

2020

Mite-a-Thon

Final Report



“CCBA made mite count awareness and proficiency a #1 priority in our club. Even new apprentices and mentees received thorough instruction on the devastation of hives due to Varroa mites. We wanted to contribute to this citizen science project and are so glad that our members participated in this tri-national effort.”

- Lauren Smith

Chester County Beekeepers Association

2020 Mite-A-Thon Analysis

Introduction

Following the fourth annual Mite-A-Thon, this document is a report on both the May and August results of the Mite-A-Thon 2020, with some brief comparison to previous years. This report attempts to answer the questions:

- 1) What does the data show us concerning mite levels and participation across North America?
- 2) Did the promotion of two data collection periods lead to increased monitoring over the summer months?
- 3) Is this a useful project for beekeepers and leadership team partners?
- 4) Is there anything more that should be added to this project in future years?

The project was led by the Pollinator Partnership and the North American Pollinator Protection Campaign (NAPPC), and funded by following sponsors and leadership team as of September 2020:

- Almond Board of California
- American Beekeeping Federation
- American Honey Producers Association
- Bee Friendly Farming
- Bee Informed Partnership
- Canadian Honey Council
- Dadant*
- Honey Bee Health Coalition
- Manitoba Ministry of Agriculture and Resource Development*
- Michigan State University
- NAPPC
- Newfoundland and Labrador Beekeeping Association*
- Pollinator Partnership
- Project Apis m.
- Saskatchewan Ministry of Agriculture*
- University of Maryland
- University of Minnesota Bee Lab and Bee Squad
- USDA

*New partners in 2021



Background

The varroa mite, *Varroa destructor*, is a leading cause of colony mortality in North American honey bee colonies. Honey bees face multiple stressors (pests, pathogens, pesticides, poor nutrition, and weather extremes). The combined effects might be more damaging than the individual effects of each stressor. Among all those stressors, varroa is arguably the single most important driver of colony mortality. It is both extremely damaging to the bees and widely spread, detected in over 90% of the colonies sampled by the APHIS National Honey Bee Disease Survey in the US. Varroa is an ectoparasite of the honey bee that was inadvertently introduced into North America 30 years ago from Asia. In addition to the direct damage inflicted from the parasite, mites serve as a vector for a series of viruses. They also cause bees to have a higher risk of infection by compromising their immune systems. There are significant data showing that low rates of varroa mite infestation make overwintering success more probable. The management of varroa mites implies both the monitoring of load levels in colonies and the use of control techniques (both prophylactic and therapeutic). However, even the first step, monitoring of varroa mite prevalence and load, can be rare in the beekeeping community, resulting in a large portion of beekeepers unaware of the level of infestation present in their colonies.

Approach

Pollinator Partnership and NAPPC organized the Mite-A-Thon, a citizen science initiative, to promote the practice of monitoring varroa levels and to gather data on varroa mite infestations across North America for all types of beekeepers. The Mite-A-Thon is an intensive outreach effort, this year adding a spring effort to the fall sampling period. Two weeks in early May and two weeks in late August were chosen because they represent critical periods for monitoring varroa mites in North America, early in the season and just before the start of the overwintering period. Initial iterations only focused on the period before overwintering, while this year's approach emphasized learning monitoring techniques early and monitoring throughout the summer. The first Mite-A-Thon took place in 2017 (September 9 to 16), and was repeated in 2018 (September 8 to 22) with the addition of a second week so that beekeepers affected hurricanes along the Atlantic coast could participate. Previously, in 2019 (September 7-21), a second week had been added so that beekeepers attending Apimondia could participate. In addition to the intensive outreach during the Mite-A-Thon, an online tool allowing the entry of varroa monitoring results (www.mitecheck.com) is available year-round. The website also allows the public to view a dynamic, county level map displaying the highest mite counts reported.

In both periods of 2020 (spring and fall), Participants were encouraged to test the level of mites in their colonies via standardized protocol utilizing two common methods of assessment (alcohol wash or powdered sugar roll) and then to upload their data (www.mitecheck.com). Uploads included data on location, total number of colonies, number of colonies tested, management methods that have been used and that are being considered, and number of varroa mites counted from each colony.

Commercial, sideliner, and hobbyist beekeepers were all encouraged to participate in order to create a rich distribution of sampling sites in Canada, Mexico, and the United States. To this end, all partner organizations participated in outreach across North America. The following partner outreach initiatives were conducted in 2020 (partial list):

Partners	Outreach Initiatives
Almond Board of California	Publicized in weekly newsletter
American Beekeeping Federation	Emailed reminder to members, newsletter articles
American Honey Producers Association	Promoted in 2 of their bi-monthly member emails
Bee Culture Magazine	Featured on Beekeeping Today podcast
Bee Friendly Farming	Publicized in monthly newsletter
Bee Informed Partnership	Promoted on BIP website, MiteCheck website, MiteCheck app, and social media posts
Canadian Honey Council	Promoted to members
Honey Bee Health Coalition	Publicized in special edition newsletters
Michigan State University	Promoted in talks to local beekeeping clubs, promoted on social media, publicized in Michigan beekeeper newsletter
Pollinator Partnership	Featured on website homepage, promoted Mite Mondays on social media, publicized in monthly newsletters, semiannual newsletter and Mite Monday Mailchimp emails to MAT audience, emailed all beekeepers and beekeeping organization contacts, created Spanish outreach materials and reached out to Mexican contacts. Made French outreach materials available on website. Gave talks to beekeeping organizations.
Project Apis m.	Featured in a special eNews bulletin that was picked up by the American Bee Journal and sent to their mailing list as well, Promoted in social media posts
University of Maryland	Promoted in social media posts
University of Minnesota Bee Lab and Bee Squad	Promoted in social media posts

In addition to general outreach, 2020 was the second year of the Mite-A-Thon Giveaway. An additional survey was open during each two-week period for officers of beekeeping organizations to submit additional data on their club's participation and educational efforts surrounding the event. Two of these entries were chosen to win \$100 Dadant gift certificates to thank them for their participation and to encourage others to strive for greater participation in the future.

Objectives

The primary objectives for this annual project are 1) to teach effective varroa mite monitoring methods and encourage testing and 2) to make management strategies available for discussion within bee organizations utilizing Mite-A-Thon partner-developed information and outreach materials.

Giveaway Results

The second year of the giveaway was a success, with Chester County Beekeepers Association (CCBA) in Pennsylvania and Long Beach Beekeepers in California selected as winners.

CCBA focused on providing thorough monitoring instruction for all club members, including expert lectures during their virtual zoom meetings. They also provided testing kits to all of their members, and encouraged enough monitoring to boost Pennsylvania into being the state with the most participation. Lauren Helfgott, CCBA Education Committee Lead, added:

CCBA made mite count awareness and proficiency a #1 priority in our club. Even new apprentices and mentees received thorough instruction on the devastation of hives due to Varroa mites. We wanted to contribute to this citizen science project and are so glad that our members participated in this tri-national effort.



Photos from Chester County Beekeepers Association



Photos from Chester County Beekeepers Association

Long Beach Beekeepers also saw increased participation this year due to their promotions and trainings. They routinely reminded their members to test for varroa on social media and through their email newsletters. In addition, they held 2 live testing demonstrations at their meetings.

To view the recording of Long Beach Beekeepers' August meeting led by President Jennifer Duke, including a presentation by Pollinator Partnership's President and CEO, Laurie Davies Adams, and the testing demonstration, [click here](#).



Survey Results

1 . Number of mites - **May**.

The result of the combined partner outreach initiatives was participation from 147 beekeepers across the continent who tested 391 colonies for mites. Of the nearly 400 results submitted in May, 58.57% detected varroa, and 14.83% were found above the 3 mites per 100 bees (sample) action threshold.

Table 1. Number of May samples having each number of varroa mites.

Number of Mites	Number of Samples
0	162
1	97
2	37
3	37
4	17
5	7
6	8
7	4
8	5
9	1
10	5
11+	11
Total Colonies	391

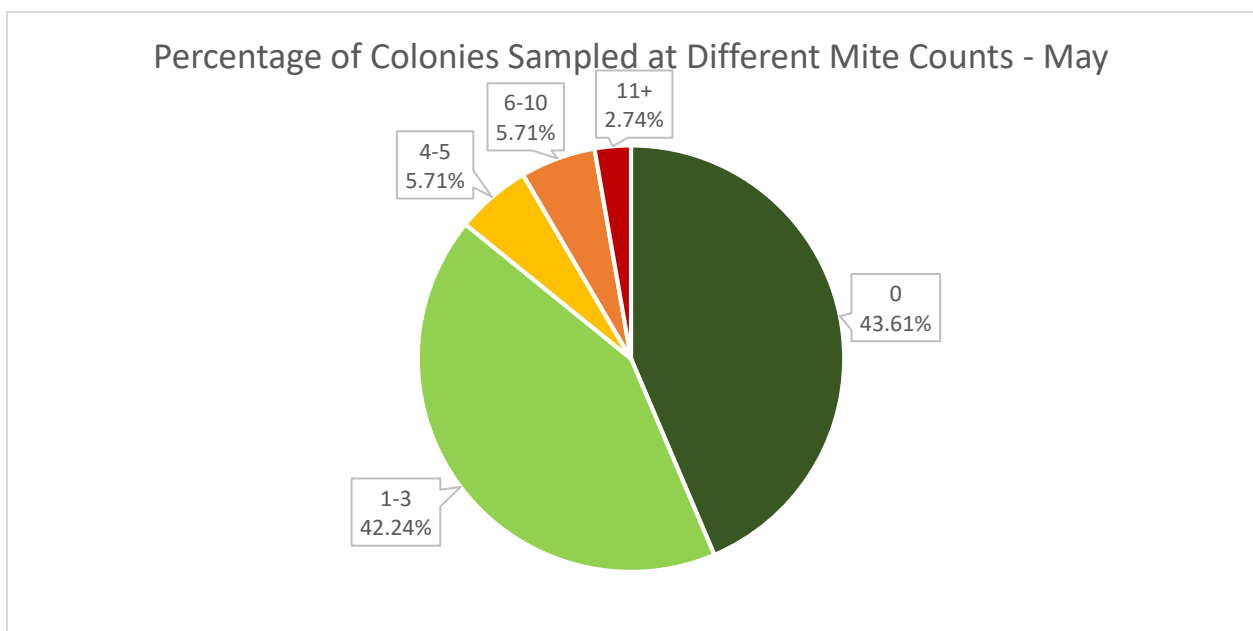


Figure 1. Percentage of May samples recorded at each of 5 levels of varroa mite infestation.

1. Number of mites – August.

In August 2020, 357 beekeepers across the continent who tested 1311 colonies for mites. Of these results, 74.83% detected varroa, and 23.19% were found above the sample action threshold.

Table 2. Number of August samples having each number of varroa mites.

Number of Mites	Number of Samples
0	330
1	362
2	187
3	128
4	66
5	50
6	40
7	20
8	26
9	17
10	19
11+	66
Total Colonies	1311

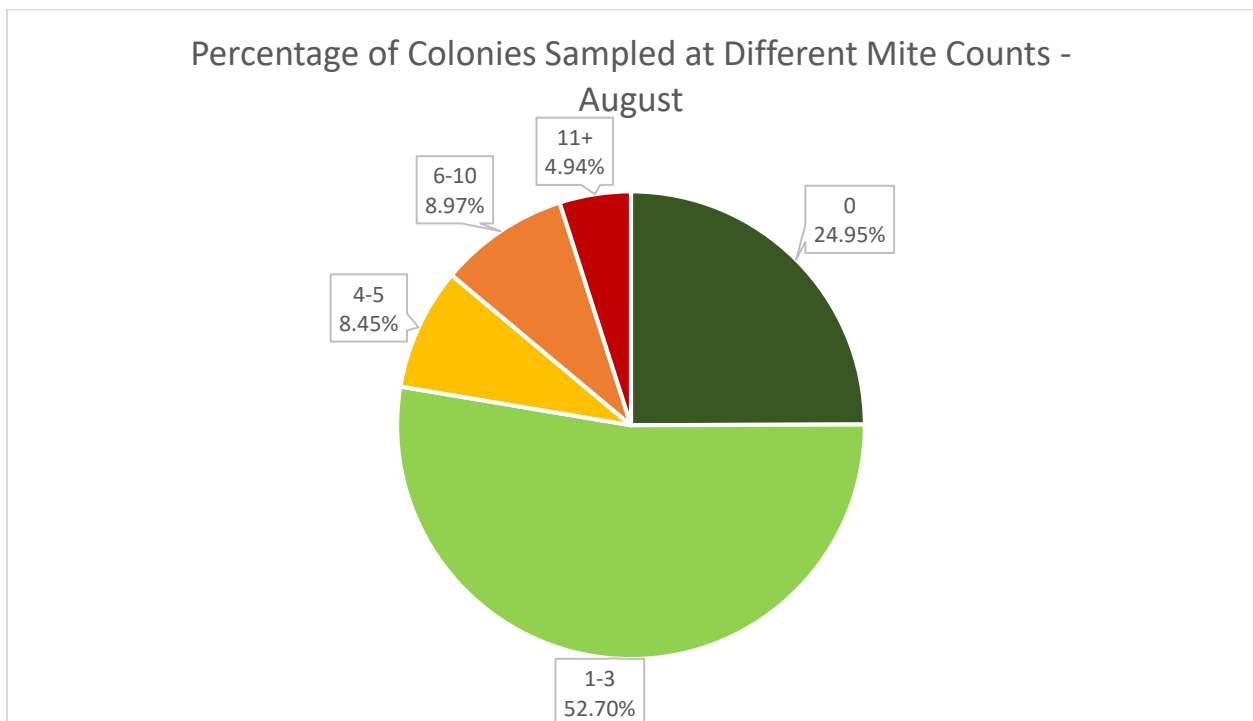


Figure 2. Percentage of August samples recorded at each of 5 levels of varroa mite infestation.

2. Number of reports at each level of mite infestation – **May**.

76.19% of May participants submitted at least one positive sample, and 17.69% had an average varroa count above the 3 mites per sample action threshold.

Table 3. Number of May participants at each varroa mite count level.

Number of Mites	Number of Participants
0	35
1	43
2	17
3	19
4	8
5	2
6	7
7	2
8	3
9	0
10	2
11+	9
Total Beekeepers	147

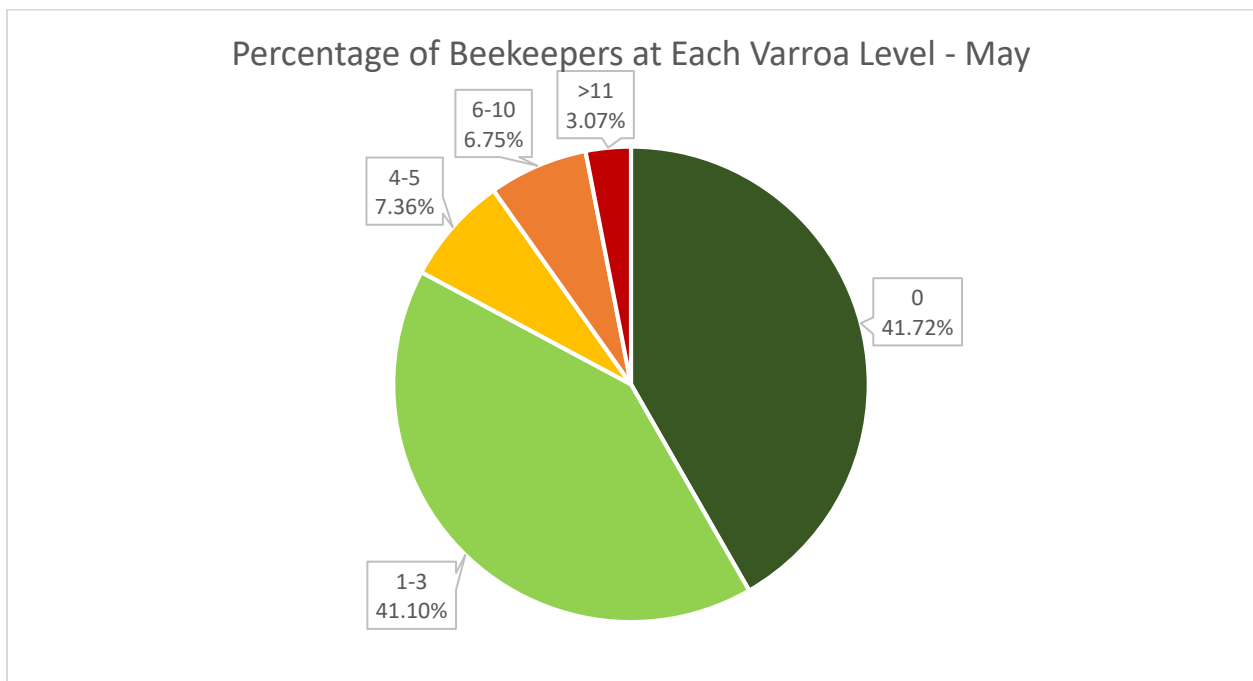


Figure 3. Percentage of May Mite-A-Thon participants with average varroa levels at each of 5 infestation levels.

2. Number of reports at each level of mite infestation – **August**.

90.48% of August participants submitted at least one positive sample, and 26.33% had an average varroa count above the 3 mites per sample action threshold.

Table 4. Number of August participants at each varroa mite count level.

Number of Mites	Number of Participants
0	34
1	80
2	57
3	46
4	17
5	17
6	21
7	7
8	13
9	8
10	9
11+	48
Total Beekeepers	357

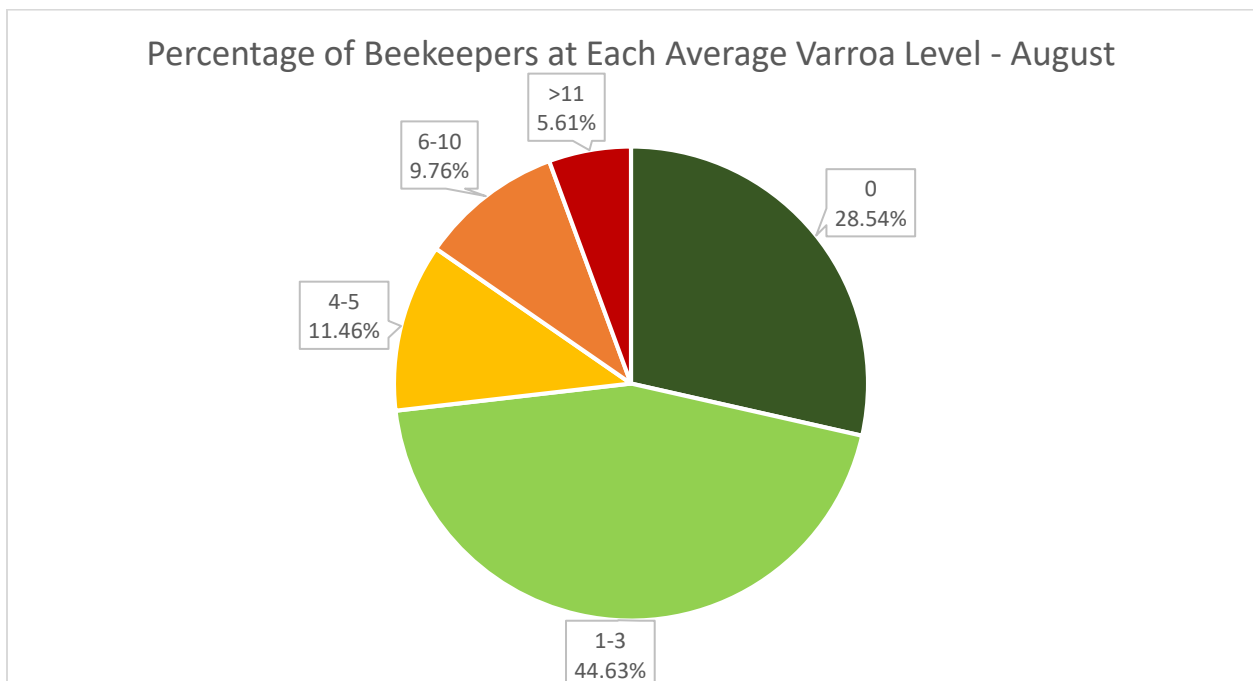


Figure 4. Percentage of August Mite-A-Thon participants with average varroa levels at each of 5 infestation levels.

3. Individual comparisons – **May and August.**

Fifteen beekeepers participated in both the May and August events (4.2%). Of these beekeepers, average mite counts found in May were 1.10 mites per sample. August saw average mite counts of 2.78 mites per sample among the same beekeepers.

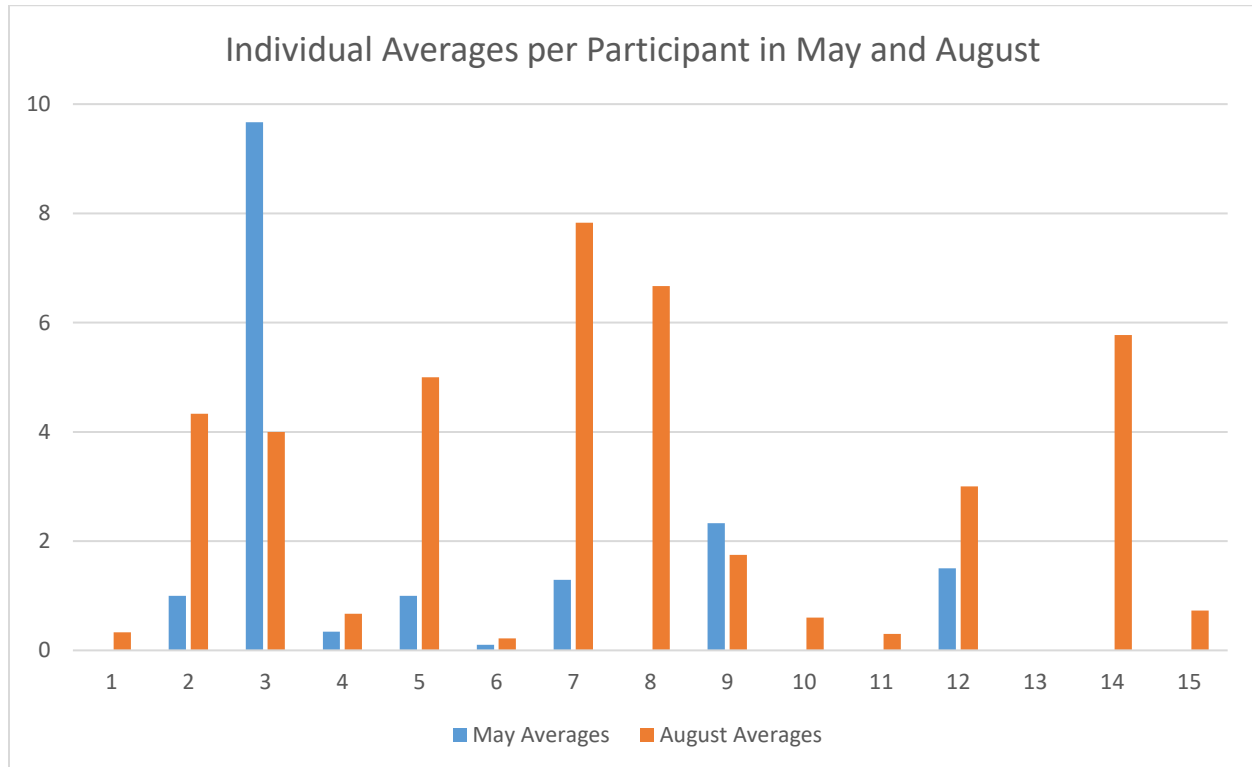


Figure 5. Individual mite averages per participant in both May and August.

4. Hive movement – May.

The survey asked the following question: “Have you moved the majority of these colonies in the last 2 months?” In May, 79 beekeepers answered the question on hive movement, with 6% having moved their hives in the last 2 months. Of this 6%, average varroa counts were 1.80 mites per sample. The average count of those who did not move their hives was between 2 and 3 mites per sample, just below the action threshold. Approximately 46% of beekeepers chose not to answer this question.

Table 5. Number of yes, no, don’t know, and no answer responses to the question, “Have you moved the majority of these colonies in the last 2 months?” and average mite counts for each May response.

Hives Moved in the Last 2 Months	Number of Responses	Average Mite Counts
Yes	9	1.80
No	68	2.27
Don’t Know	2	1.17
No Answer	68	2.39

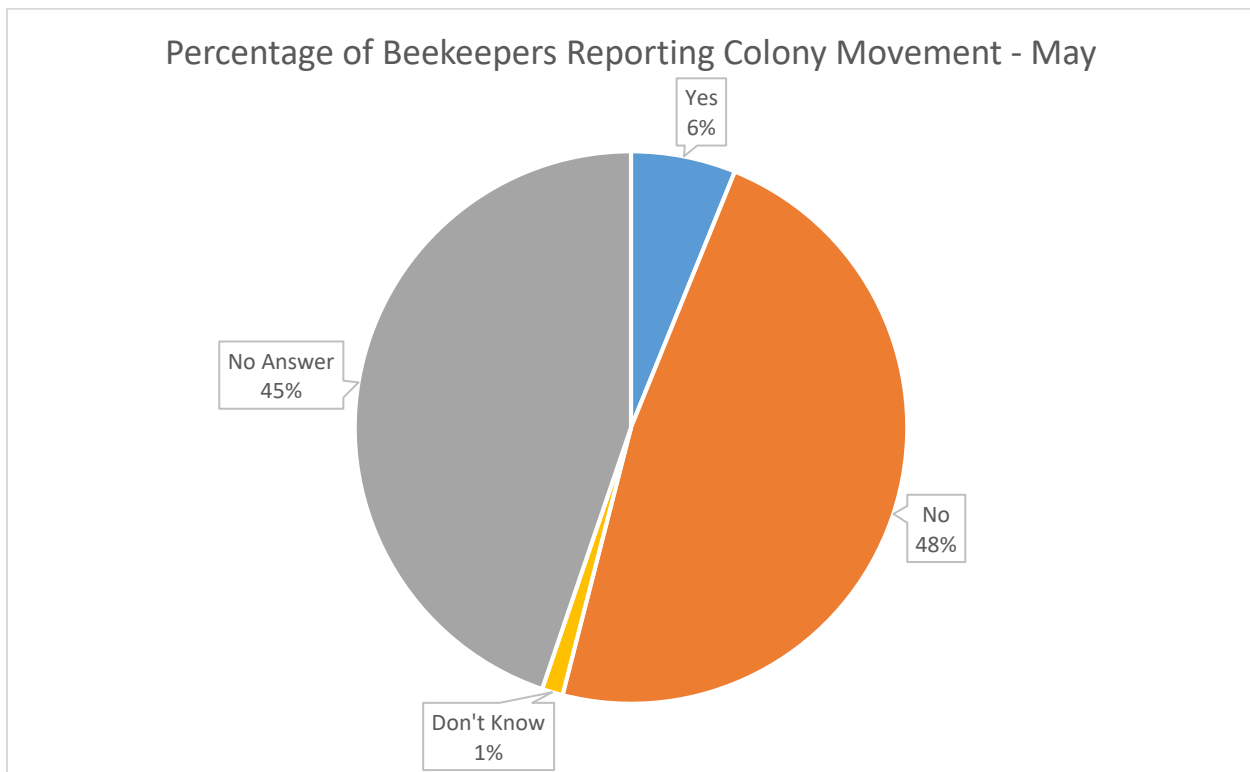


Figure 5. Percentage of May responses recorded for yes, no, and no answer in answer to the question, “Have you moved the majority of these colonies in the last 2 months?”

4. Hive movement – **August.**

The survey asked the following question: “Have you moved the majority of these colonies in the last 2 months?” In August, 233 beekeepers answered the question on hive movement, with 2% having moved their hives in the last 2 months. Of this 2%, the average varroa count was above the sample action threshold of 3.38 mites per sample. The average count of those who did not move their hives was between 2 and 3 mites per sample, just below the action threshold. Approximately 35% of beekeepers chose not to answer this question.

Table 6. Number of yes, no, don’t know, and no answer responses to the question, “Have you moved the majority of these colonies in the last 2 months?” and average mite counts for each August response.

Hives Moved in the Last 2 Months	Number of Responses	Average Mite Counts
Yes	6	3.38
No	227	2.61
No Answer	124	6.25

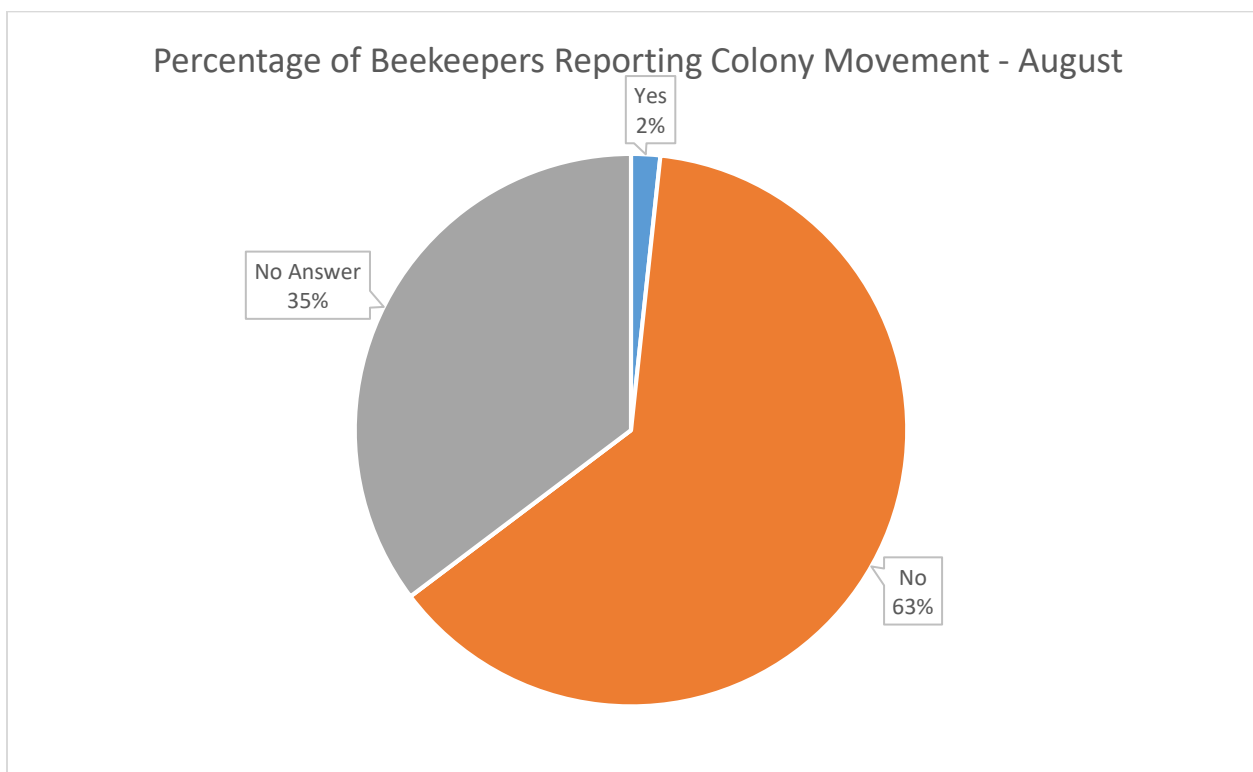


Figure 6. Percentage of August responses recorded for yes, no, and no answer in answer to the question, “Have you moved the majority of these colonies in the last 2 months?”

5. Management methods used and intended to use – **May**.

In May, 78 beekeepers provided answers to the management questions associated with the sampling event. The most popular management method reported was **Drone Comb Removal**, followed by **Break Brood Cycle** and **Oxalic Acid**.

With respect to future management practices, 31.86% of beekeepers who answered said they would use Formic Pro in the weeks following their monitoring. The next highest method considered for future use was Oxalic Acid, reported by 27.43% of beekeepers. Interestingly, 68 beekeepers declined to answer the management methods-used question; however, only 34 declined when asked which methods they were considering.

Table 7. Number of beekeepers who used each varroa management method over the past 2 months and number of beekeepers considering each management method for the next 2 months.

Management Methods	Number Used in the Past 2 Months	Number Considering for the Next 2 Months
Drone Comb Removal	20	26
Break Brood Cycle	17	17
Oxalic Acid	16	31
Formic Pro	12	36
Apivar	12	14
Other	10	13
Mite Away Quick Strips	9	24
Hop Guard	5	8
Powdered Sugar	5	7
Apiguard	2	13
Formic Acid	2	7
ApiLifeVar	1	6
CheckMite+	1	1
Apistan	0	1
No Answer	68	34

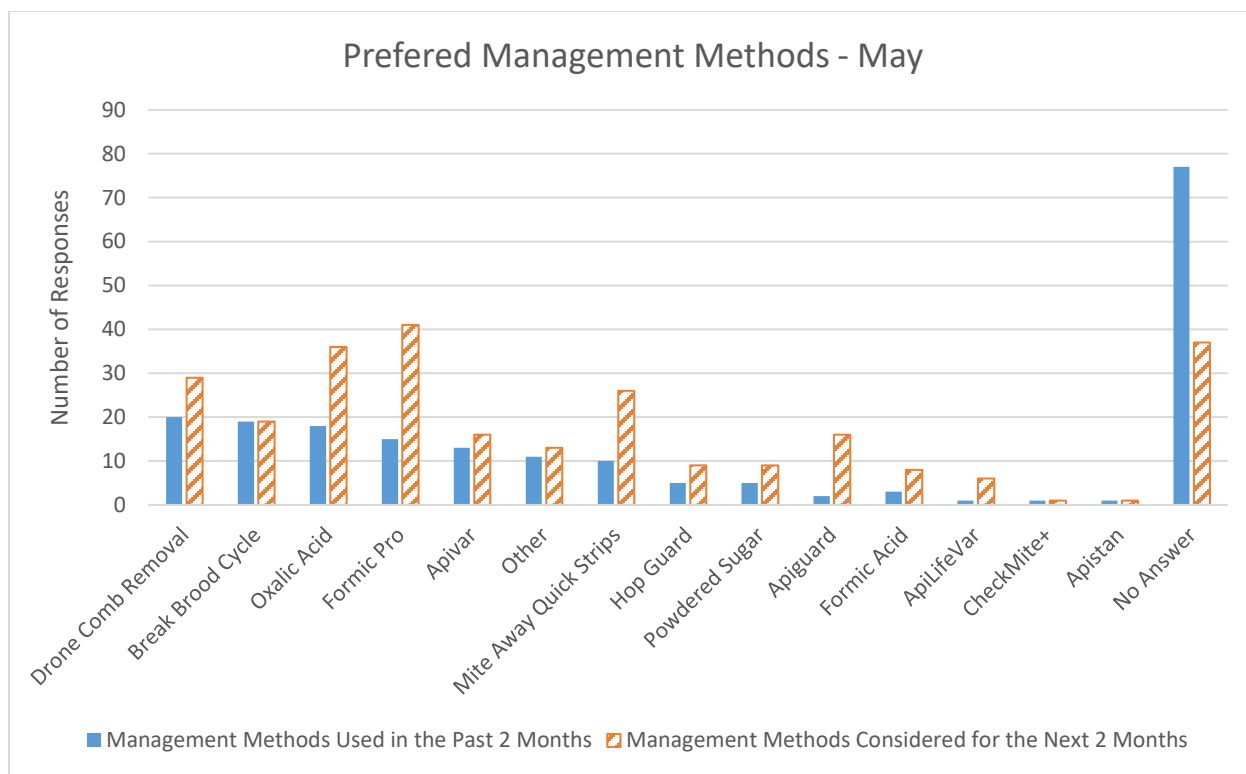


Figure 7. Number of beekeepers who used each varroa management method over the past 2 months and number of beekeepers considering each management method for the next 2 months.

5. Management methods used and intended to use – August.

In August, 344 beekeepers provided answers to the management questions associated with the sampling event. The option for No Treatment was added for this sampling event. The most popular management method reported was **No Treatment**, followed by **Break Brood Cycle** and **Oxalic Acid**.

With respect to future management practices, 43.97% of beekeepers who answered said they would use Oxalic Acid in the weeks following their monitoring. The next highest method considered for future use was Formic Pro, reported by 25.86% of beekeepers. Interestingly, when the No Treatment option was added, only 13 beekeepers declined to answer the management methods-used question, and only 9 declined when asked which methods they were considering.

Table 8. Number of beekeepers who used each varroa management method over the past 2 months and number of beekeepers considering each management method for the next 2 months.

Management Methods	Number Used in the Past 2 Months	Number Considering for the Next 2 Months
No Treatment	126	46
Break Brood Cycle	66	13
Oxalic Acid	64	153
Drone Comb Removal	57	30
Formic Pro	40	90
Apivar	30	46
Apiguard	26	48
Mite Away Quick Strips	24	45
Hop Guard	10	10
Powdered Sugar	10	12
Other	9	6
Formic Acid	5	14
ApiLifeVar	2	6
CheckMite+	1	3
Apistan	1	3
No Answer	13	9

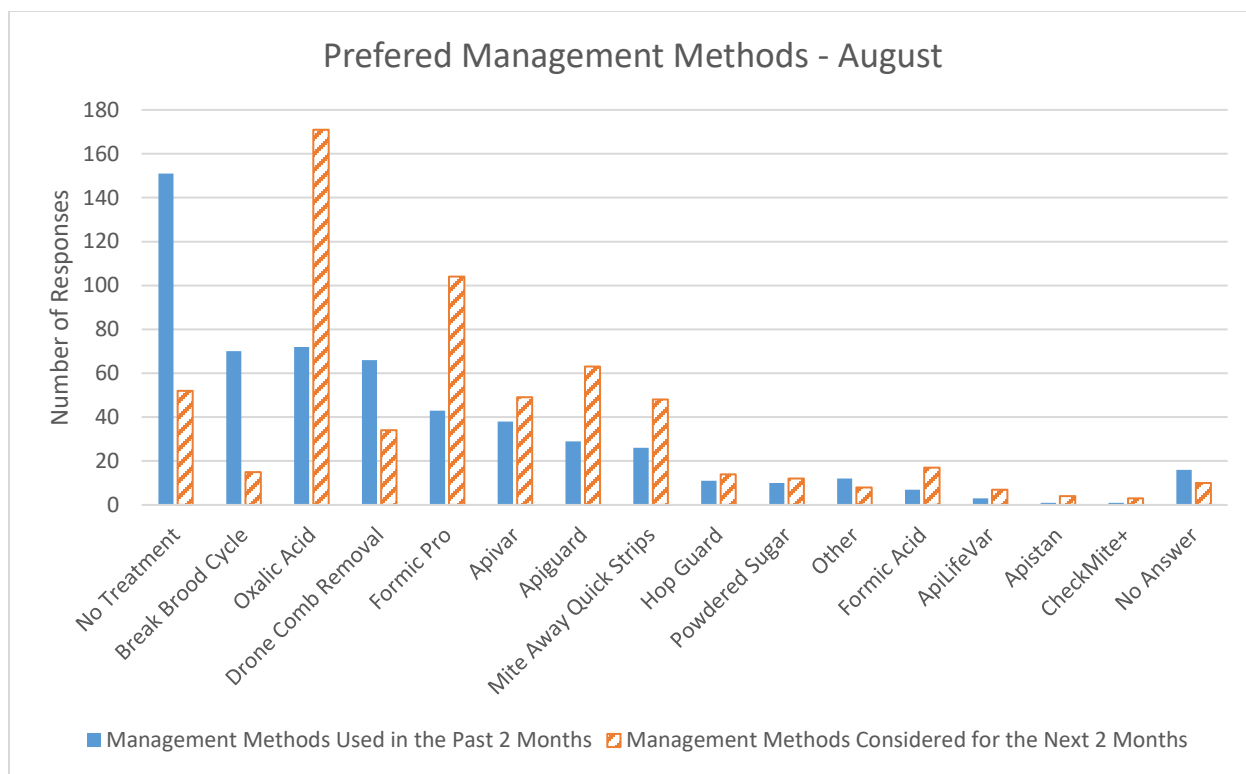


Figure 8. Number of beekeepers who used each varroa management method over the past 2 months and number of beekeepers considering each management method for the next 2 months.

6. Density of varroa within sample areas.

A density map was created, showing the average varroa mite load per square kilometer in North America during the event's timeframe. This shows a snapshot of the reporting regions, and while it illustrates the variability in mite pressure observed throughout the continent, it also must be recognized that higher mite densities may simply be reflecting the amount of responses received from those geographic areas. Likewise, areas with lower density could be the result of low response rates from those areas. The interpretation of these maps should be considered in the context of the program's stated objectives – to increase knowledge and use of testing protocols and to secure data from individual beekeepers about their colonies.

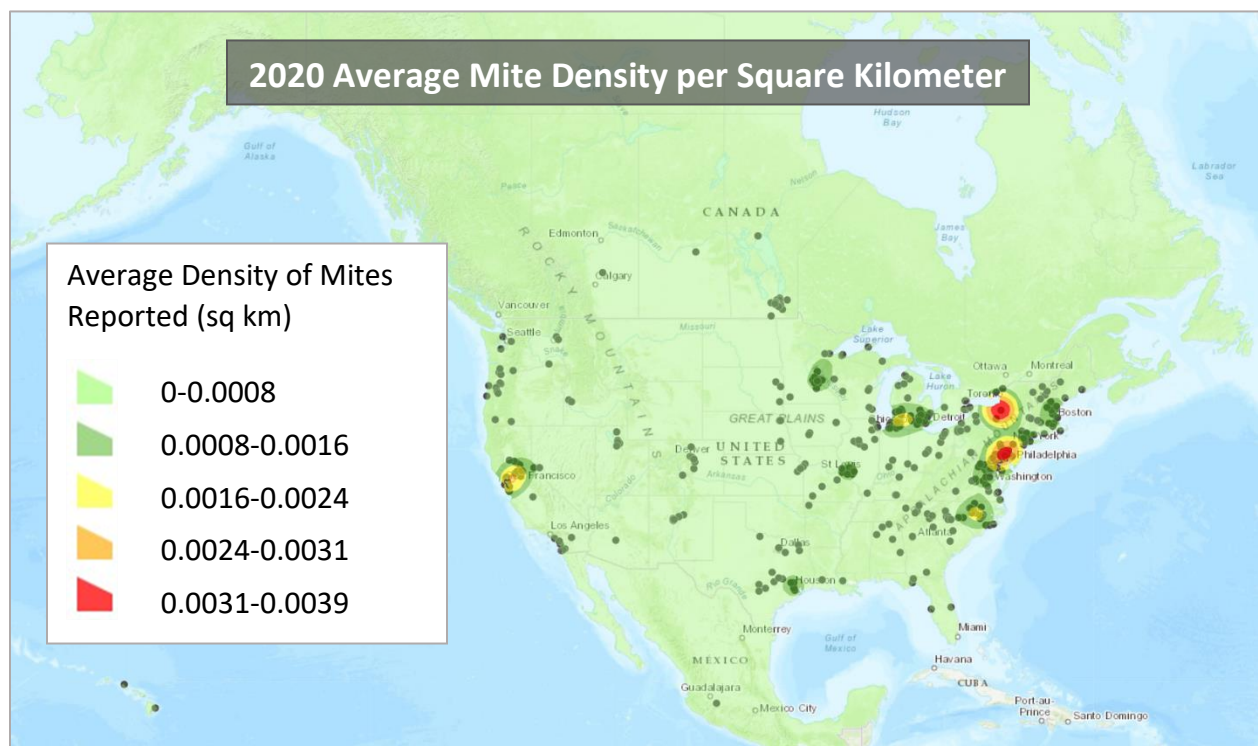


Figure 9. Average density of mites reported per square kilometer in North America.

7. Location of participants.

This year, as in previous years, the majority of participants came from the United States. Pennsylvania had the most participation thanks in part to Chester County Beekeepers Association, followed by Michigan and California (Table 9). This is a difference from 2019, for which the top regions for participation were North Carolina, Michigan, and Virginia (Table 10). Additionally, 15 beekeepers participated in both the May and August events.

Table 9. Top 10 participating states and provinces for 2020 with number of participants.

State or Province	2020 Participants
PA	90
MI	53
CA	41
NC	38
VA	27
MB	23
NY	21
IL	19
TX	17
MN	16

Table 10. Top 10 participating states and provinces for 2019 with number of participants.

State or Province	2019 Participants
NC	72
MI	47
VA	41
CO	29
CA	28
MD	27
TX	26
PA	25
OR	18
MA	15

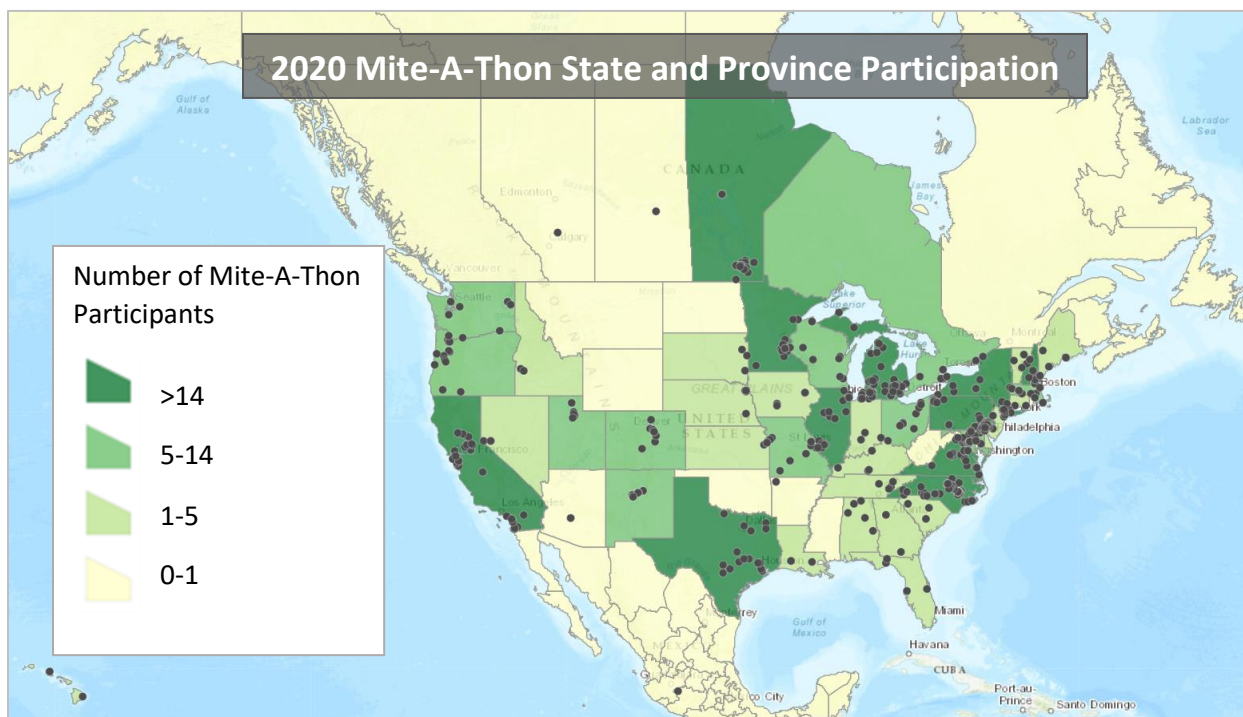


Figure 10. Distribution of Mite-A-Thon Participants across North America aggregated by state or province.

8. Number of hives managed by participants.

Of May participants, 87% had 10 hives or fewer. 86% of August participants had 10 hives or fewer.

Table 11. Number of hives owned by Mite-A-Thon participants.

Number of Hives	May Participants	August Participants
1-3	75	162
3-10	53	144
10-100	15	49
100+	4	2

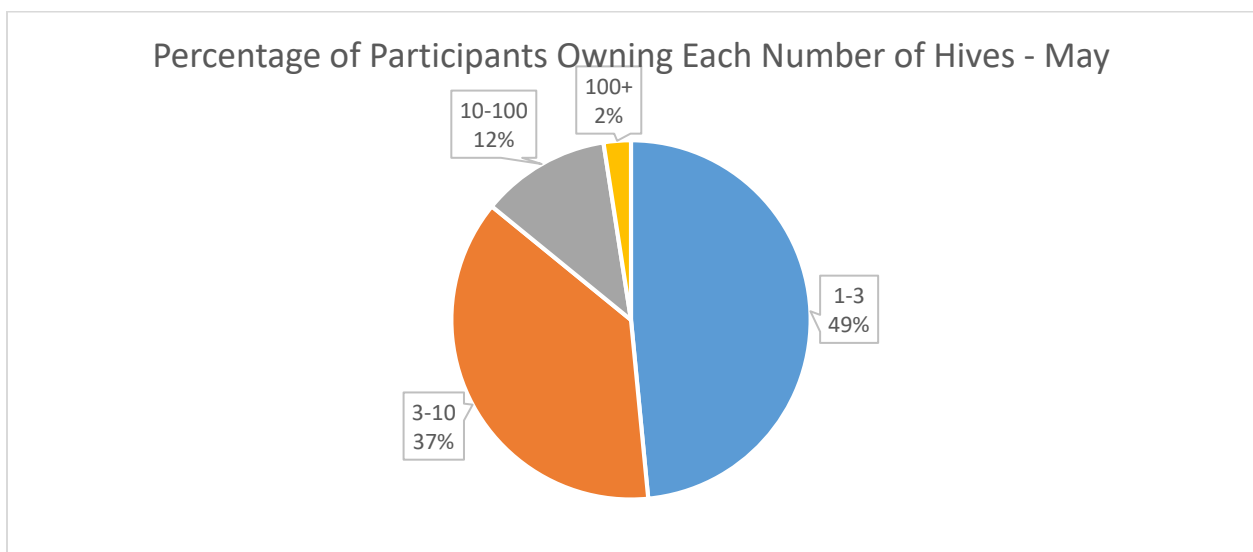


Figure 11. Percentage of May Mite-A-Thon participants who own each number of hives.

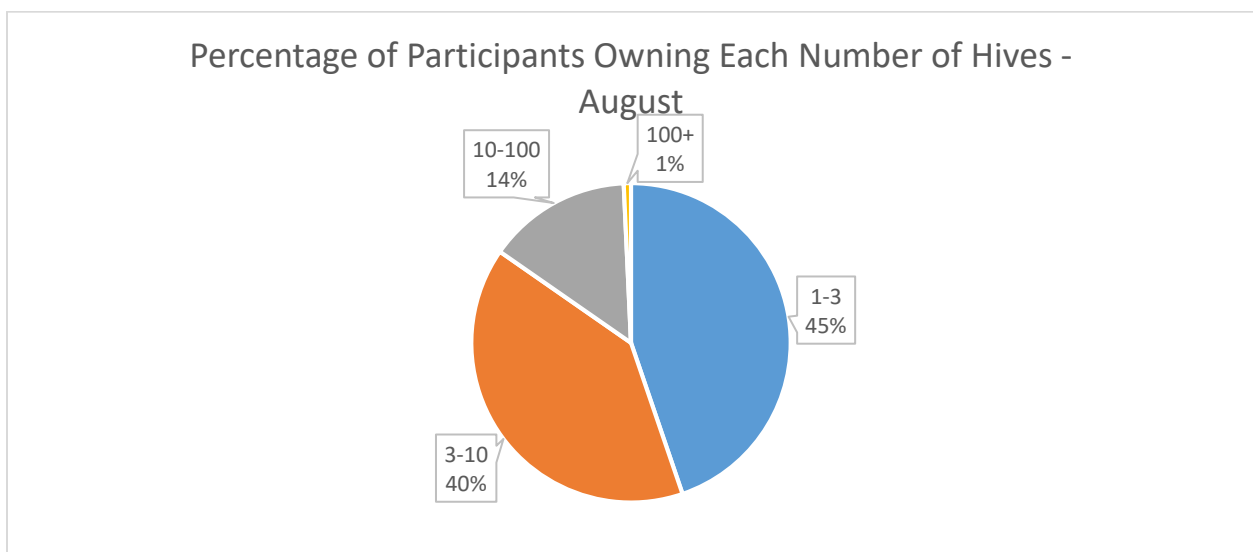


Figure 12. Percentage of May Mite-A-Thon participants who own each number of hives.

9. Number of new and returning participants.

Interestingly, 74.52% of 2020 participants were new to the Mite-A-Thon, meaning over 310 beekeepers participated for the first time (Figure 13). Because recurring participation was determined by calculating duplicated email addresses from 2017-2019, it does not take into account the 88 participants who were unwilling to share their contact information or those who may have changed email addresses.

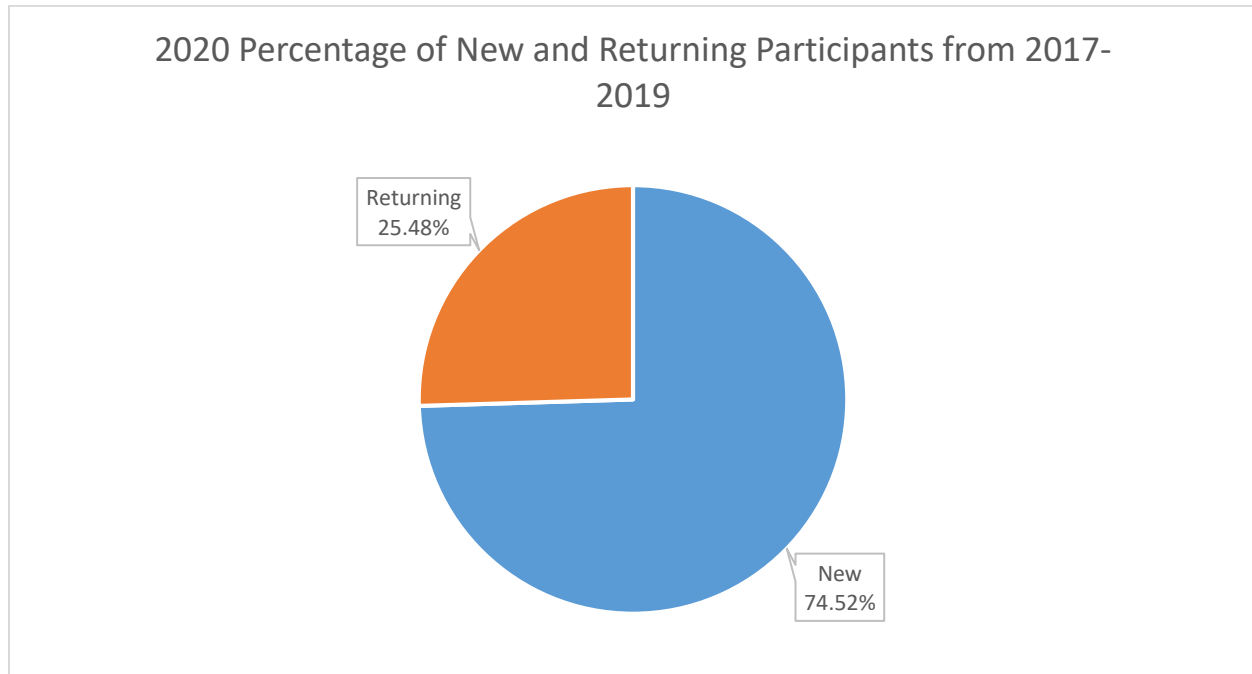


Figure 13. Number and percentage of new Mite-A-Thon participants in 2020 and returning participants from 2017-2019.

Compared to 2019, 2020 had 41 fewer participants and 140 fewer colonies tested. Estimating using the 74.52% new participation rate for 2020 and the rates of 80.05% and 85.77% for 2019 and 2018 respectively, the Mite-A-Thon has seen about 2,300 different participants over 4 years and 8,876 colonies have been sampled. The 2020 results showed no substantial differences from 2019 in the numbers of mites found in each sample, average varroa counts for each beekeeper, or the highest mite counts reported by each beekeeper.

Table 12. Yearly participation comparison with projected new participants for each year.

Year	Participants	Colonies Sampled	Projected New Participants
2020	504	1702	376
2019	545	1842	436
2018	683	2322	586
2017	904	3010	904
Total	2636	8876	2299

10. Outreach penetration.

The Pollinator Partnership social media outreach initiative “Mite-A-Thon Mondays” had a total reach of 119,891 from Facebook, Instagram, Twitter, and Mailchimp, averaging a reach of 8,946 per post. This included 14 posts on both Facebook and Instagram and 12 posts on Twitter and Mailchimp emails. The combined reach for the posts across the 4 platforms was 10.81% of the total potential reach, 1,108,712.

Table 13. Reach of the 14 Mite-A-Thon Monday posts from Facebook, Instagram, and 12 Twitter posts.

Outreach Medium	Total Reach (Twitter Impressions and Mailchimp Opens)	Average Reach per Post	Total Potential Reach	Potential Reach per Post
Facebook	53,826	3,845	811,160	57,940
Instagram	35,697	2,550	172,200	12,300
Twitter	22,640	1,887	97,356	8,113
Mailchimp	7,728	644	27,996	2,333
Combined	119,891	8,946	1,108,712	80,686

11. Social media pageviews.

It should be noted that reach includes unique views of each post or email opens, not unique individuals, because it includes double counting of individuals who viewed more than 1 of the 14 posts. Of each outreach platform, Mailchimp was the most successful at engaging viewers, with 12.34% engagement. Total engagement for this initiative was 4.34%. Engagement includes likes, shares, comments, and opens. During 2020 promotional periods, 4,113 unique pageviews were recorded on <https://www.pollinator.org/miteathon>, of which 13.76% viewed the giveaway, signup, or resources page (Table 15, Figure 16). Pageviews peaked the first weekend of the event, with additional peaks for each Mite-A-Thon Monday outreach surrounding the events.

Table 14. Total engagement compared to reach of each outreach platform.

Outreach Medium	Total Reach (Twitter Impressions and Mailchimp Opens)	Total Engagement	Average Engagement per Post
Facebook	53,826	1,070	76
Instagram	35,698	2,781	199
Twitter	22,640	403	34
Mailchimp	7,728	954	80
Combined	119,891	5,208	388

Table 15. Total unique website pageviews of pollinator.org/miteathon web pages from 2020 promotional periods.

Website Traffic	Unique Pageviews
Main Page	3,547
Giveaway	270
Resources	212
Newsletter Signup	84
Total	4,113

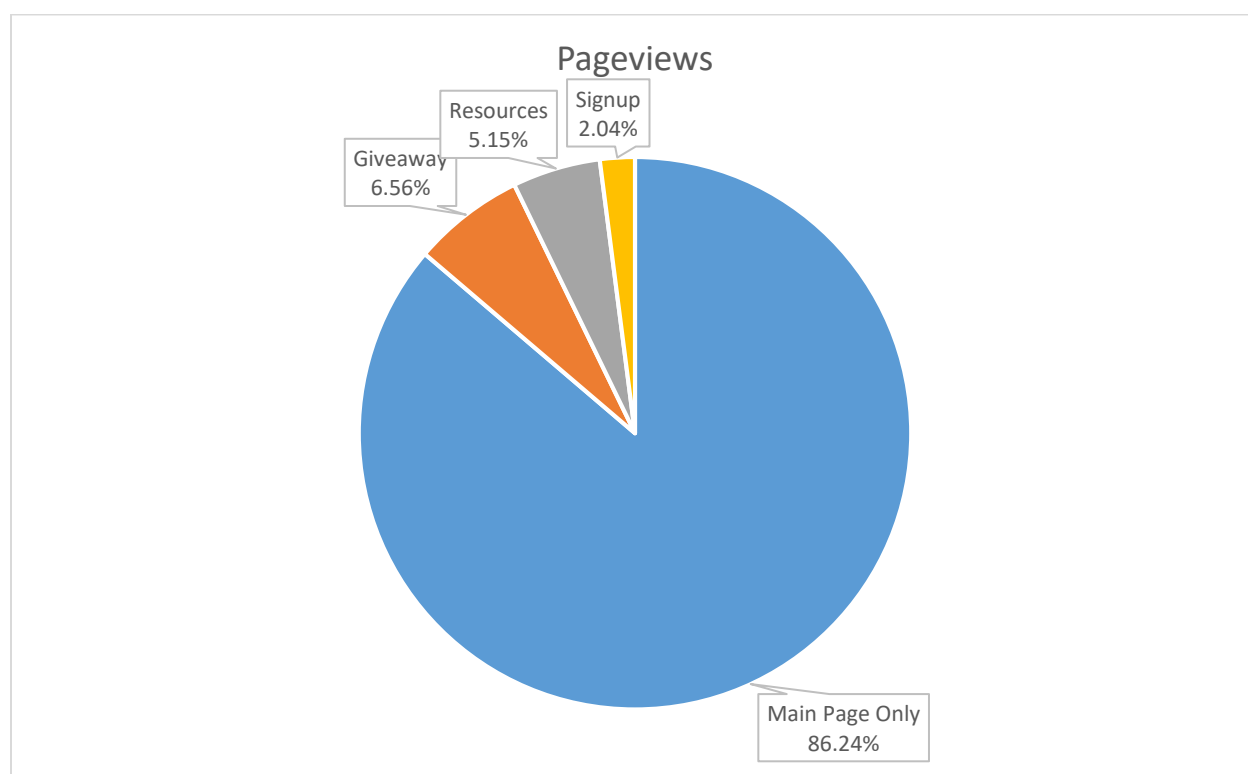


Figure 15. Percentage of Pollinator Partnership Mite-A-Thon pageviews for each webpage.

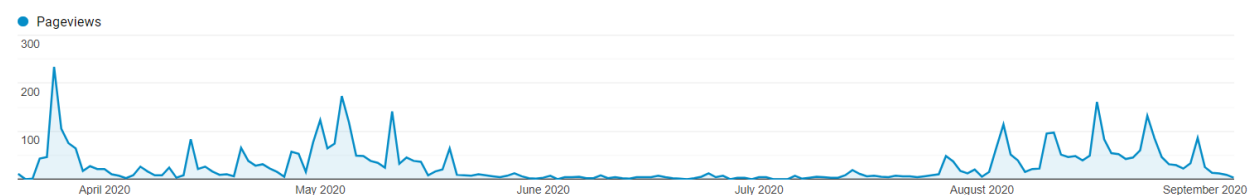


Figure 16. Pageviews per day on <https://www.pollinator.org/miteathon> during the 2-week period of the Mite-A-Thon.

The Bee Informed Partnership reached over 11,000 social media followers with their posts. Additionally, they saw 209 users access the MiteCheck app during the May event and 288 users access the app during the August event. MiteCheck.com also had a total of 566 unique pageviews during the events.

Discussion and Next Steps

In 2020, nearly 75% of participation was from new individuals who had not participated in previous years. This is encouraging, because it shows that many new individuals are being reached and educated on varroa management and that past participants may now be trained and familiar with testing, lessening their desire to contribute data. This number has been falling by roughly 5% each of the past three years, indicating that there is also a growing number of beekeepers who remain engaged and report data even after being trained.

Another encouraging result was the 90% decrease (August 2020 compared to 2019) in declined answers to the management methods question when asked which methods were used in past months and the 80% decrease in declined answers to the management method question when asked which methods would be considered for the coming months. Instead, the number of “No Treatment” responses for 2020 was similar to the non-answers from 2019. This likely indicates that the addition of the No Treatment response for 2020 was appropriate and that many of the declined answers in previous years were due to not treating. There was also a 63% decrease in “No Treatment” responses when asked which methods would be considered for the coming months. This could indicate that the Mite-A-Thon is successfully making beekeepers, many of which were first time participants, aware of available management methods.

With the additions of the Manitoba and Saskatchewan ministries of agriculture and the Newfoundland and Labrador Beekeeping Association to the Mite-A-Thon leadership team and adjusting data collection dates to better accommodate Canadian beekeepers, Canadian participation rebounded in 2020; however, it is still less than half of what it was in 2018 and 2017. It is possible that covid-19 complications were responsible for a general decrease in participation this year.

Additionally, Mexico had its first participant this year, but future Mite-A-Thons should consider that beekeepers in Mexico may need earlier and more frequent engagement to continue. A Mexican addition to the leadership team as well as a Spanish Mitecheck survey and Mexico Mitecheck map will likely help with this. Mexican beekeepers may also benefit from a later sampling date than the US and Canada.

With a better idea of the gaps in currently available data, Pollinator Partnership is seeking to increase effectiveness of the **Mite-A-Thon in 2021**. Increased participation is one indicator of the success of this project, but other criteria need to be established. The timely dissemination of this report to all participants and other beekeepers will be a large impetus for increased effectiveness of the program. Although not the primary priority of the project, collecting a more robust data set in future years may be possible by continuing to reengage those who have already been trained. The timely reporting of results after each year’s event to document the year’s efforts will help retain and recruit participants.