



**Bee Informed Partnership: Sentinel Apiary Program
Final Report 2018**



Dear Sentinel Participant,

Thank you for participating with us in the 2018 Sentinel Apiary Program! This year, as a group of 64 beekeepers, you took 1,901 *Varroa* and *Nosema* samples from 418 colonies!


This report is a summary of the *Varroa*, *Nosema*, and colony management information we collected in 2018. Of special note is that 2018 Sentinel Apiary Participants experienced the lowest average monthly *Varroa* loads of any year of the program! Now that we have collected four years of extensively detailed colony health data, we are beginning to perform data analyses and use all of your hard work to inform our future research. A couple of exciting things in the works that have come from Sentinel data are:

1. Investigation of inter-apiary *Varroa* transmission. Sentinel data revealed rapid increases in *Varroa* populations that cannot be explained by normal mite reproduction, indicating a possible outside source of mites. This has led us to begin investigating the extent to which *Varroa* from highly infested/crashing colonies spread to nearby apiaries across the landscape.
2. Correlation of internal physical symptoms to mortality using historical Sentinel samples. We save ~10% of all Sentinel samples as a historical record, and recently a PhD student in our lab, Anthony Nearman, has made exciting headway in correlating internal abnormalities in these bees to colony mortality. This could pave the way for a new method of colony sampling to better predict mortality.
3. Collaboration with NASA-DEVELOP to investigate landscape effects on Sentinel colony health using NASA-Earth satellite imagery. This summer we had the amazing opportunity to work with NASA to develop a tool which can intake information about your Sentinel Apiary and show us a variety of landscape factors around it such as precipitation, soil moisture, and land cover. This will allow us to make correlations between the landscape, colony health, and how the effectiveness of management practices varies across space.

As you can see, this data is incredibly powerful and your contribution to science and to beekeeping as a whole cannot be understated. We hope you enjoy this report and keep on the lookout for more updates about the program and future studies!

Thank you again for your participation.
Happy Beekeeping,


Kelly Kulhanek


Dan Reynolds

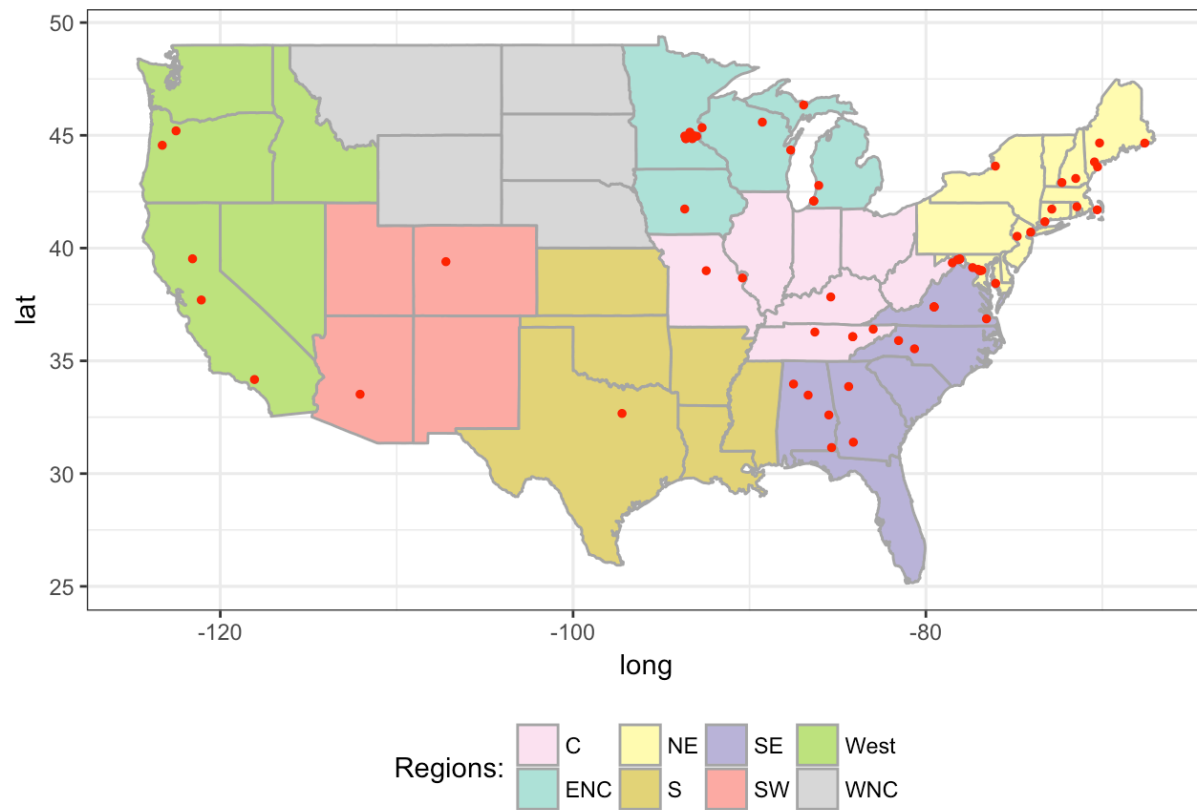


Participant Demographics

This is a breakdown of participation rates by number of apiaries, colonies, and samples. We divide the US into 8 regions, or climate zones, because mortality and management are more comparable within these regions.

Region:	Central	East North Cental	North East	South	South East	South West	West	TOTAL:
Apiaries	8	19	18	1	12	1	5	64
Colonies	55	140	98	4	78	4	39	418
Samples	166	735	476	7	357	24	136	1,901

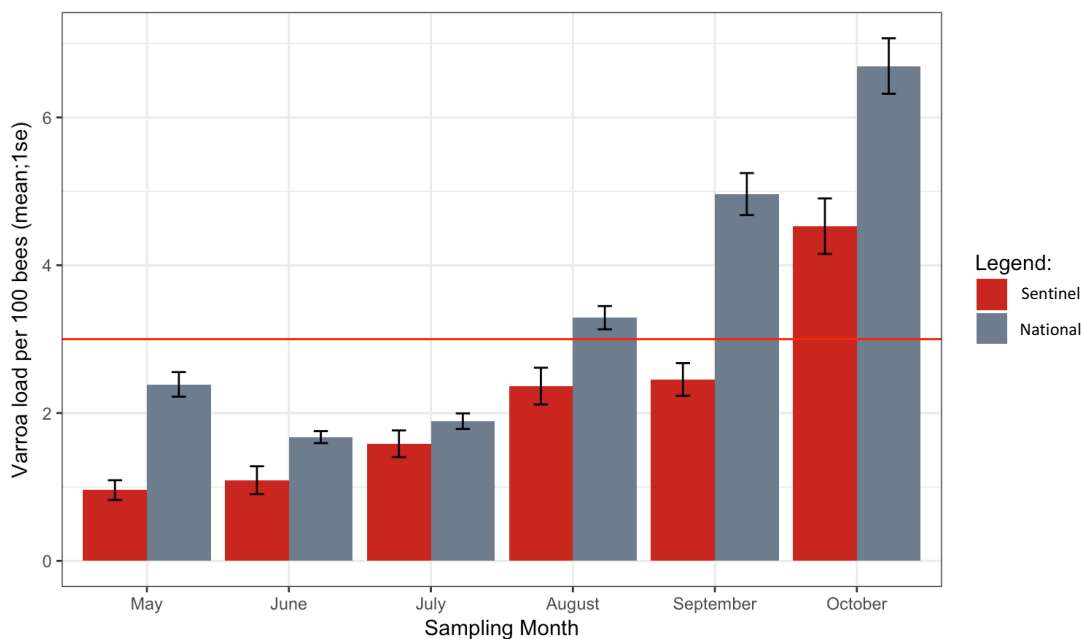
2018 Sentinel Apiary Locations



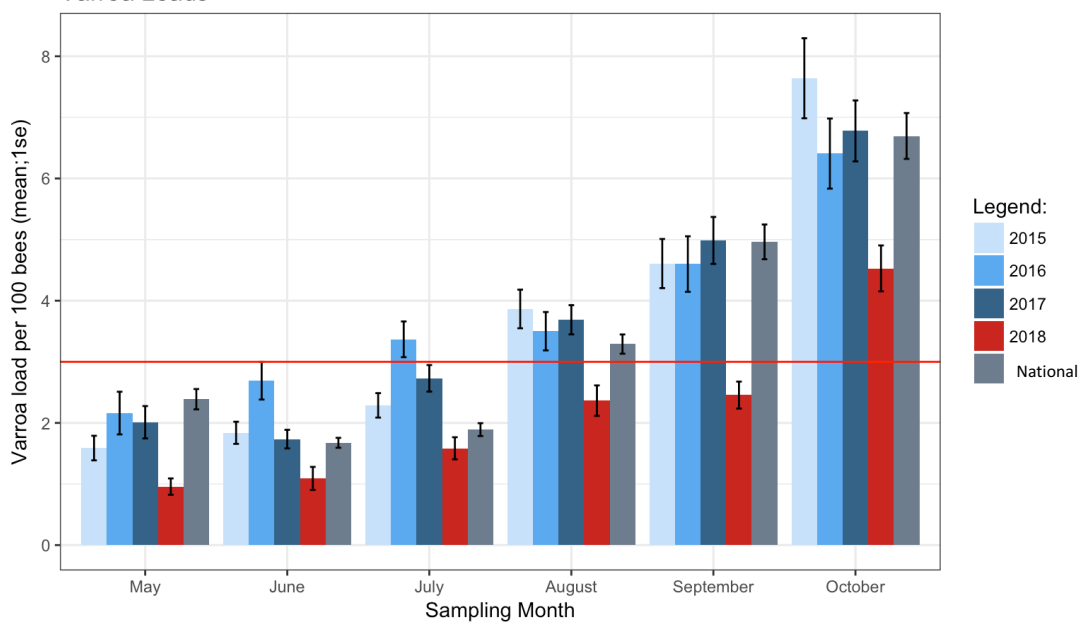


Each year we calculate the average *Varroa* load (mites/100 bees) for all Sentinel Apiary Program participants. We compare these monthly averages to the Historical National Average (calculated from all USDA-APHIS samples). This year we are thrilled to report that Sentinel Participants had significantly lower *Varroa* loads than the Historical National Average! You can also compare 2018 to other Sentinel years and the Historical National Average below.

Varroa Loads



Varroa Loads

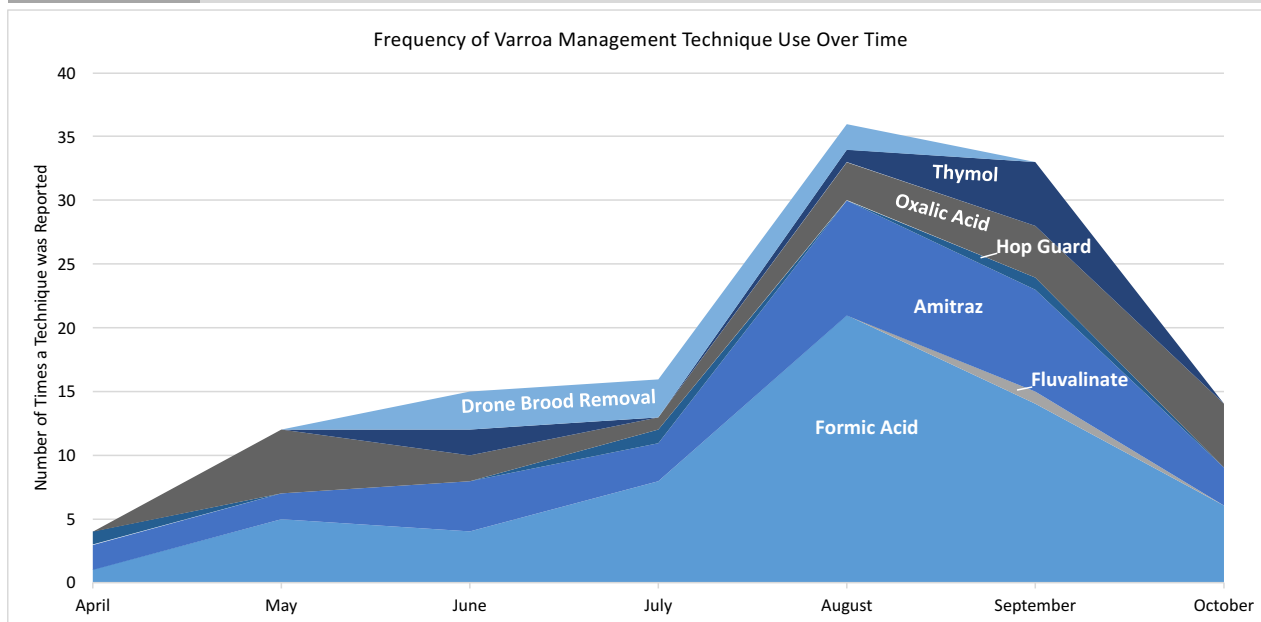




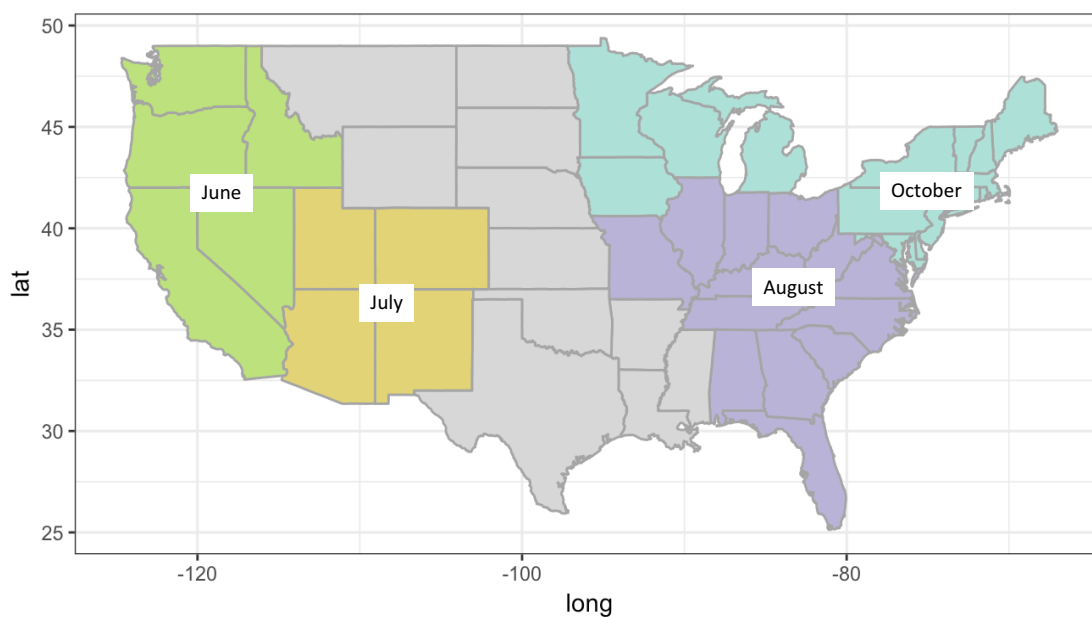
Varroa Treatment

This page describes the patterns in *Varroa* treatments used by Sentinel Participants over the season. The table below shows the number of reported uses of each active ingredient. The following graph depicts how the frequency of use *Varroa* control methods changes over time, and is further broken down into active ingredient. Finally, the map shows when each climatic region of the US reaches the treatment threshold of 3 mites/100 bees. There has been a trend over the last three years that western and southern states reach threshold earlier than eastern or northern states. This could have interesting implications for *Varroa* monitoring and treatment schedules.

	April	May	June	July	August	September	October
Formic Acid	1	5	4	8	21	14	6
Fluvalinate	0	0	0	0	0	1	0
Amitraz	2	2	4	3	9	8	3
Hop Guard	1	0	0	1	0	1	0
Oxalic Acid	0	5	2	1	3	4	5
Thymol	0	0	2	0	1	5	0
Drone Brood Removal	0	0	3	3	2	0	0



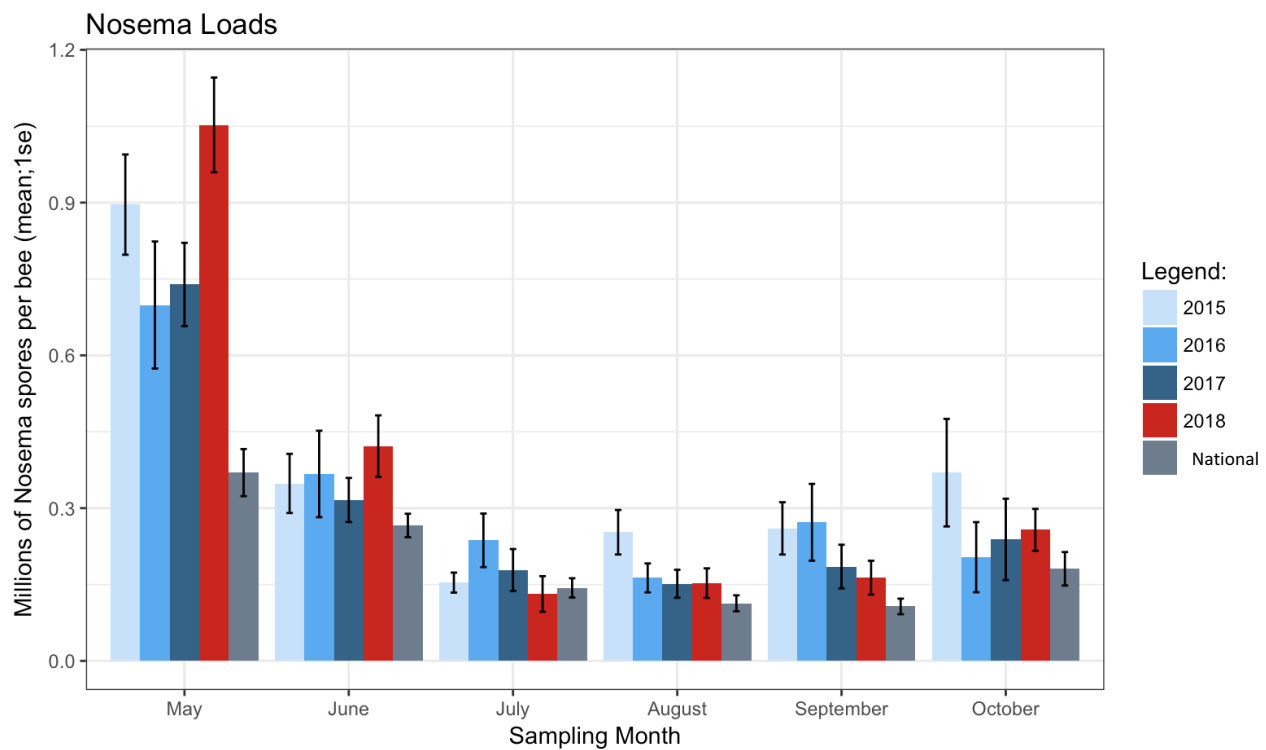
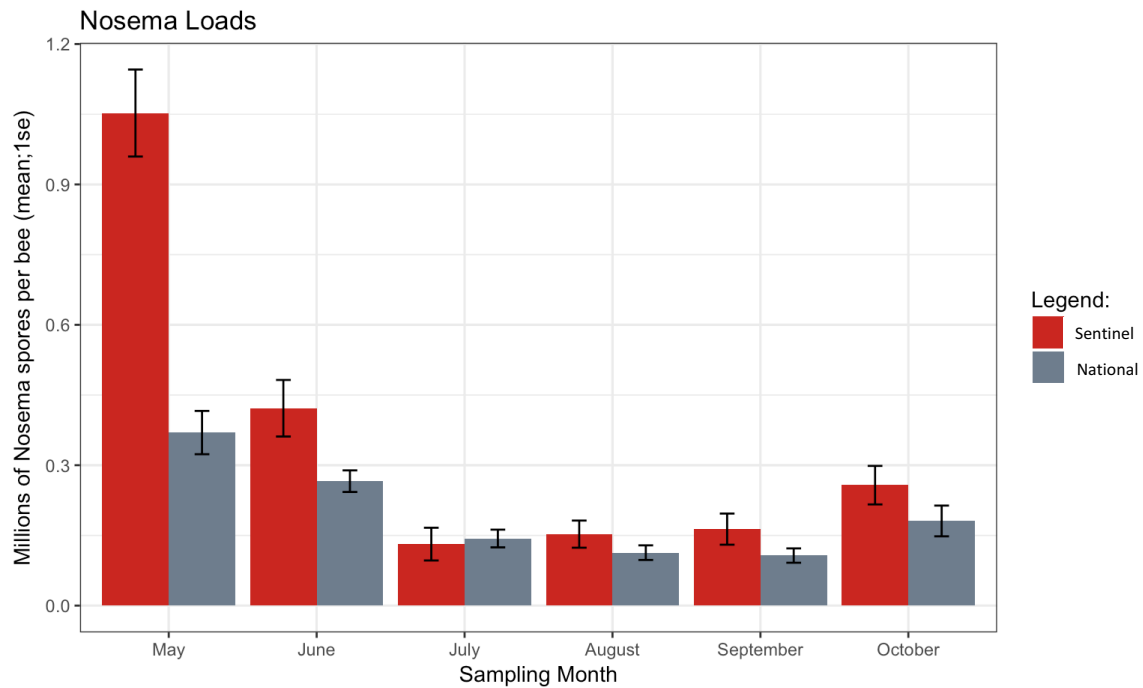
Month Each Region reaches 3 Mites/100 Bees





Nosema Summary

This page summarizes 2018 Sentinel Participant average *Nosema* loads compared to the Historical National Average and to prior Sentinel years. While 2018 participants started with relatively high *Nosema* loads, by mid summer they were comparable to the Historical National Average and to other years of Sentinel.





On each monthly data sheet, we ask Sentinel participants whether they lost any colonies and if so, why. This page summarizes the responses of beekeepers regarding their perceived causes of colony loss. You can see that Queen Failure was the most commonly reported cause of loss, followed by Don't Know and Varroa. Happily, no losses were reported as being due to pesticide exposure.

