm glad to report that by the time the local volunteer fire fighters arrived, sirens blazing, we had successfully contained the fire. Nothing to see here, we told them, except a charred black roadside. We were just doing the DOT mowing crews a favor.

Because of this, fire is out of the equation. It's probably best to borrow my dad's metal detector. As I drift off to sleep, I think about how humbling a hobby beekeeping is and wonder if other experienced or semi-experienced beekeepers have ever accidentally slung their hive tools.

The good news about losing a hive tool is that if a person is falling asleep thinking about a lost hive tool, then the hobby is serving its function perfectly—distracting and providing relief from the onslaught of serious concerns that face us daily. It's a strange thing to take pleasure in getting stung in the thumbnail and crawling through briars, but I would have rather been doing that than sitting in my office. And I'd rather be drifting off to sleep thinking about a hive tool than a meeting at work.

Hobby beekeepers should keep this in mind when considering (or dreaming about) transitioning to larger-scale sideline or full-time beekeeping. Drifting off to sleep thinking about bees might not be so pleasant then. Bees might keep a person awake. A local dairy farmer told me that during an arctic freeze a few years ago, in which the temperature didn't exceed freezing for a week (a rarity in NC), pipes were bursting all over his farm. One night during the freeze, he rose up to a sitting position, still asleep, and exclaimed, "Damn you, Winter!" nearly scaring his wife to death before lying back down and slumbering until his 5 AM frigid milking. There is a lot of pressure on full-time farmers, beekeepers included.

On the other end of the spectrum, hobby beekeeping should be a pressure-relief valve. That is, losing a hive tool can prevent losing your mind. If hobby beekeeping is adding to your stress level, then something is probably going wrong.

I did eventually find that hive tool. All I needed was a sunrise and, to quote Dickinson, "a certain slant of light." While working the bees one morning, I glanced behind me and just happened to notice a glimmer in the ditch.

That's a good analogy. At its best, hobby beekeeping is a glimmer in a ditch, providing a bright spot in life's tangled and thorny brambles.

Catch The *Buzz*

A STIFF BREEZE IS NO MATCH FOR A HONEY BEE SWARM

A stiff breeze is no match for a clump of honey bees, and now scientists are beginning to understand why.

When scouting out a new home, the bees tend to cluster together on tree branches or other surfaces, forming large, hanging clumps which help keep the insects safe from the elements. To keep the clump together, individual honey bees change their positions, fine-tuning the cluster's shape based on external forces, a new study finds. That could help bees deal with such disturbances as wind shaking the branches.

A team of scientists built a movable platform with a caged queen in the center, around which honey bees clustered in a hanging bunch. When the researchers shook the platform back and forth, bees moved upward, flattening out the clump and lessening its swaying, the team reports in Nature Physics.

The insects, the scientists hypothesized, might be moving based on the strain — how much each bee is pulled apart from its neighbors as the cluster swings. So the researchers made a computer simulation of a bee cluster to determine how the bees decided where to move.

When the simulated bees were programmed to move to areas of higher strain, the simulation reproduced the observed flattening of the cluster, the researchers found. As a bee moves to a higher-strain region, the insect must bear more of the burden. So by taking one for the team, the bees ensure the clump stays intact.

Catch The *Buzz*

NEW TICK FOUND ON EAST COAST. BEEKEEPERS OUTSIDE, CHECK TWICE WHEN COMING IN!

An invasive tick species first identified inside the US in New Jersey last Fall has apparently survived the Winter and has now popped up in North Carolina, Pennsylvania, Arkansas, Virginia, West Virginia, and New York. So far, the longhorned tick (Haemaphysalis longicornis), which transmits several serious illnesses in Asian countries, has not been found to carry any diseases in the US. But swarms of the arachnids have been known to suck so much blood from livestock that they cause anemia, or even kill the animals.

"The jury's still out on how big a threat this is," Ben Beard, the Center for Disease Control and Prevention's deputy director of vector-borne diseases, tells The New York Times. "But we think it's a very important question to address."

The tick was first found in 2017 when a woman went to a Hunterdon County, New Jersey, public health department after she sheared a sheep and found ticks on herself. An entomologist with the department tells The Times that she turned out to be covered with more than 1,000 of the animals, which were frozen and later identified by Andrea Egizi of Rutgers University.

Trib LIVE notes that the ticks reproduce asexually, and can lay 2,000 eggs after feeding. They are very small and difficult to distinguish from other species. Pennsylvania state veterinarian David Wolfgang tells the outlet, "Scientists don't yet know how this species will adapt to the North American climate and animal hosts, but we know it survived New Jersey's Winter and has infested sheep and cattle in this region."

Haemphysalis longicornis. Engorged female. Commonsource, Wikimedia Commons

LAVENDER HILLS FARM

Keepers of the bees and producers of award-winning honeys, handcrafted cosmetics, candles and soaps.

Tom **Morrisey**

For Tom Morrisey and Tina-May Luker, home is Lavender Hills Farm, a 25-acre property near Orillia in central Ontario, Canada. Here, beautiful gardens and a custom-designed, bee-friendly, two-acre tallgrass prairie meadow (seed-drilled 10 years ago by their neighbors and friends Paul Jenkins and Miriam Goldberger of Wildflower Farm) supplement the natural softwood and hardwood forests and swamp that surround their farm. Tom – who's been a beekeeper for 40 years – tends 20 colonies at the farm, in addition to 110 colonies he manages in outyards in the region, for a total of 130 colonies. He calls himself a "sideline beekeeper", but, of course, at one time he was a

Different types of lavender at Lavender Hills Farm, Orillia, Ontario

novice.

Tom started out four decades ago working as part of the interpretive staff at a provincial park where the focus was agriculture and apple orchards. There was also a beehive under glass at the park – an observation hive – but no one on staff knew anything about bees. So Tom took a five-day course at the University of Guelph (Ontario's agricultural college) in order to explain to visitors the fine points about apple pollination. Later, he moved to the Orillia area and started working in adult education at a local college. As he recalls now, he looked around at all the farms in the area and thought, "I don't know anything about farming, but I know about beekeeping!" So he bought a couple of colonies and began keeping bees as a hobby. After working for a while in Ontario's Ministry of Natural Resources, he went traveling internationally. When he returned to Canada, he met Tina-May Luker and told her he wanted a job where he could ride his bicycle to work. He knocked on the door of commercial beekeeper John Van Alten of Dutchman's Gold Honey (and later president of the Ontario Beekeepers Association) and offered his services. Two days later, he was hired to help manage between 800-1200 hives.

When he and Tina-May moved back to the Orillia area fifteen years ago, they bought their farm and Tom began beekeeping in earnest, with 50 colonies the first year and another 50 a year later. His farm beeyard is adjacent to the tall-grass meadow and surrounded by electric fencing to deter black bears. The remainder are situated in a half-dozen outyards within an hour's drive, with between 10-30 hives at each location. The outyards include a commercial cranberry bog and a wildflower farm. His honey house at the farm is a converted double garage several hundred feet from the beeyard and close to the driveway so the honey supers can easily be unloaded from his pickup truck after a trip to the outyards.

That brings us to one of Tom's favorite beekeeping gadgets, and one he devised himself. "In my pickup I put a piece of plywood with a little bit of a rim around it, sort of like a picture frame, and put some loops of wire into that, and that allowed me to use straps to tie down all my frame. It's terrific, and only cost fifty bucks for lumber."

Tom has another favorite piece of equipment, his "Mr. Long Arm". That's an extendable painter's pole at the end of which he has fashioned something like a butterfly net made of fence brace wire threaded through the seamed end of a heavy-duty plastic shopping bag. "When it's extended its full length of 12 feet," he says, "I can often retrieve swarms that have settled well above me in the branches near my beeyards. The bees can't grip the smooth plastic so

Beekeeper Tom Morrisey and his brother-in-law Paul Campbell working with the hives in late August 2017, at Lavender Hills Farm.

I just shake them out into a brood box on the ground. No more ladders for me!"

As for those swarms, he says: "You can use that whole impulse to swarm to make more colonies of bees, if you want them. If you don't want them, then you've got to be very diligent to manage your colonies so they don't get crowded."

Tom has started raising queens this year and finds it an engrossing learning experience. "It's not something a beginner usually tackles, but at some point you get enough confidence to try it, and it's very interesting. The whole idea is to try to select bees that have the characteristics that I like working with and to give me a supply of queens early in the season when they're very handy to have."

In Spring, his bees find willows and red maple in the plentiful swamps around one of the outyards, where thawing occurs earlier than other places. At the farm, local basswood trees (*Tilia americana*) provide a good flow and produce excellent honey about three out of five years. Abundant staghorn sumac (*Rhus typhina*) feeds the bees and the red fruit clusters provide the fuel for Tom's smoker. There's clover and

Late Summer straining of pollen grains at Lavender Hills Farm, Orillia, Ontario

alfalfa in neighboring farm fields and birdsfoot trefoil (*Lotus corniculatus*) and viper's bugloss (*Echium vulgare*) growing wild along the country roads. Tina-May's borders and vegetable garden provide lots of nectar and pollen from plants like Oriental poppy (*Papaver orientale*), butterfly milkweed (*Asclepias tuberosa*), lavender (*Lavandula angustifolia*), motherwort (*Leonurus cardiaca*), Russian sage (*Perovskia atriplicifolia*) and asparagus that's gone to flower. In the designed meadow, masses of coreopsis give way to purple coneflower (*Echinacea purpurea*), Culver's root (*Veronicastrum virginicum*), blazing-star (*Liatris pycnostachya* and *L. ligulistylis*). The final act, lasting from August well into October, stars the goldenrods, and Tom and Tina-May grow four species including stiff goldenrod (*Solidago rigida*) and the very late-flowering showy goldenrod (*Solidago speciosa*). Says Tom: "Goldenrod is a good honey, very dark and somewhat strong tasting. The bees produce a bright yellow wax when they're collecting goldenrod." But this late flowering of the goldenrods and native asters also helps the health of the hive, as Tom explains.

Tina-May Luker with Lavender Hills Farm products at the Gravenhurst Farmers' Market, Muskoka

"There's an expression that it's really good to have 'fat bees' going into Winter, meaning bees that are really well-fed. And being stimulated by a good flow of nectar and pollen allows them to make the physiological changes they need for Winter. Bees in the Summer, they're flying around, they last six weeks, then they die. But in the Winter, they have to sit in a hive, they don't go out for six months, so their whole body, essentially, has to work in a different fashion."

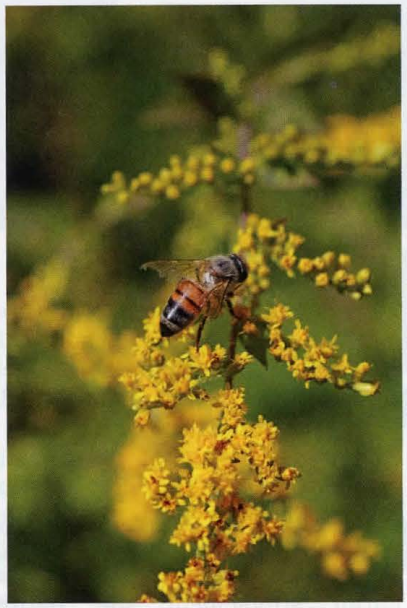
Most years, Tom's colonies Winter very well, with his survival rates matching or bettering the provincial average. "I make sure the bees are well fed, because that stimulates them to keep brooding up later in the season. So I feed them in the Fall. And I make sure the mites are under control."

Honey extraction begins in late July and extends well into October. From time to time, Tom enlists the help of family members like brother-in-law Paul Campbell, seen assisting him here. Over the years, he has automated his honey harvest to lighten the load, but it's still hot, sticky, noisy work, with rock music blaring from speakers above the clatter of the hot knives of the decapping machine and the whirring of the horizontal extractor.

Tom and Tina-May are regulars at four farmers' markets in the area, selling honey, mustard, honey butter, herbal soap, candles, and treats like honey straws that children love. "Farmers' markets are a great place to get to know your customers and build a steady market for your product," says Tom. "People want to know that you're the beekeeper, and they want to hear stories about keeping bees, just like I'm telling stories now."

It's a demanding occupation with lots of tiring physical work and he gets stung "dozens of times a day, sometimes." And the challenges are many now. "When I started," he recalls, "There were no parasitic mites, viruses weren't an issue, and agri-chemicals didn't seem to be as big a factor. You could put a box of bees in the back of the farm, they'd Winter all right, and you'd get a box of honey. It's certainly changed in the past 20 years."

One of the newest factors is small hive beetle, and though it's been seen in the Niagara region, it hasn't yet made it this far north. However he's heard talk of beekeepers arranging refrigerated storage for their honey frames.

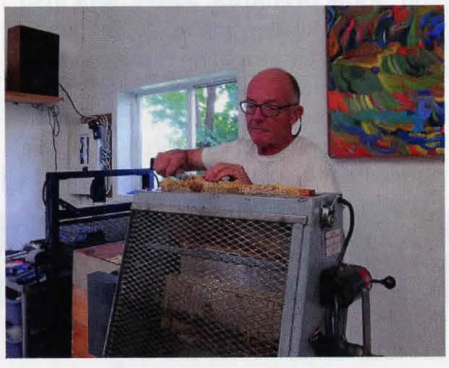


Rough goldenrod (Solidago rugosa) at Lavender Hills Farm, Orillia, Ontario.

But Tom is still enthralled with the whole thing. "Keeping bees is a very elemental occupation. The bees are subject to all the natural forces around them, from the plants to the weather and all the variations in between. It's one expression of nature that you can roll up your sleeves and get right into. And that's very enjoyable, because every year is different."

If there's one piece of advice he'd give to a new beekeeper, it's this: "Get two hives, not just one, because of the chance of you either making a mistake or nature dealing you a blow that might take one of your hives, but you'll always have another one."

And that could be the beginning of a very long love affair.



Tom Morrisey loads honey frames into the decapping machine in the honey house at Lavender Hills Farm, Orillia, Ontario.

Cooking With Honey

Ann **Harman**

PEAR SOUP

A fruit soup, chilled, is refreshing on a hot day. The same soup, served piping hot, is welcome on a frigid Winter day.

2 pounds fresh pears
(Canned pears can be used)
4 cups water
⅛ teaspoon crushed anise seed
1 stick cinnamon
½ cup honey (use slight less with canned fruit)
¼ cup raisins
¼ cup medium sweet sherry, brandy, Madeira or mead

Cook pears in the water with cinnamon stick and anise until pears are soft. Remove cinnamon stick and put pear mixture through food mill to remove peel and cores. Add honey, stirring until dissolved. Chill to serve cold. Soak raisins in wine or brandy and put on top of soup just before serving. Serves four.

Kitchen Creations With Honey
Harman and Miner

HONEY PUMPKIN LOAF

1½ cups honey
1 cup pumpkin
⅝ cup cooking oil
2 eggs
2¾ cup all-purpose flour
1 teaspoon baking soda
½ teaspoon cinnamon
¼ teaspoon nutmeg
¼ teaspoon salt

Heat oven to 350°F. Grease (not oil) and flour bottom only of 9"X5" loaf pan. In a large bowl blend first four ingredients. Beat one minute at medium speed. Add remaining ingredients. Blend at low speed until moistened. Beat one minute at medium speed. Pour batter into loaf pan. Bake at 350°F for 50 minutes. Cool five minutes, remove from pan. Cool completely.

Ontario Honey Recipe Book

CHUNKY APPLE CRANBERRY SAUCE

Use this delicious version of cranberry sauce the holiday dinners.

2 cups fresh cranberries
2 tart apples, peeled if desired, cut in 1/3 inch slices
1 cup chopped onion
1/3 cup olive oil
1/3 cup honey
4 teaspoons red wine vinegar
¼ teaspoon ground ginger
¼teaspoon ground cinnamon
freshly ground black pepper

In medium saucepan stir all ingredients. Heat to a boil. Lower heat, cover, and simmer 15 minutes, stirring occasionally. Cool and refrigerate. Makes four cups.

National Honey Board