Bee Informed Partnership: Sentinel Apiary Program
Final Report 2016

Dear Sentinel Participant,

The 2016 Sentinel Apiary Program was a huge success, and we couldn't have done it without you! This was only the second year of the Program, and we already have participation from 28 beekeepers in 16 states across the US.

Together we:

- Sampled and monitored the heath of 289 colonies
- Processed 1,229 samples for *Varroa* and *Nosema*
- Shared data from 32 hive scales
- Collaborated with our beekeeping neighbors to improve colony health in our regions!

This report is a summary of all the *Varroa*, *Nosema*, and colony management information we collected in 2016. We also collected pollen samples in Maryland, processed by the Maryland Department of Agriculture, and will be sending another report on pollen pesticide residues soon. We are currently working on how to best analyze and share hive scale data. We found some particularly interesting Varroa trends (page 4) that show us we still have some work to do on improving Varroa management and control. We hope to make bigger strides toward this goal in 2017, and we hope that you will join us along the way.

We sincerely thank you for your participation in the 2016 Sentinel Apiary Program. We are so proud of how far the Program has come, and we are incredibly excited to see where we can take it. Together we have the power to inform and influence beekeepers nationwide, and to encourage collaboration and accountability in our local beekeeping communities.

Thank you for your participation.
Happy Beekeeping,
The Bee Informed Partnership Team

Participant Demographics

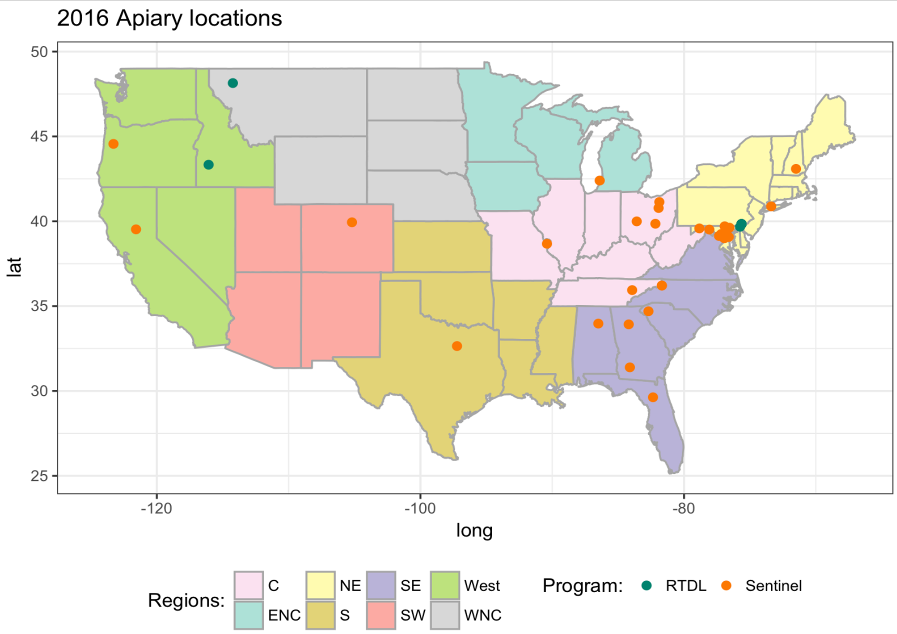
This report combines data from 2 different groups of participants: Sentinel and Real Time Disease Load Monitoring participants. They are defined below. The average participant operation size was 18.1 colonies.

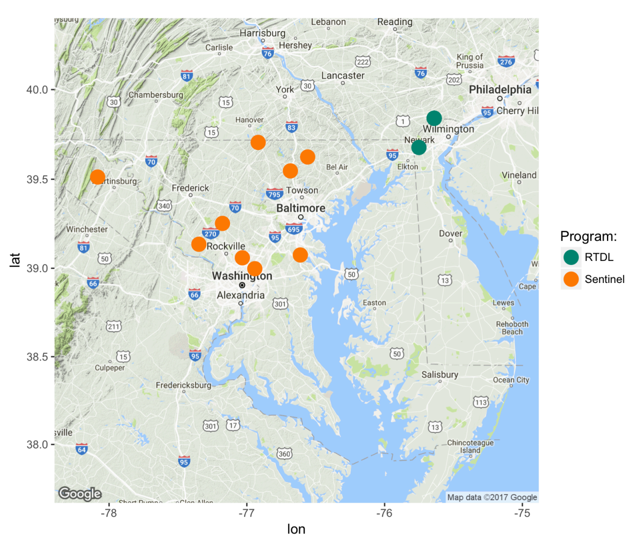
The **Real Time Disease Load Monitoring Program** (RTDL) was initiated in 2013 as a precursor to the Sentinel Project but will be continued and supported by UMD. It involves monthly sampling and colony inspections with the goal of monitoring disease load profiles and treatment efficacy.

The Sentinel Apiary Program is a project piloted in 2015 building on the RTDL, with the addition of continuous hive-scale data with the added goal of tracking disease load with environmental conditions through hive-scale weights. Pollen was also collected in Maryland and processed by the Maryland Department of Agriculture.

The **USDA-APHIS National Honey Bee Disease Survey** is a national survey conducted to monitor honey bee diseases across the US. We use this survey data as a benchmark for comparison.

Operation Size		# of Beekeepers	# of Colonies Sampled	# of Samples Processed
Backyard	*(less than 50 colonies)*	36	271	1151
Sideline	*(50-500 colonies)*	2	18	78
Commercial	*(500 or more colonies)*	0	0	0
	TOTAL	**38**	**289**	**1229**





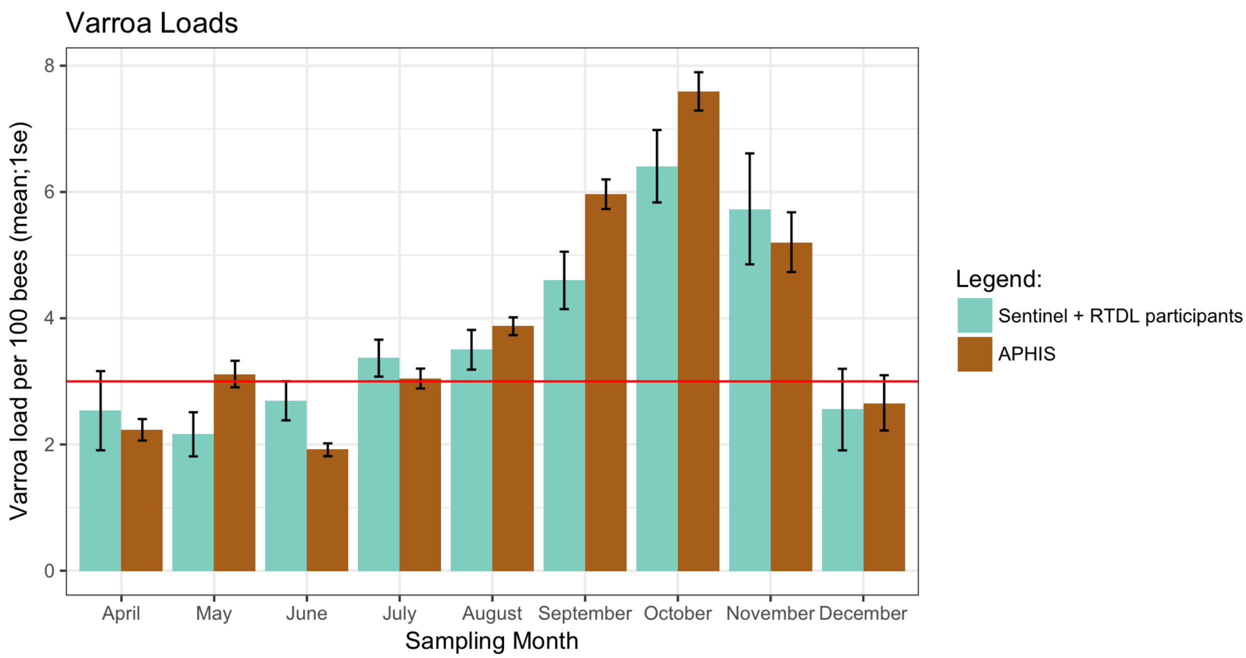
* We grouped the beekeepers into eight regional areas so that you could compare your results based on region. Maryland pop-out map provided for better resolution.

For All Participants

This page summarizes the average *Varroa* mite load for all Sentinel and RTDL participants (blue) compared to the national average for each month (brown). The red line is at 3 mites/100 bees, what we consider to be a threshold level for when you should begin treating your colonies to avoid serious damage. You can see that our participants tracked very closely to APHIS national averages, and had lower *Varroa* loads than APHIS in the key winter prep months of September and October.

Varroa mites (number of mites per 100 bees)

	April	May	June	July	August	September	October	November	December
Sentinel + RTDL Average	2.54	2.16	2.69	3.37	3.50	4.60	6.41	5.73	2.55
Sentinel + RTDL standard error	0.63	0.35	0.31	0.29	0.31	0.45	0.57	0.88	0.65
APHIS Average	2.23	3.12	1.92	3.04	3.87	5.96	7.59	5.21	2.66
APHIS standard error	0.17	0.21	0.10	0.16	0.14	0.23	0.30	0.47	0.44



* APHIS Honey Bee Disease Survey is a national effort sponsored by USDA Animal and Plant Health Inspection Service (APHIS) in collaboration with the Agricultural Research Service (ARS) and University of Maryland (UMD). To date, the data provided for the APHIS monthly average are a composite of 5 years of data.

Data presented: average ± 1 standard error

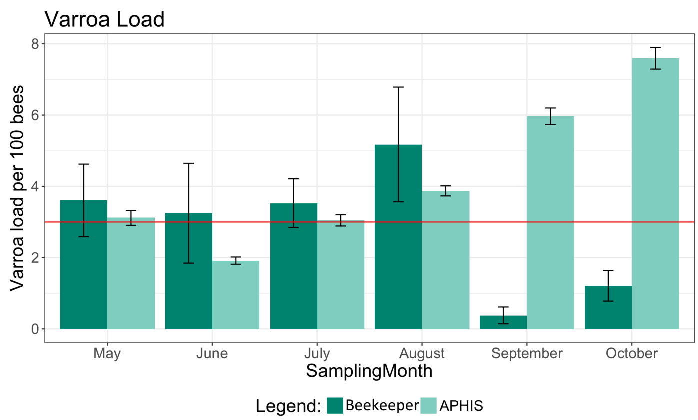
For All Participants

The following graphs compare individual Beekeeper *Varroa* loads to the APHIS National Average for each month. This year we saw three main types of trends for average *Varroa* levels across the season. Trend 1 consists of levels rising until a peak in August or September, and then lowering after a successful treatment. Trend 2 consists of levels rising to a peak (July), lowering from a successful treatment (August), and then climbing back up extemely rapidly (September). Trend 3 consists of levels rising consistently throughout the season (August to October).

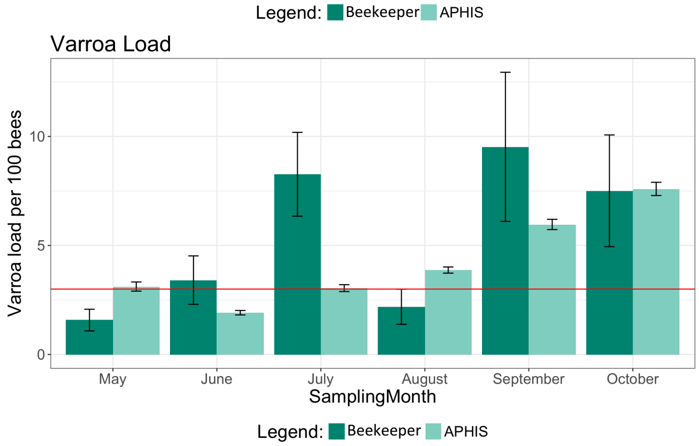
We are particularly concerned with Trends 2 and 3. Trend 2 indicates a possible reinfestation of mites from a neighboring colony or beekeeper. This emphasizes the need for treating all colonies in an apiary, and for communicating with your surrounding beekeepers the importance of monitoring and managing mite populations. Trend 3 indicates the lack of any successful treatment, and demonstrates the need for better *Varroa* management in that apiary, as well as post-treatment monitoring. These are general trends we obsereved across some participants, but there is much variability and these trends do not represent everyone.

Over the course of the season (April-October), 26 colonies died. This represents a summer loss of only 8.99% for all participants (national average summer loss 2015 = 16.5% [95% CI 15.8-17.2%]). Participants who's *Varroa* trends generally looked like Trend 1 experienced 8.33% average summer loss. Those who looked like Trend 2 experienced 2.44% average summer loss. Those who looked like Trend 3 experienced 13.2% average summer loss. We expected the none/ineffective treatment group to have the highest summer loss. It may seem surprising that the reinfestation trend participants had such low loss, but often the reinfestations occur late in the fall and thus we may not see the effects on colony loss until winter or spring. We will follow up with participants to inquire about their winter loss numbers.

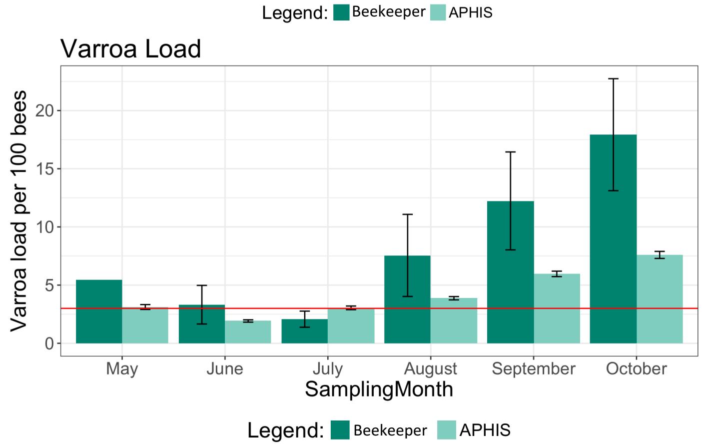
Trend 1
(Successful Treatment)



Trend 2
(Possible Reinfestation)



Trend 3
(No or Ineffective Treatment)

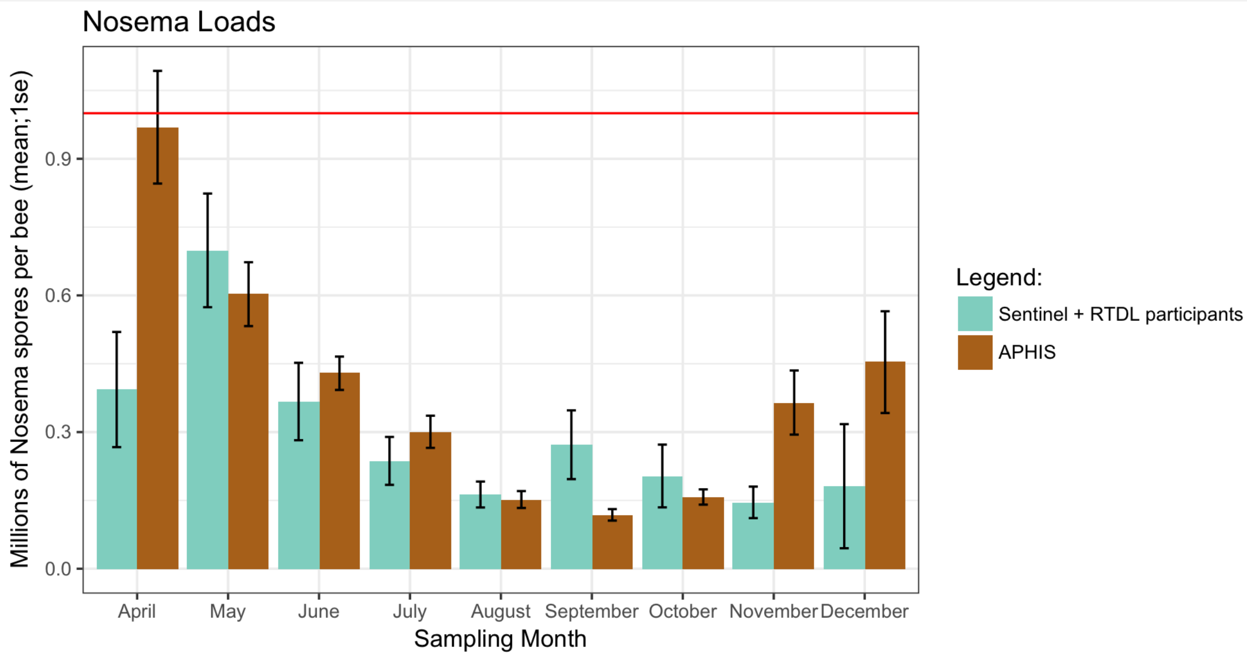


For All Participants

This page summarizes the average *Nosema* spore load for all participants (blue) compared to the national average for each month (brown). The red line is at 1 million spores/bee, what we consider to be a threshold level for when you should begin treating your colonies to avoid serious damage. You can see that our participants tracked very closely to APHIS national averages, and had lower *Nosema* loads in April, November and December, but higher than APHIS average loads in September.

Nosema spores (million of spores per bee)

	April	May	June	July	August	September	October	November	December
Sentinel + RTDL Average	0.39	0.70	0.37	0.24	0.16	0.27	0.20	0.15	0.18
Sentinel + RTDL standard error	0.13	0.12	0.08	0.05	0.03	0.08	0.07	0.03	0.14
APHIS Average	0.97	0.60	0.43	0.30	0.15	0.12	0.16	0.36	0.45
APHIS standard error	0.12	0.07	0.04	0.04	0.02	0.01	0.02	0.07	0.11



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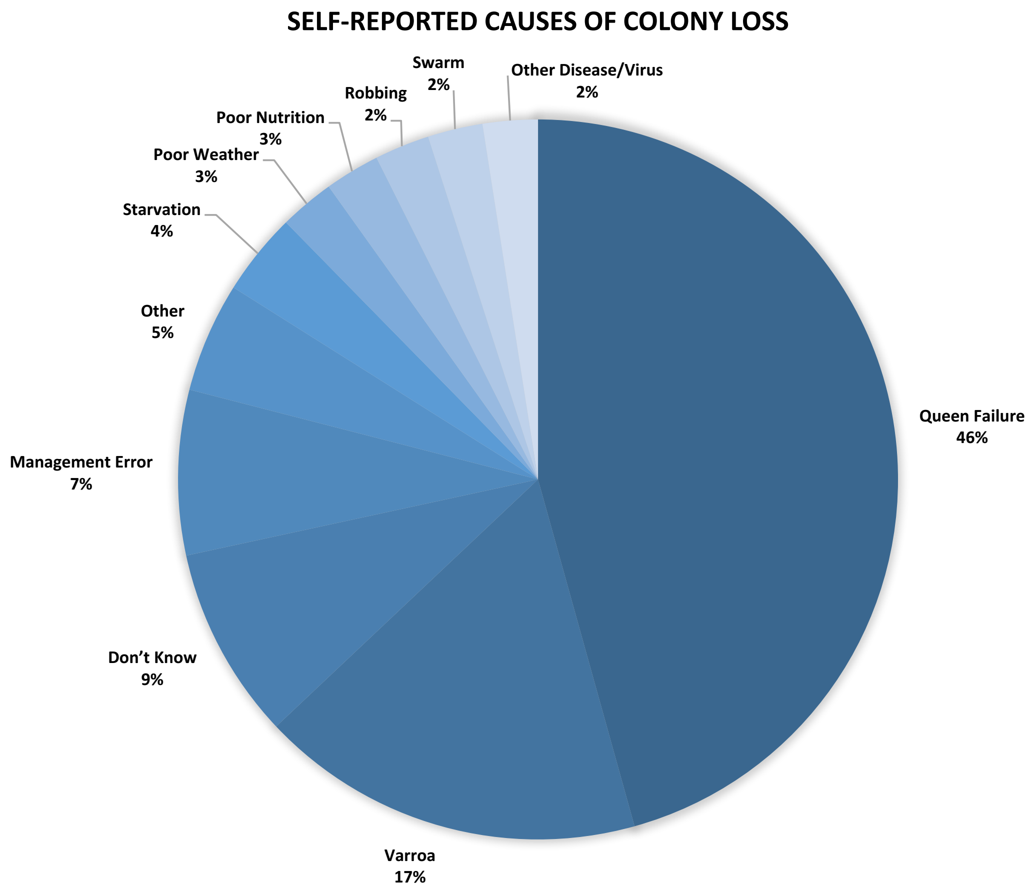
Data presented: average ± 1 standard error

For All Participants

Beekeepers record when they experience a colony death in their sampling apiary on their monthly data sheets. They also record what they percieve to be the cause of death of each lost colony. The summary of causes of loss is reported below (41% of data sheets had No Loss reported). This is most representative of Summer Loss, as data sheets were submitted from April-December.

Self-Reported Causes of Colony Death (from Monthly Data Sheets)



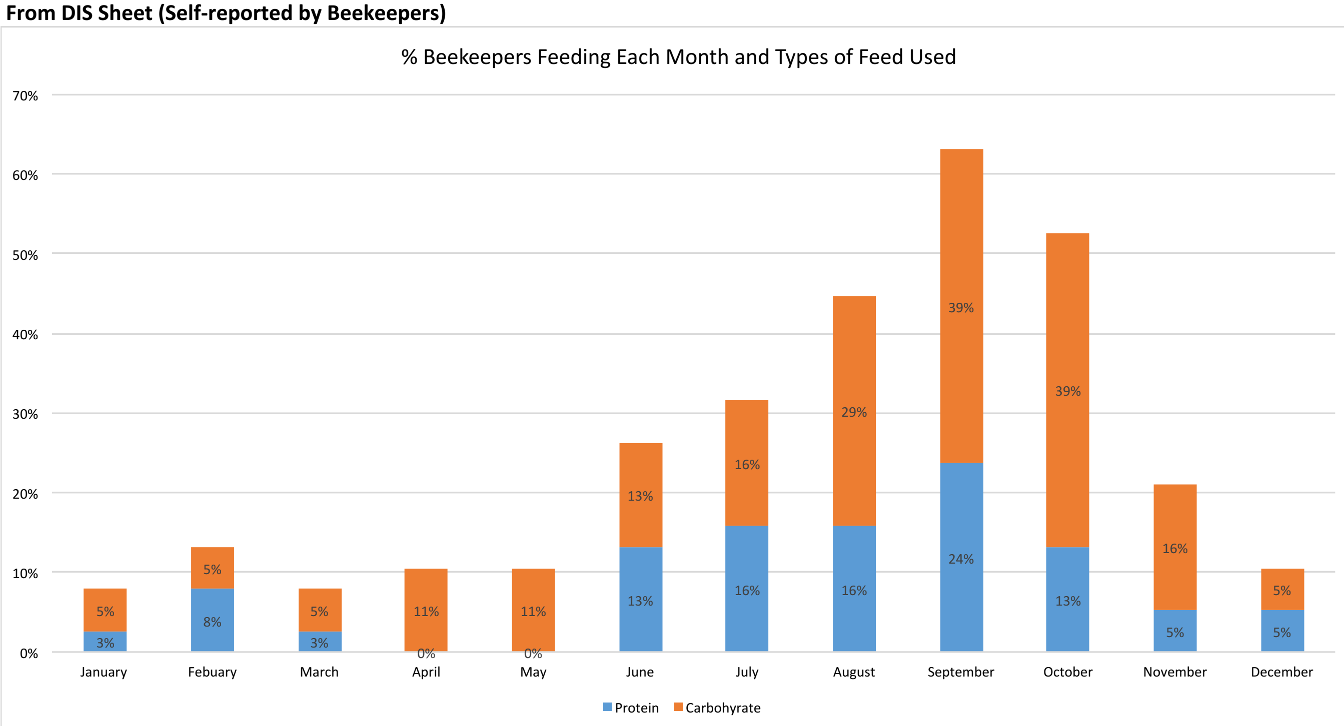
Cause of Loss	No Loss	Queen Failure	Poor Weather	Poor Nutrition	Starvation	Management Error	Varroa	Nosema	Small Hive Beetle
# Selections	117	37	2	2	3	6	14	2	0

Cause of Loss	Pesticides	CCD	DK	Natural Disaster	Other	Robbing	Swarm	Other Disease/Virus
# Selections	0	0	7	0	4	2	2	2

Management Practices

Beekeepers also record when and what products they use to feed their colonies. This information is summarized below.

From DIS Sheet (Self-reported by Beekeepers)



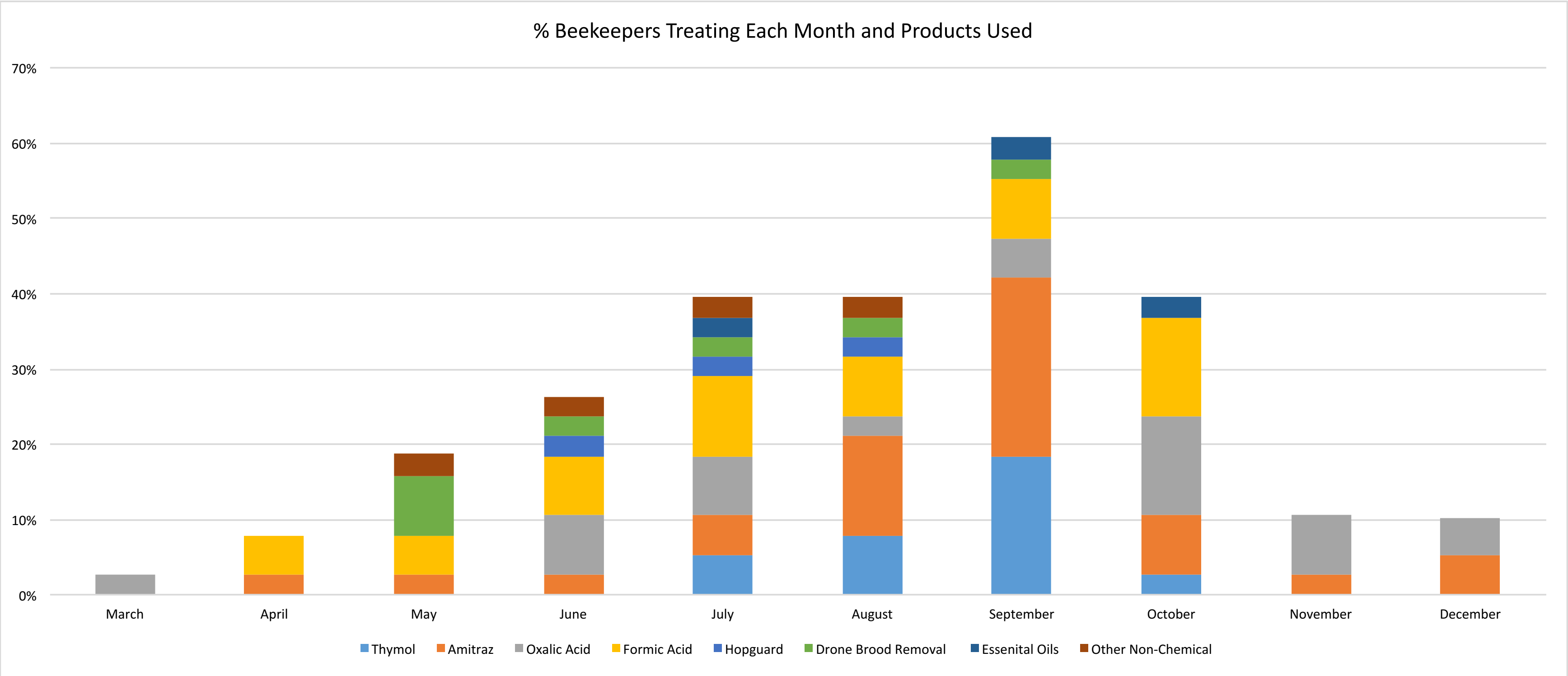
Beekeepers Feeding Their Colonies Each Month											
		April	May	June	July	August	September	October	November	December	Total
Total	# Beekeeper	2	6	6	8	13	17	19	8	4	83
	# Hives	11	27	97	61	182	327	188	74	113	1080

*Carbohydrate includes 1:1 sugar water, 2:1 sugar water, High Fructose Corn Syrup, Pro Sweet, candy, and fondant
** Protein includes pollen patties, Mega Bee, and Ultra Bee

Management Practices

The following summarizes when and what products (active ingredients) beekeepers used to perform *Varroa* control. For example, you can see that September is the most common month for using *Varroa* control methods, and Amitraz was the most commonly used product that month. This graph includes chemical and non-chemical methods. The most common products are separated into categories/active ingredients, with brand names listed below.

From DIS Sheet (Self-reported by Beekeepers)



Beekeepers Using Chemical or Non-Chemical Varroa Control Methods										
	April	May	June	July	August	September	October	November	December	Total
# Beekeeper	3	4	10	13	14	17	10	4	0	75
# Hives	21	58	124	125	192	281	174	55	0	263

*Names of products used include: Apiguard (Thymol), Apivar (Amitraz), Mite Away Quick Strips (Formic Acid), Wintergreen & Apilife Var (Essential Oils), Powdered Sugar and Rhubarb and Sumac Smoke (Other Non-Chemical)