Dear Sentinel Participant,

Thank you for participating with us in the 2017 Sentinel Apiary Program! This was the biggest year of the program yet. Since the program was piloted in 2015, we have grown from 21 beekeepers in 8 states to 61 beekeepers in 26 states all over the country.

This year, with your help, we were able to:
- Sample and perform health inspections on 473 colonies throughout the beekeeping season
- Process 2,157 samples for *Varroa* and *Nosema*
- Share data from over 80 hive scales
- Engage in valuable conversations with beekeepers across the country about problems in the beekeeping world, and how we can work on them as a community

This report is a summary of all the *Varroa*, *Nosema*, and colony management information we collected in 2017. We highlight some interesting trends in *Varroa* populations, including a trend that we had not seen much in past years, but became very common this year. We hope this report will give you some insights as to what the beekeeping community at large is experiencing, as well as the management practices being used to combat colony health issues.

We sincerely thank you for your participation in the 2017 Sentinel Apiary Program. As the Program grows, your data will allow us to make incredibly powerful observations about management, colony mortality, and *Varroa* levels that have the potential to influence beekeeping practices nationwide. We are truly excited to begin exploring this unique database, and have countless questions we think it could help us answer. Together we have the power to inform and influence beekeepers nationwide, and to encourage collaboration and accountability in our local beekeeping communities. We hope you will stick with us as we continue on this journey!

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

Kelly Kulhanek

Dan Reynolds

Participant Demographics

These are the operation sizes and locations for all participating beekeepers. This year we had a higher proportion of sideline beekeepers than prior years, and we still had zero commerical beekeepers participate. We divide the US into 8 regions, or climate zones, because mortality and management are more comparable within these regions.

Operation Size		# of Beekeepers	# of Colonies Sampled	# of Samples Processed
Backyard	(less than 50 colonies)	47	358	1590
Sideline	(50-500 colonies)	14	115	567
Commercial	(500 or more colonies)	0	0	0
	TOTAL	61	473	2,157

Region	West	South West	West North Central	South	East North Central	Central	North East	South East
# Participants	4	0	0	1	14	9	23	10

2017 Apiary locations

Regions: C, NE, SE, West, ENC, S, SW, WNC
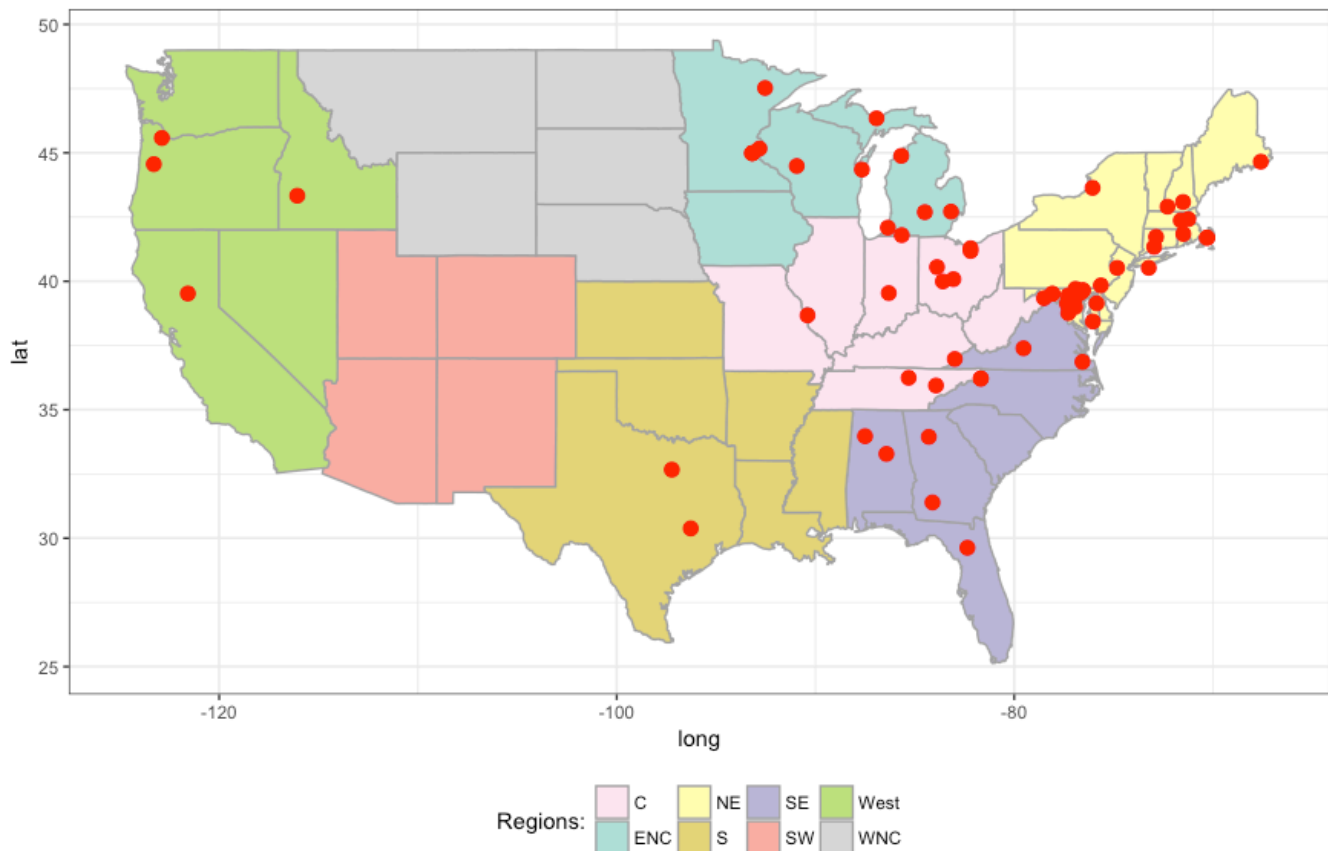
The first graph on this page summarizes the average _Varroa_ mite load for all Sentinel participants (blue) compared to the national average for each month (brown). The red line is at 3 mites/100 bees, what we consider to be a threshold level for when you should begin treating your colonies to avoid serious damage. You can see that our participants tracked very closely to APHIS national averages, and had lower _Varroa_ loads than APHIS in all months of the year. The trend of _Varroa_ levels increasing as we entered Fall is typical, although many participants experienced an etremely rapid increase in _Varroa_ infestation levels in October this year (more about this on Page 4). The second graph shows all years of Sentinel (2015-2017; blue colors) compared to the national average (black).

**Varroa mites (number of mites per 100 bees)**

	May	June	July	August	September	October
Sentinel Average	2.01	1.73	2.73	3.69	4.99	6.78
Sentinel standard error	0.26	0.15	0.22	0.24	0.38	0.50
APHIS Average	3.12	1.92	3.04	3.87	5.96	7.59
APHIS standard error	0.21	0.10	0.16	0.14	0.23	0.30
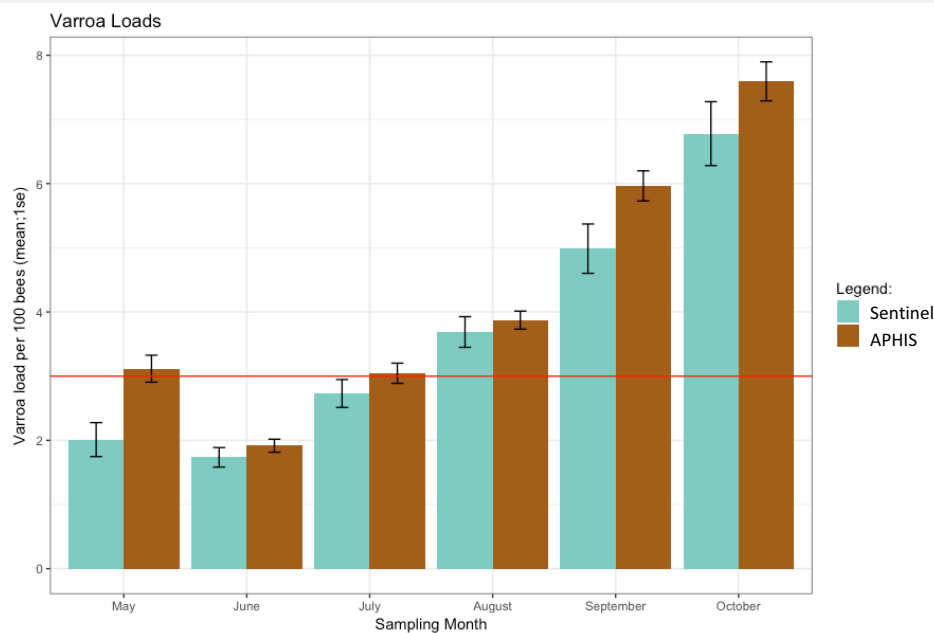
Varroa Loads

* 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


Sentinel Mite Loads Compared to APHIS National Average
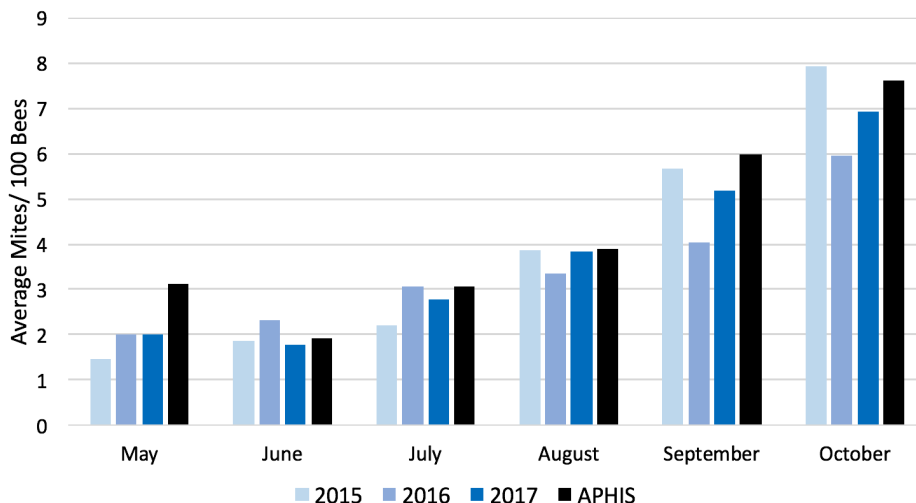
For the first two years of the Program (2015-2016), we saw three typical *Varroa* trends in participating apiaries. Examples of these are shown below (Trends 1-3). This year, we saw a new trend appear in a significant proportion of apiaries. This new "Trend 4" is characterized by relatively low mite levels throughout the season, followed by a rapid spike in mite levels in October. This is particularly problematic for beekeepers because there is so little time between these spikes and winter in which to correct the problem. We are not sure what is causing this trend, but we are now looking into modeling *Varroa* populations to see if we can figure it out.
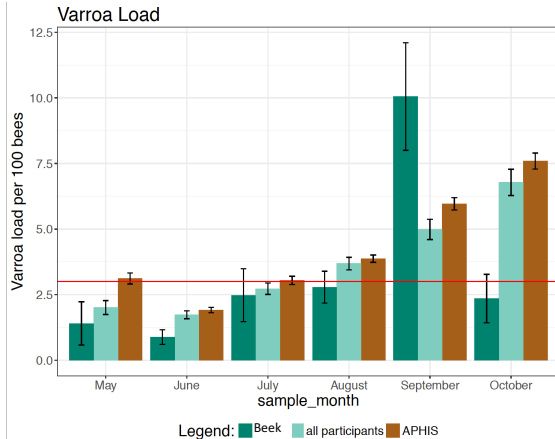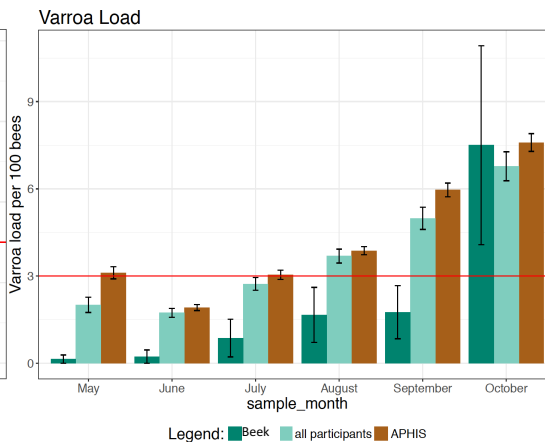

Trend 1: One spike in mite loads in fall, rectified by a successful treatment.
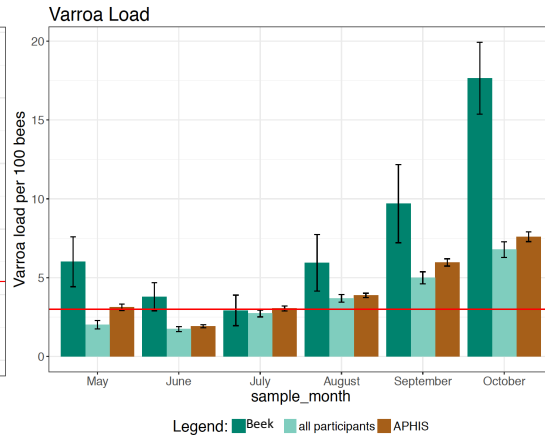

Trend 2: Mite levels continue to increase due to lack of successful treatment.
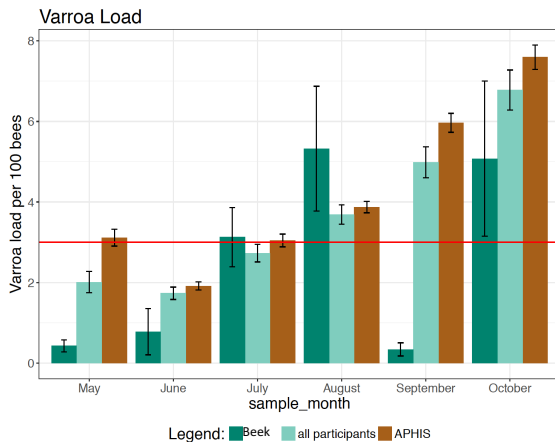
Trend 3: Early spike in mites followed by a successful treatment, but then followed by a rapid reinfestation of mites. This may be due to "horizontal transmission" of mites from a nearby crashing colony.

Trend 4: Low levels of mites throughout the season until a sudden rapid spike in levels in October. This trend was unusually common in the 2017 season.

Proportion of Different Varroa Trends Seen in 2017 Sentinel Participants
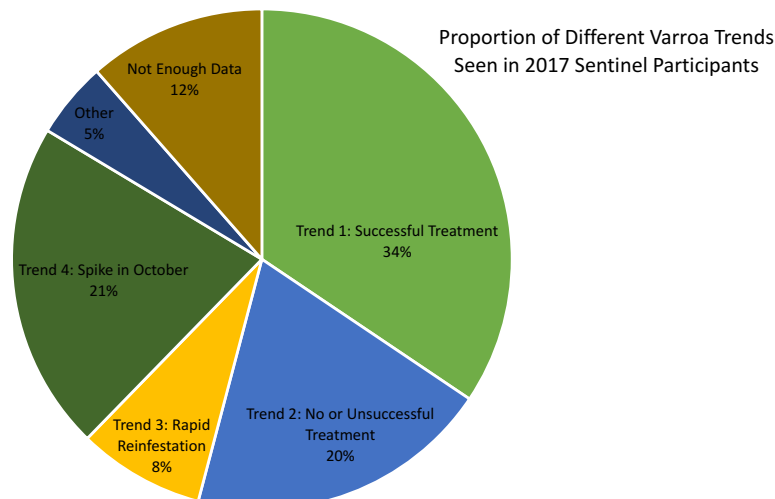
This graph shows the proportion of each *Varroa* trend seen in 2017 participating Sentinel Apiaries. Successful treatment was the most common trend, followed by the new "Trend 4" of a spike in October.

This page summarizes the average *Nosema* spore load for Sentinel participants (blue) compared to the national average for each month (brown). We consider 1 million spores/bee to be a threshold level for when you should begin treating your colonies to avoid serious damage. Note that no Participants reached this threshold this year. You can see that our participants' trend tracked closely to APHIS national averages, and had lower *Nosema* loads in June and July, but higher than APHIS average loads in May, September, and October.

Nosema spores (million of spores per bee)

|	May	June	July	August	September	October
Sentinel Average	0.74	0.32	0.18	0.15	0.19	0.24
Sentinel standard error	0.08	0.04	0.04	0.03	0.04	0.08
APHIS Average	0.60	0.43	0.30	0.15	0.12	0.16
APHIS standard error	0.07	0.04	0.04	0.02	0.01	0.02
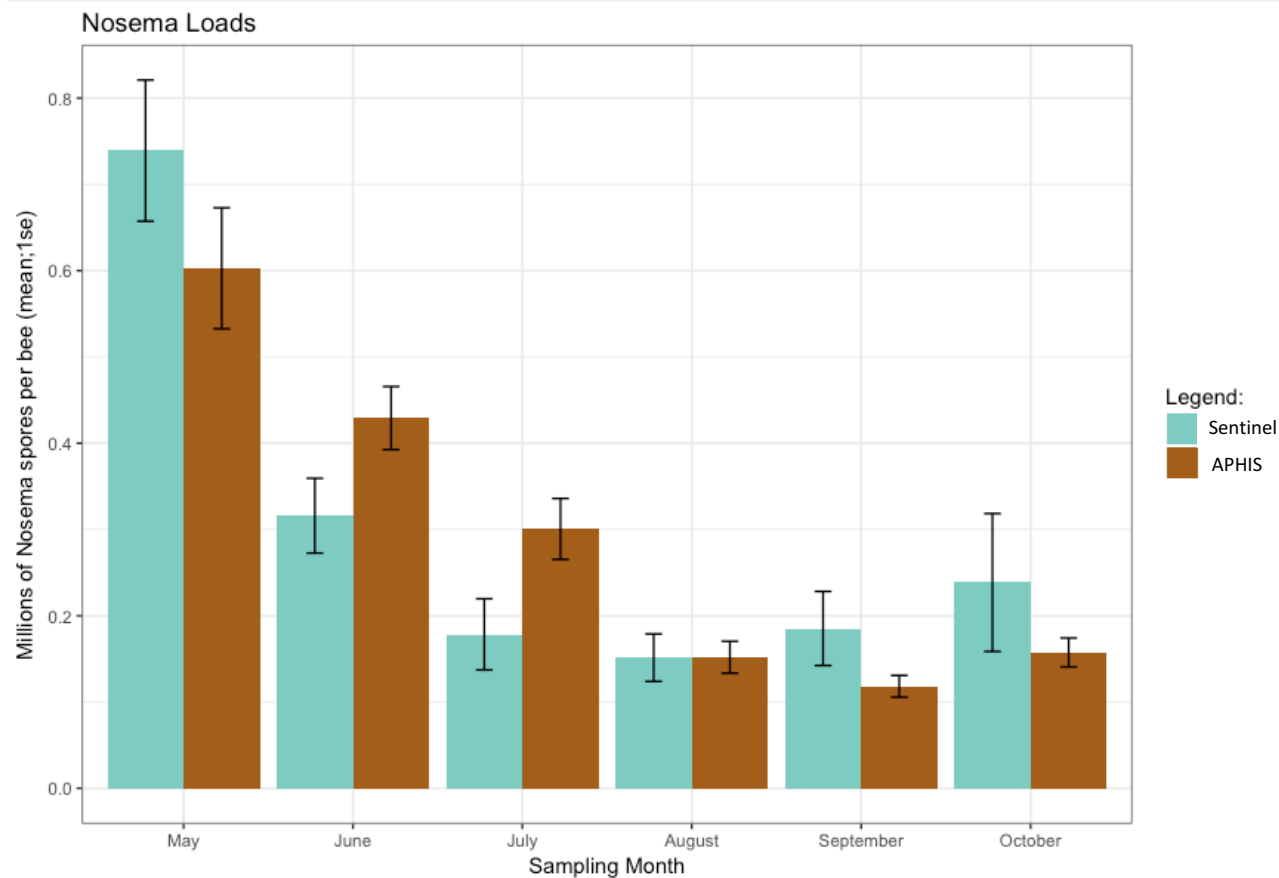
* APHIS Honey Bee Disease Survey is a national effort sponsored by USDA Animal and Plant Health Inspection Service (APHIS) in collaboration

 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

Beekeepers record when they experience a colony death in their sampling apiary on their monthly data sheets. They also record what they perceive to be the cause of death of each lost colony. The summary of causes of loss is reported below (64% 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)

Self-Reported Causes of Loss in Sentinel Apiaries
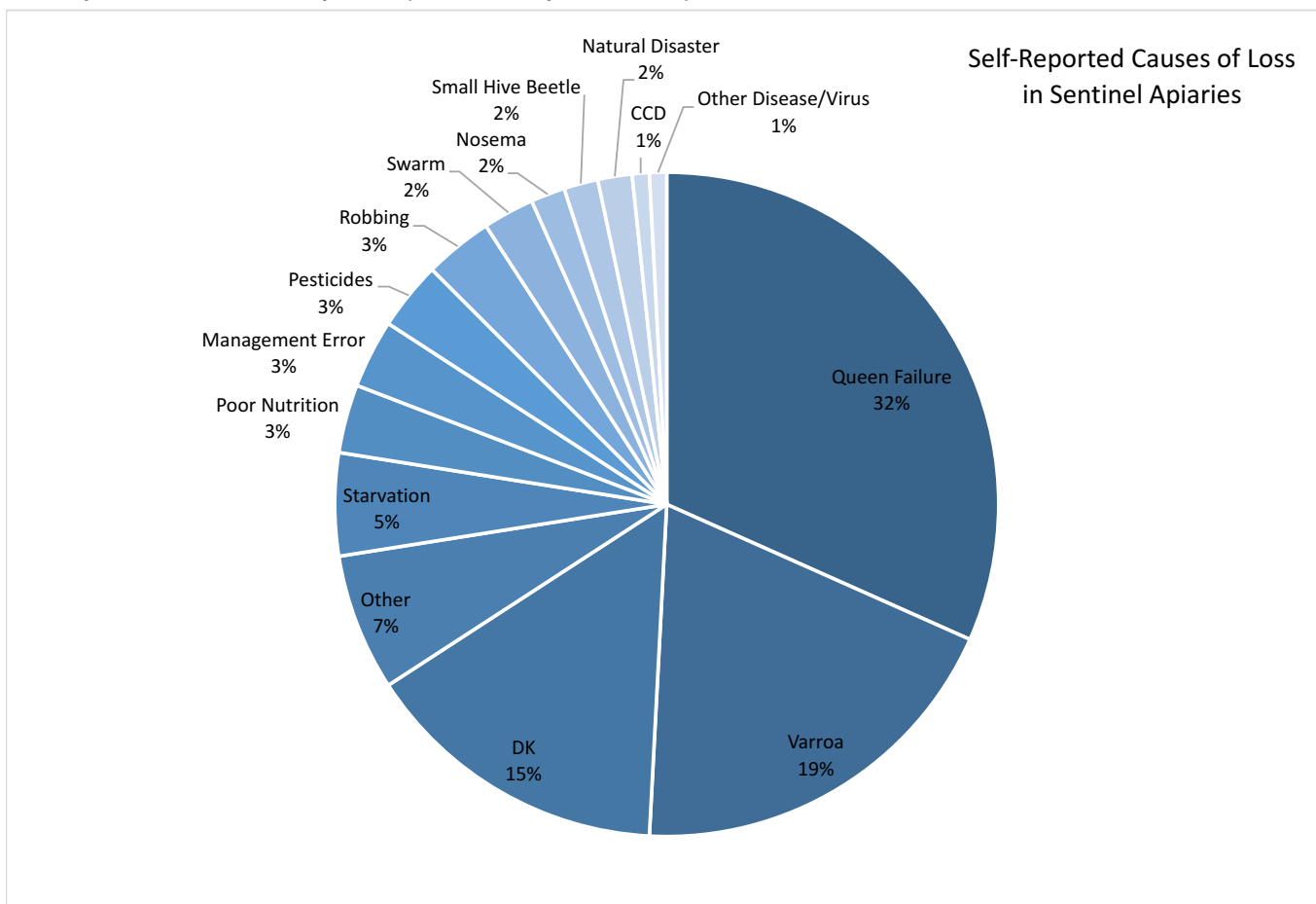
Cause of Loss	No Loss	Queen Failure	Poor Weather	Poor Nutrition	Starvation	Management Error	Varroa	Nosema	Small Hive Beetle
# Selections	211	38	0	4	6	4	23	2	2

Cause of Loss	Pesticides	CCD	DK	Natural Disaster	Other	Robbing	Swarm	Other Disease/Virus
# Selections	4	1	18	2	8	4	3	1

Management Practices

Beekeepers also record when and what products they use to feed their colonies. This information is summarized below. A common answer for feed timing that is not reflected in the graph is "continuous" or "as needed."

From DIS Sheet (Self-reported by Beekeepers)

Beekeepers Feeding Products At Different Times of Year
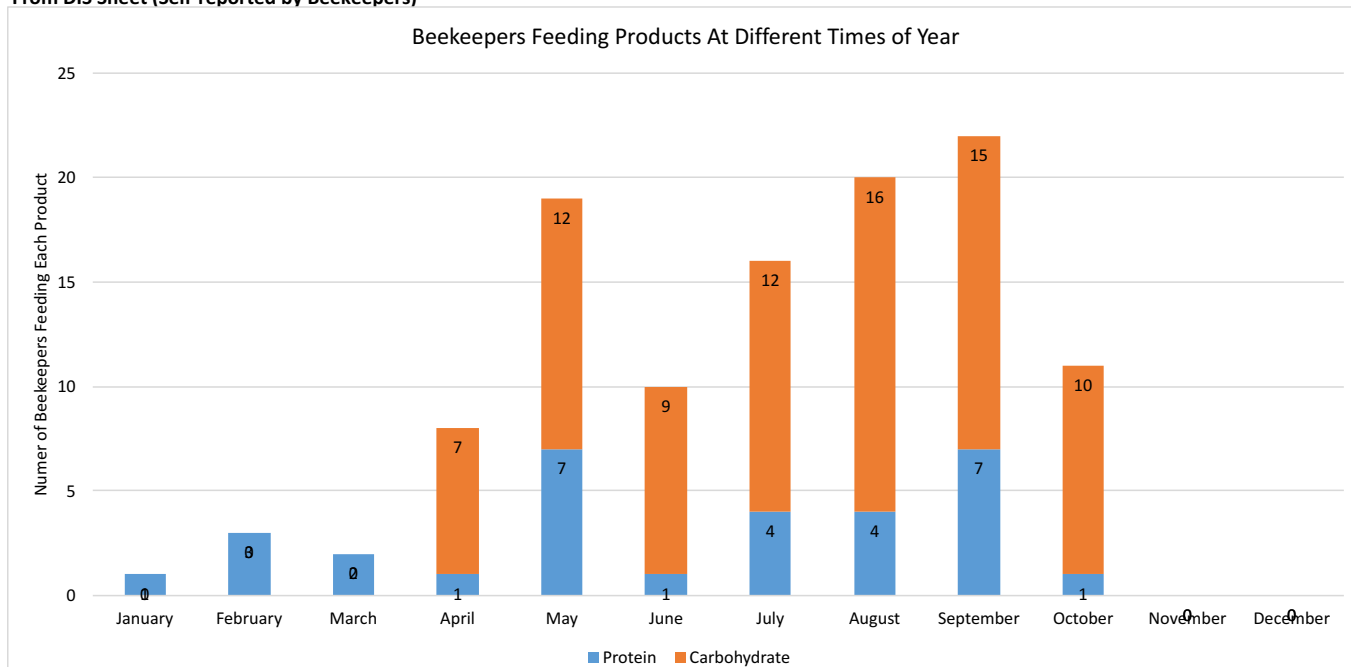
Beekeepers Feeding Their Colonies Each Month

	January	February	March	April	May	June	July	August	September	October	November	December
Protein	1	3	2	1	7	1	4	4	7	1	0	0
Carbohydrate	0	0	0	7	12	9	12	16	15	10	0	0
Total	**1**	**3**	**2**	**8**	**19**	**10**	**16**	**20**	**22**	**11**	**0**	**0**

*Carbohydrate mainly includes 1:1 sugar water, 2:1 sugar water, High Fructose Corn Syrup, Pro Sweet, candy, and fondant

** Protein mainly includes pollen patties, Mega Bee, and Ultra Bee

The following summarizes the most commonly reported products (active ingredients) beekeepers used to perform *Varroa* control. For example, you can see that August is the most common month for using *Varroa* control methods, and Formic Acid was the most commonly used product that month. Other chemical methods were reported, including Coumaphos and Fluvalinate. Several non-chemical methods were also reported, including Drone Brood Removal. These are difficult to represent in a graph because they occur continuosly over long periods of time. The most common products are separated into categories/active ingredients, with brand names listed below.

From DIS Sheet (Self-reported by Beekeepers)

Beekeepers Treating with Different Chemical Products at DIfferent Times of Year
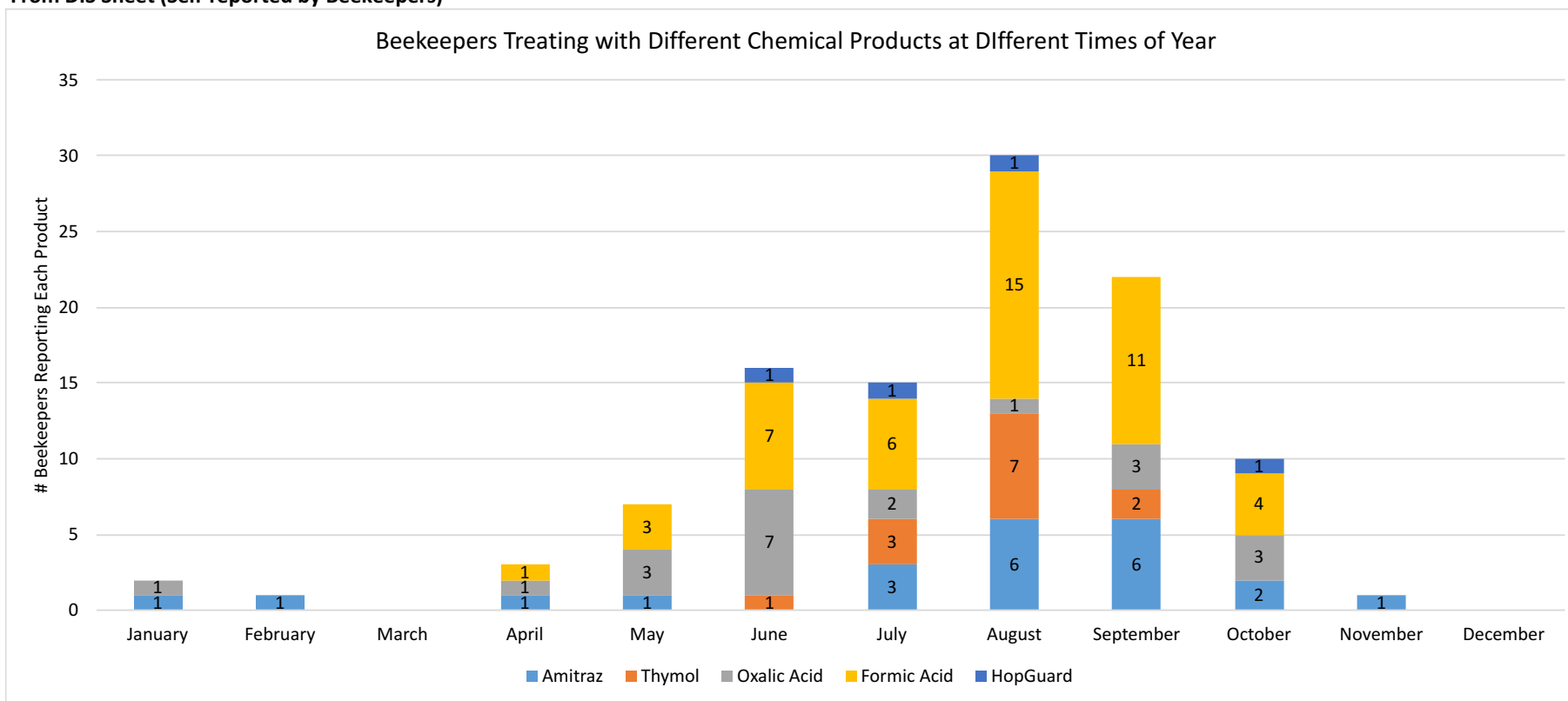
*Names of products used include: Apiguard, Apilife Var (Thymol), Apivar (Amitraz), Mite Away Quick Strips, Formic Pro (Formic Acid), HopGuard and HopGuard II