Danielle Downey
Executive Director, Project Apis m.

Today's talk:

Honey bees relevance- for context

What happened?

Who responded, and how

What do we know so far?

What info is still to come?

How does this compare to previous losses?

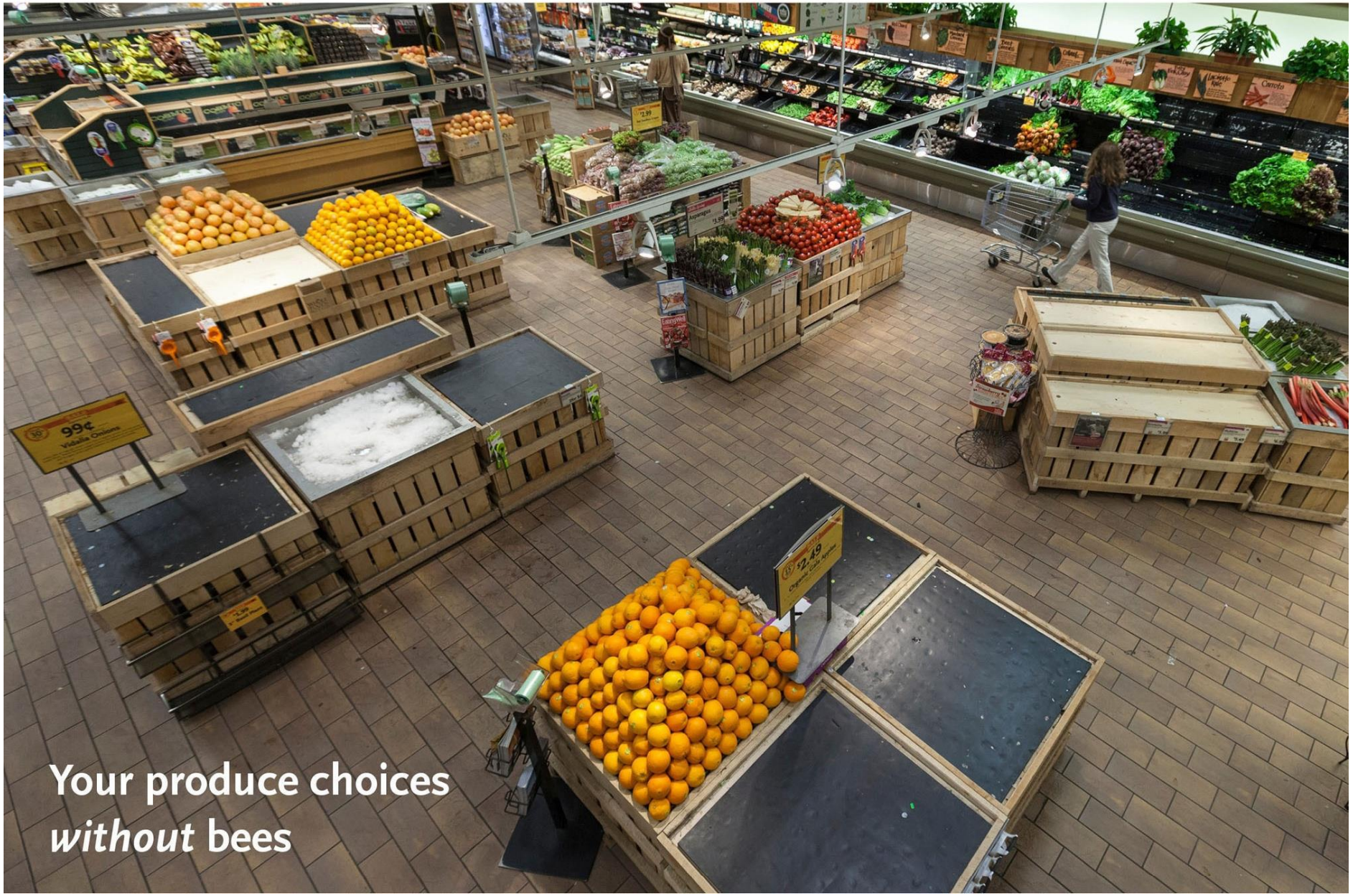
Bees Supply Chain Contribution

Honey USA: $350Million

Pollination USA: $18Billion

Pollination global: $235-577Billion

From: This is what your grocery storelooks like without bees. (prnewswire.com)

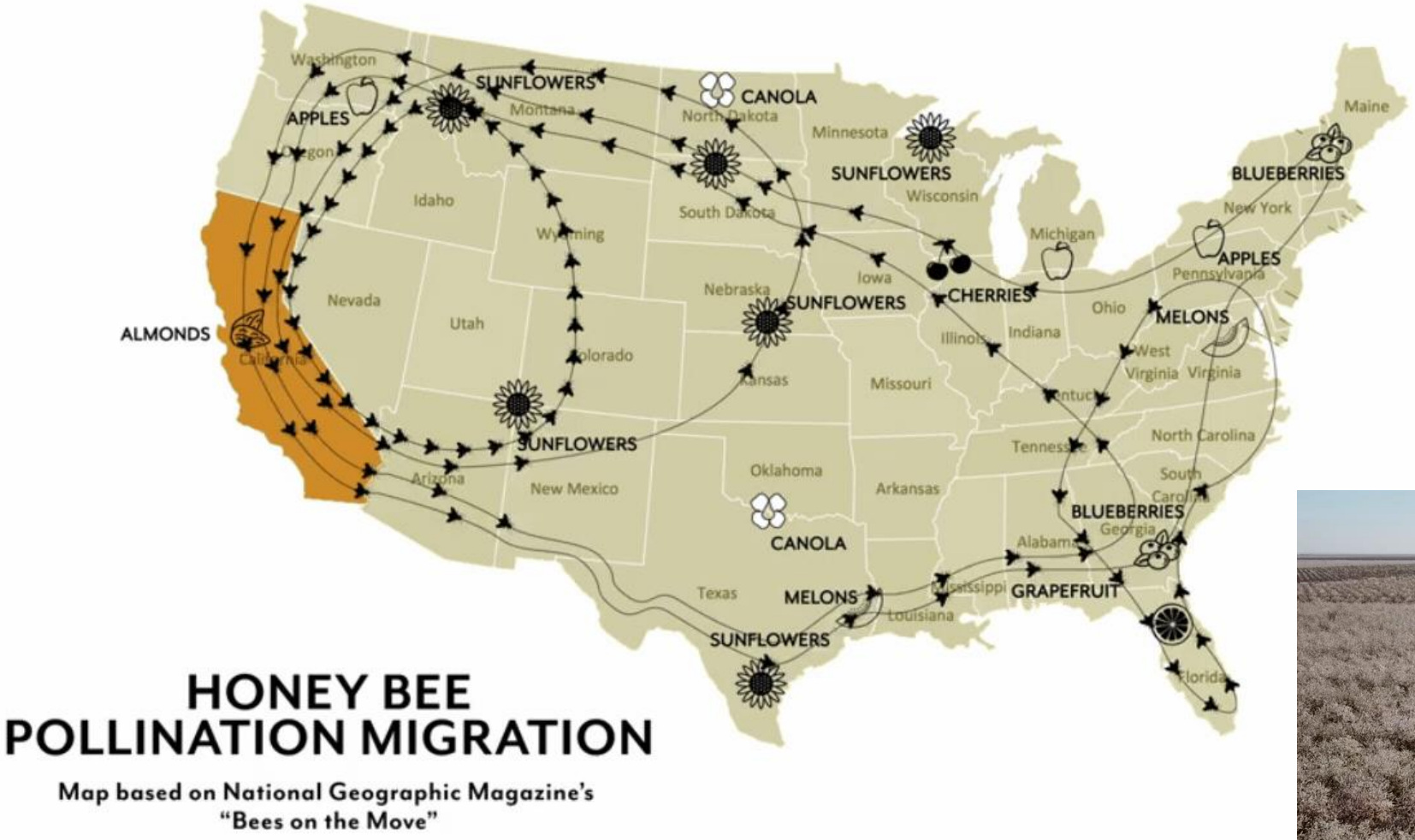


From: This is what your grocery storelooks like without bees. (prnewswire.com)

We Need Healthy Honey Bees

- 1 in 3 bites is dependent on pollinators.
- Honey bees play a crucial role in sustaining a reliable and nutritious food supply.
- Pollination value is over 50x that of honey in USA.
- Almond pollination requires over 2 million colonies.

75% of food crops and 35% of the global agricultural production volume depends on pollinators



HONEY BEE POLLINATION MIGRATION

Map based on National Geographic Magazine's "Bees on the Move"

Project *Apis m.*

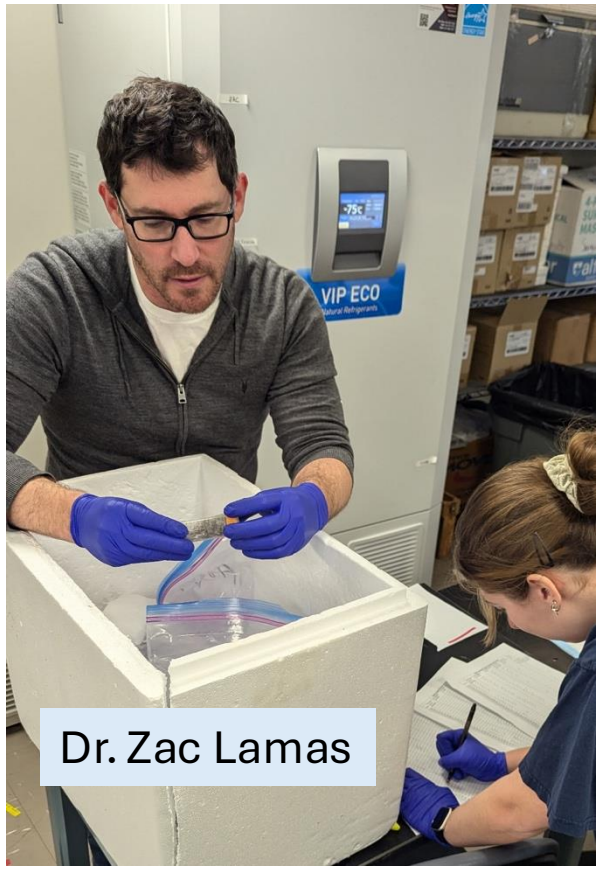
2025 Colony Losses Survey Summary

Webinar: February 28, 2025

Administered by: Project *Apis m. (PAm)*

With gratitude, we acknowledge the many collaborators who contributed to this work, especially USDA scientists.

Project *Apis m.*



Dr. Zac Lamas

Andrew Garavito

Dr. Judy Chen & Dr. Jay Evans

2024 People's Choice Award goes to bee-saving duo

Samuel J. Heyman Service to America Award

An Amazing Swift Response!
USDA-ARS Bee Research Laboratory
Beltsville, MD

Analysis Teams for PAm Survey data

Overall Leadership: Danielle Downey, Marta Guarna (PAm)

General coding, scientist coordination: Jay Evans (USDA-ARS-BRL)

Geography/states/regions: Chris Crawford (USDA-OCS), Anthony Nearman (BRL)

Mite treatments: Narayanan Kannan (Stoneville), Steve Cook (BRL), Frank Rinkevich (USDA-ARS-HBGBL)

Connecting to disease trends/Nat Survey: Judy Chen (USDA-ARS-BRL), Jay Evans (USDA-ARS-BRL), Zac Lamas (USDA-ARS-BRL), Diana Cox-Foster (USDA-ARS-Logan), Nathalie Steinhauer (Oregon State)

Nutrition and Landscape Impacts: Arathi Seshadri (USDA-ARS-Stoneville) , Pierre Lau (USDA-ARS-Stoneville), Christina Grozinger and others (PSU/Beescape), Vanessa Corby-Harris (USDA-ARS-Tucson)

Economic damage: Izzy Hill (USDA-OCS), Chris Crawford USDA-OCS), and others

Pesticide Concerns & Residue Analysis: Scott McArt (Cornell)

Analysis of Samples

USDA ARS Bee Lab, Beltsville: four-tiered investigation to determine potential causes:

- **Pathogen Screening** – Testing for all known honey bee pathogens using molecular methods.
- **Pesticide Residues & Pollen Diversity** – Examining stored pollen for pesticide contamination and plant diversity.
- **Metagenomic Analysis** – Identifying previously unknown pathogens in colonies with high disease prevalence.
- **Microbiome & Host-Pathogen Interactions** – Assessing gut bacterial diversity and potential links to colony health.

Frank Rinkevich, USDA ARS Bee Lab, Baton Rouge: Varroa mite resistance to Amitraz

Scott McArt, Cornell University: Pesticide residue analysis in bees, wax and bee bread

The PAm Surveys (Still active for input)

Jan 28 Survey 1

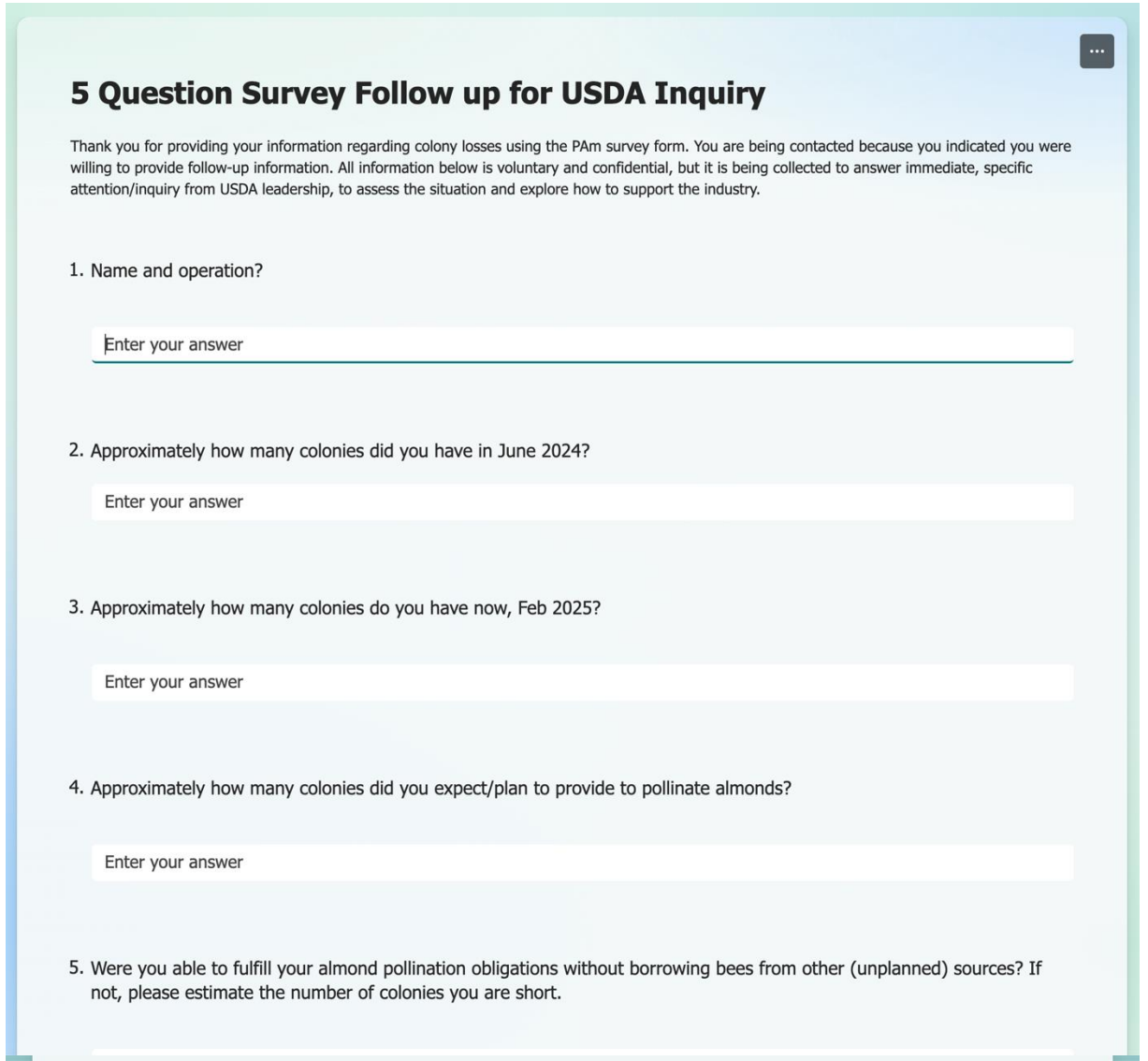
Feb 10 = **702 analyzed**

Feb 27 = **792**

Feb 12 Survey 2

Feb 10 = **97 analyzed**

Feb 27 = **102**



5 Question Survey Follow up for USDA Inquiry

Thank you for providing your information regarding colony losses using the PAm survey form. You are being contacted because you indicated you were willing to provide follow-up information. All information below is voluntary and confidential, but it is being collected to answer immediate, specific attention/inquiry from USDA leadership, to assess the situation and explore how to support the industry.

1. Name and operation?

Enter your answer

2. Approximately how many colonies did you have in June 2024?

Enter your answer

3. Approximately how many colonies do you have now, Feb 2025?

Enter your answer

4. Approximately how many colonies did you expect/plan to provide to pollinate almonds?

Enter your answer

5. Were you able to fulfill your almond pollination obligations without borrowing bees from other (unplanned) sources? If not, please estimate the number of colonies you are short.

First Survey

- Launched in response to beekeepers calls to researchers with alarming losses.
- 22 questions- targeting commercial beekeepers on their way to almonds.
- Goal was to determine if this was regional or widespread, hear what beekeepers were seeing, and how to support.

What are beekeepers biggest problems?

Parasites: Varroa mites kill colonies if not treated.

Pathogens: Mites are a 'dirty needle' that vectors deadly viruses.

Pesticides: More agricultural exposure to crop pest control at each pollination event. Sublethal impacts lead to mortality and compromise queen quality.

Poor Nutrition: As populations urbanize, diverse agroecosystems simplify, and monoculture agriculture proliferates, floral resources diminish. Less bee pasture, less honey, nutritionally stressed hives.

Second Survey (two weeks later)

5 questions. Sent to those who consented in Survey 1.
97 responses analyzed

Colonies in June: **622,176**
Colonies in Feb: **312,883**
Expected to take to almonds: **399,991** *(NASS estimate 1.8 million 2024)*
Number of colonies short: **84,699** *(4 had extra, one tbd)*

NASS estimate of US colonies in June 2024: 2,709,370
Estimate of colonies represented in PAm surveys: 1,835,000 (68% of US total)
Survey respondents' losses are 41% of total US colonies.

All info has been made public as it comes available through joint press releases, announcements, and published survey analyses. Information will be shared as it is available.

Project Apis m. | HONEY BEE HEALTH COALITION | ABF EST. 1943 AMERICAN BEEKEEPING FEDERATION | AHPA

FOR IMMEDIATE RELEASE

Contact:
Marques Chavez
mchavez@keystone.org
(571) 276-6807

Survey Reveals Over 1.1 Million Honey Bee Colonies Lost, Raising Alarm for Pollination and Agriculture

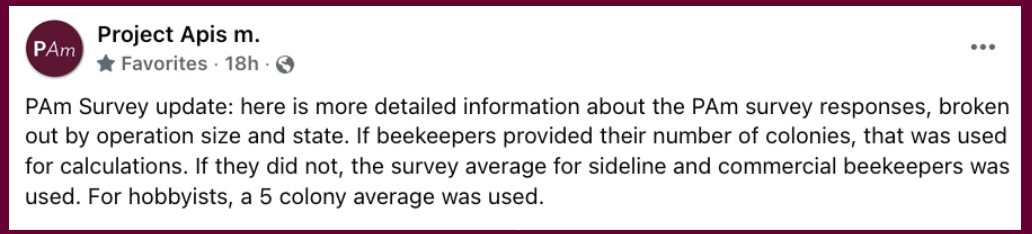
Public Webinar Scheduled to Discuss Scale, Impact of Losses

SALT LAKE CITY, UTAH, Feb. 20, 2025— A nationwide survey of beekeepers has revealed catastrophic honey bee colony losses across the United States, with commercial operations reporting an **average loss of 62%** between June 2024 and February 2025. These alarming losses, which surpass historical trends, could significantly impact U.S. agriculture, particularly crop pollination for almonds, fruits, vegetables, and other essential food sources.

"Early reports of severe colony losses began pouring in last month from beekeepers across the country," said Danielle Downey, executive director of Project Apis m. "In response, a

Survey Updates: Preliminary Findings & Ongoing Analysis

We've published a brief synopsis of survey updates on Facebook as we continue analyzing the full dataset. This presentation will cover some key findings, with more data to be released in the future as analysis progresses.



Commercial *(500+ colonies) Total Colony Loss Estimates*
June 2024- Feb 12, 2025
Project Apis m.

Beekeeper Class	State (Summer 2024)	Mean Loss Rate	Using reported operation sizes when available, otherwise mean operation size of 6585 colonies	Number of responses
Commercial (over 500 hives)	AL	54%	6,373	4
Commercial (over 500 hives)	AZ	66%	18,666	5
Commercial (over 500 hives)	CA	68%	149,090	31
Commercial (over 500 hives)	CO	42%	3,988	Less than 4
Commercial (over 500 hives)	FL	62%	34,938	10
Commercial (over 500 hives)	GA	71%	33,518	8
Commercial (over 500 hives)	IA	54%	7,105	Less than 4
Commercial (over 500 hives)	ID	52%	38,372	11
Commercial (over 500 hives)	IL	47%	515	Less than 4
Commercial (over 500 hives)	KS	81%	485	Less than 4
Commercial (over 500 hives)	KY	72%	468	Less than 4
Commercial (over 500 hives)	LA	58%	15,624	4
Commercial (over 500 hives)	ME	85%	1,531	Less than 4
Commercial (over 500 hives)	MI	64%	59,604	13
Commercial (over 500 hives)	MN	56%	65,991	18
Commercial (over 500 hives)	MO	63%	5,429	Less than 4
Commercial (over 500 hives)	MS	51%	9,509	4
Commercial (over 500 hives)	MT	55%	24,328	6
Commercial (over 500 hives)	NC	80%	15,793	Less than 4
Commercial (over 500 hives)	ND	63%	263,898	41
Commercial (over 500 hives)	NE	67%	9,446	4
Commercial (over 500 hives)	NM	74%	962	Less than 4
Commercial (over 500 hives)	NY	77%	25,258	5
Commercial (over 500 hives)	OH	66%	4,363	Less than 4
Commercial (over 500 hives)	OK	83%	5,479	Less than 4
Commercial (over 500 hives)	OR	59%	50,170	16
Commercial (over 500 hives)	PA	32%	2,137	Less than 4
Commercial (over 500 hives)	SC	50%	3,301	Less than 4
Commercial (over 500 hives)	SD	60%	70,423	20
Commercial (over 500 hives)	TX	67%	45,663	12
Commercial (over 500 hives)	UT	63%	19,538	7
Commercial (over 500 hives)	WA	43%	16,820	8
Commercial (over 500 hives)	WI	66%	38,730	11
Commercial (over 500 hives)	WV	99%	431	Less than 4
Commercial (over 500 hives)	WY	59%	4,525	Less than 4
Commercial (over 500 hives)	None listed	58%	42,490	11

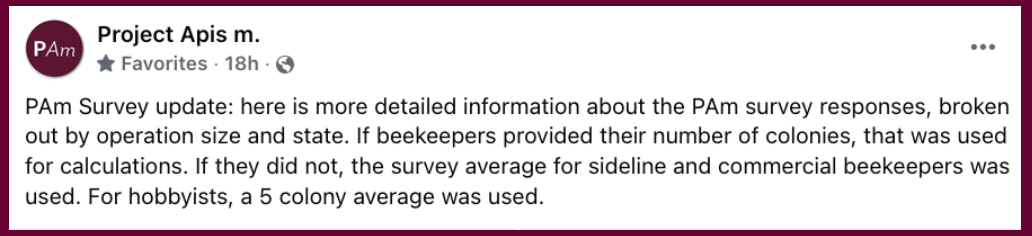
Sideliner *(50-500 colonies) Total Colony Loss Estimates*
June 2024- Feb 12, 2025
Project Apis m.

Beekeeper Class	State (Summer 2024)	Mean Loss Rate	Using reported operation sizes when available, otherwise mean operation size of 374	Number of responses
Sideliner (50-500 hives)	AL	40%	449	Less than 4
Sideliner (50-500 hives)	AR	62%	232	Less than 4
Sideliner (50-500 hives)	CA	71%	4,803	18
Sideliner (50-500 hives)	CO	35%	398	Less than 4
Sideliner (50-500 hives)	CT	58%	656	Less than 4
Sideliner (50-500 hives)	FL	48%	716	4
Sideliner (50-500 hives)	GA	43%	481	Less than 4
Sideliner (50-500 hives)	IA	51%	756	4
Sideliner (50-500 hives)	ID	48%	539	Less than 4
Sideliner (50-500 hives)	IL	77%	865	Less than 4
Sideliner (50-500 hives)	IN	59%	666	Less than 4
Sideliner (50-500 hives)	KS	52%	585	Less than 4
Sideliner (50-500 hives)	MA	41%	151	Less than 4
Sideliner (50-500 hives)	MD	4%	15	Less than 4
Sideliner (50-500 hives)	MI	51%	758	4
Sideliner (50-500 hives)	MN	78%	1,170	4
Sideliner (50-500 hives)	MO	58%	646	Less than 4
Sideliner (50-500 hives)	MS	41%	306	Less than 4
Sideliner (50-500 hives)	MT	63%	471	Less than 4
Sideliner (50-500 hives)	NC	70%	789	Less than 4
Sideliner (50-500 hives)	ND	87%	648	Less than 4
Sideliner (50-500 hives)	NE	64%	475	Less than 4
Sideliner (50-500 hives)	NJ	19%	72	Less than 4
Sideliner (50-500 hives)	NM	86%	322	Less than 4
Sideliner (50-500 hives)	NY	53%	596	Less than 4
Sideliner (50-500 hives)	OH	28%	314	Less than 4
Sideliner (50-500 hives)	OK	63%	237	Less than 4
Sideliner (50-500 hives)	OR	54%	805	4
Sideliner (50-500 hives)	PA	51%	1,324	7
Sideliner (50-500 hives)	SC	86%	323	Less than 4
Sideliner (50-500 hives)	TN	31%	234	Less than 4
Sideliner (50-500 hives)	TX	36%	1,623	12
Sideliner (50-500 hives)	UT	35%	132	Less than 4
Sideliner (50-500 hives)	VA	24%	177	Less than 4
Sideliner (50-500 hives)	VT	64%	239	Less than 4
Sideliner (50-500 hives)	WA	85%	317	Less than 4
Sideliner (50-500 hives)	WI	65%	1,457	6
Sideliner (50-500 hives)	WV	97%	361	Less than 4
Sideliner (50-500 hives)	WY	99%	371	Less than 4
Sideliner (50-500 hives)	None listed	51%	2,651	14

Hobbyist *(0-49 colonies) Total Colony Loss Estimates*
June 2024- Feb 12, 2025
Project Apis m.

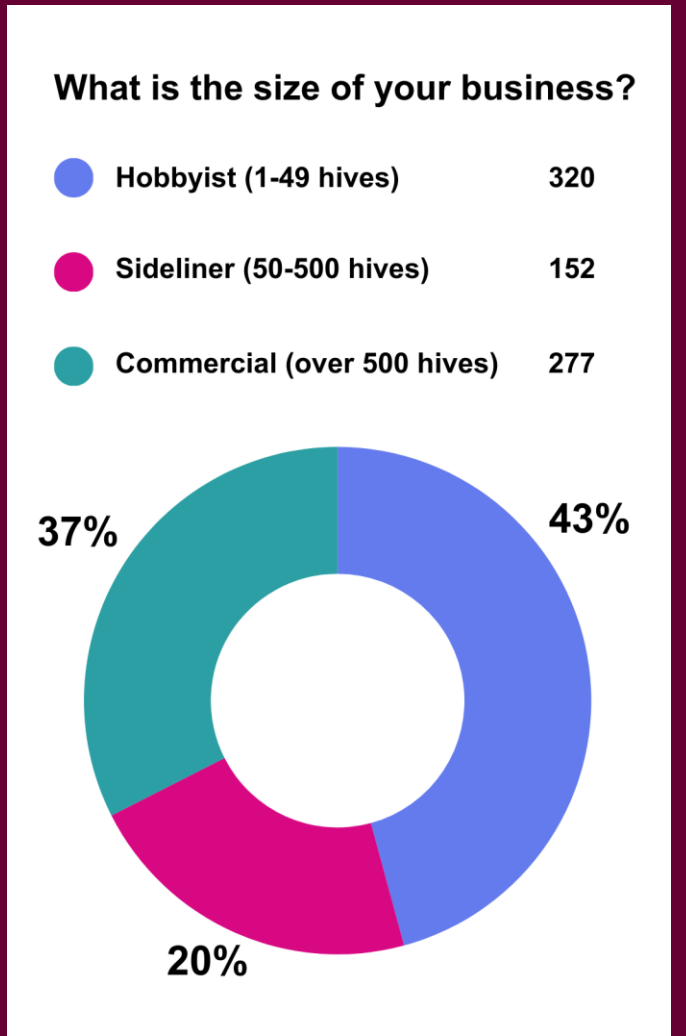
Beekeeper Class	State (Summer 2024)	Mean Loss Rate	Colonies Lost assuming operation size of 5	Number of responses
Hobbyist (1-49 hives)	AL	37%	5	Less than 4
Hobbyist (1-49 hives)	AR	78%	4	Less than 4
Hobbyist (1-49 hives)	CA	49%	29	12
Hobbyist (1-49 hives)	CO	73%	40	11
Hobbyist (1-49 hives)	CT	61%	9	Less than 4
Hobbyist (1-49 hives)	DE	0%	-	Less than 4
Hobbyist (1-49 hives)	FL	32%	8	5
Hobbyist (1-49 hives)	GA	39%	18	9
Hobbyist (1-49 hives)	HI	0%	-	Less than 4
Hobbyist (1-49 hives)	IA	98%	10	Less than 4
Hobbyist (1-49 hives)	IL	55%	17	6
Hobbyist (1-49 hives)	IN	41%	6	Less than 4
Hobbyist (1-49 hives)	KS	62%	6	Less than 4
Hobbyist (1-49 hives)	LA	31%	3	Less than 4
Hobbyist (1-49 hives)	MA	19%	5	5
Hobbyist (1-49 hives)	MD	99%	10	Less than 4
Hobbyist (1-49 hives)	ME	5%	0	Less than 4
Hobbyist (1-49 hives)	MI	57%	23	8
Hobbyist (1-49 hives)	MN	68%	14	4
Hobbyist (1-49 hives)	MO	19%	6	6
Hobbyist (1-49 hives)	MS	76%	8	Less than 4
Hobbyist (1-49 hives)	NC	48%	14	6
Hobbyist (1-49 hives)	NE	33%	2	Less than 4
Hobbyist (1-49 hives)	NH	87%	4	Less than 4
Hobbyist (1-49 hives)	NJ	88%	9	Less than 4
Hobbyist (1-49 hives)	NM	0%	-	Less than 4
Hobbyist (1-49 hives)	NY	33%	15	9
Hobbyist (1-49 hives)	OH	41%	16	8
Hobbyist (1-49 hives)	OK	74%	4	Less than 4
Hobbyist (1-49 hives)	OR	40%	12	6
Hobbyist (1-49 hives)	PA	61%	76	25
Hobbyist (1-49 hives)	SC	55%	3	Less than 4
Hobbyist (1-49 hives)	SD	85%	9	Less than 4
Hobbyist (1-49 hives)	TN	81%	4	Less than 4
Hobbyist (1-49 hives)	TX	37%	104	56
Hobbyist (1-49 hives)	UT	37%	9	5
Hobbyist (1-49 hives)	VA	39%	10	5
Hobbyist (1-49 hives)	WA	55%	19	7
Hobbyist (1-49 hives)	WI	56%	23	8
Hobbyist (1-49 hives)	WV	18%	3	Less than 4
Hobbyist (1-49 hives)	None listed	65%	160	49

Survey Updates: Preliminary Findings & Ongoing Analysis
We've published a brief synopsis of survey updates on Facebook as we continue analyzing the full dataset. This presentation will cover some key findings, with more data to be released in the future as analysis progresses.



Estimating Total Colony Loss

Beekeeper Class	Mean Loss Rate	Using number of colonies reported OR if not reported average colony number was Hobby=5, Sideline=374, Commercial=6585	Number of responses
Hobbyist (1-49 hives)	50%	717	287
Sideliner (50-500 hives)	54%	28,282	139
Commercial (over 500 hives)	62%	1,094,960	270
Not listed	46%	-	6
TOTAL		**1,123,959**	**702**

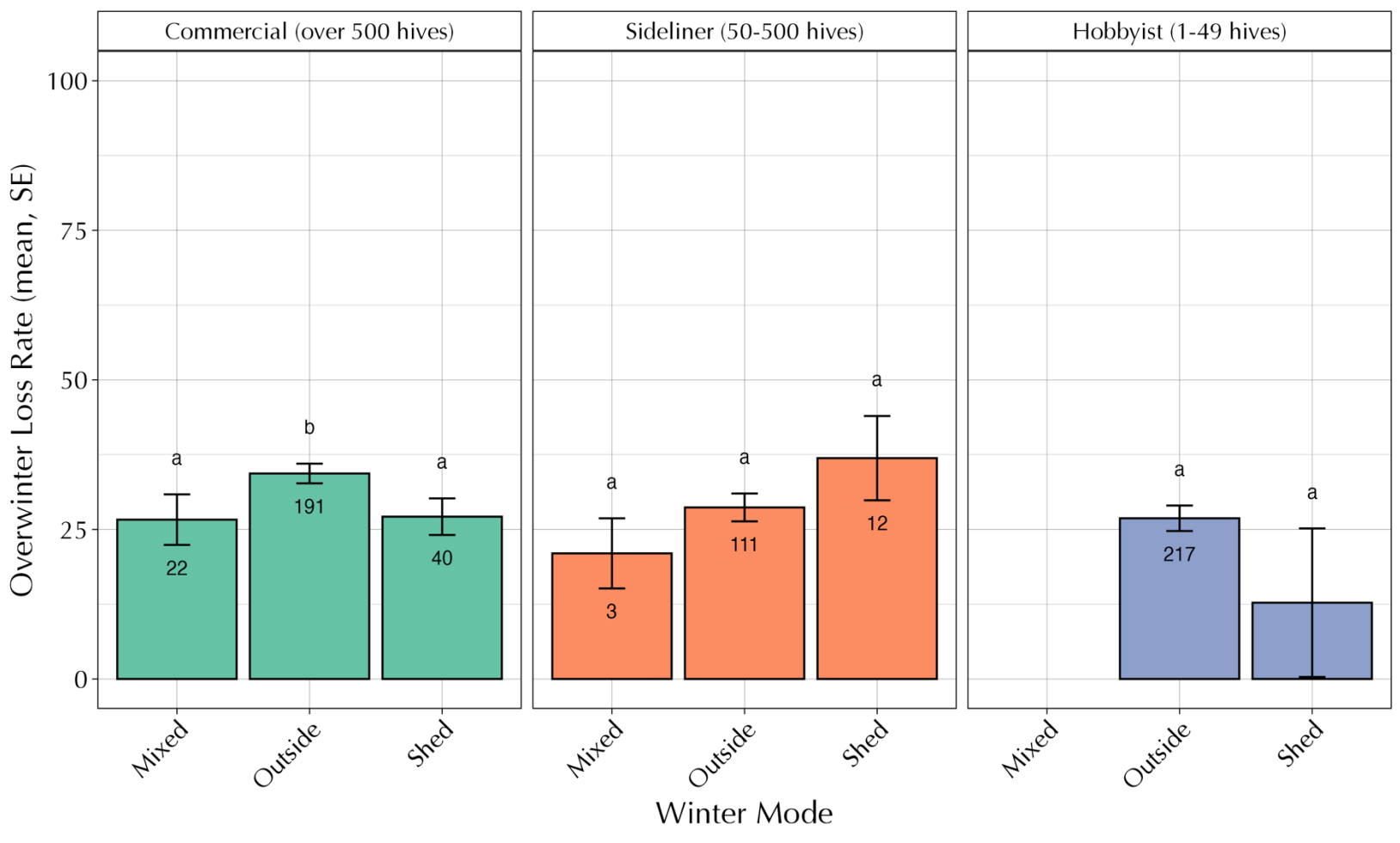


Question from Survey:

What percentage of your bees were overwintered indoors versus outdoors?

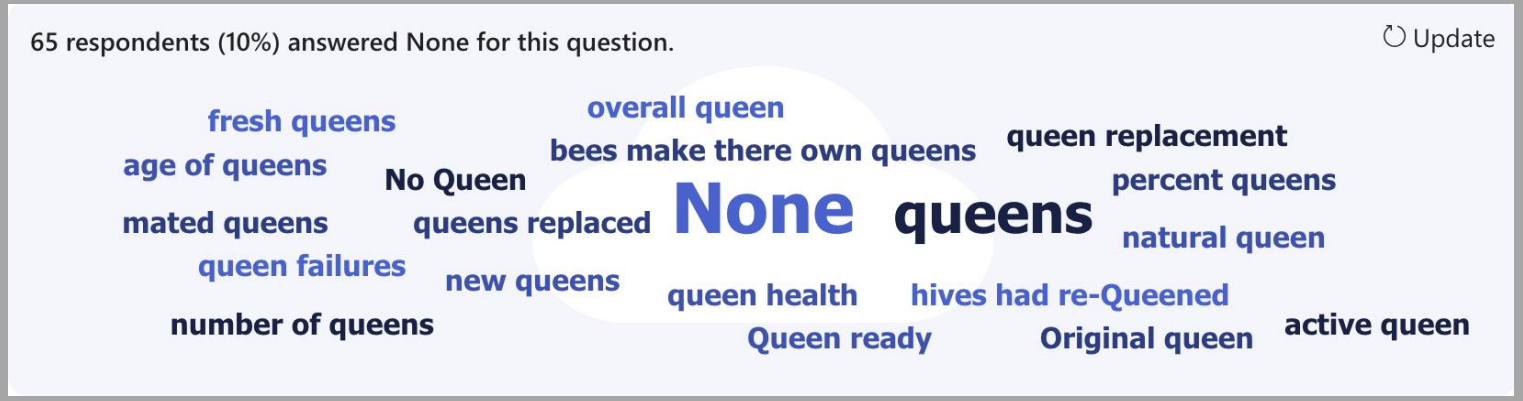
739 Responses

What percentage of your bees were overwintered indoors versus outdoors?



Question from Survey:

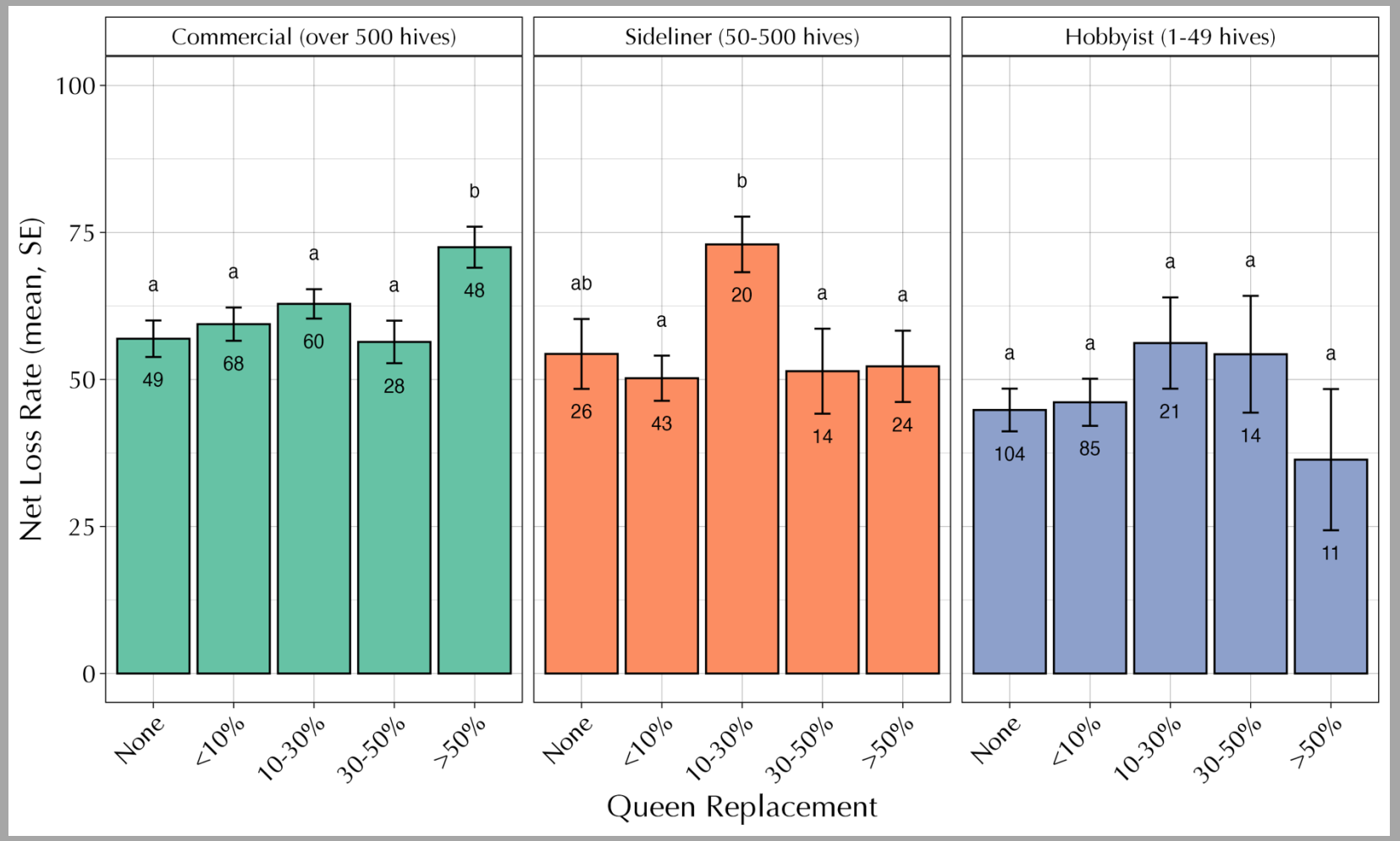
What percentage of queens were replaced due to queen health from June - winter 2024?



739 Responses

What percentage of queens were replaced due to queen health from June - winter 2024?

Project *Apis m.*



General coding, Jay Evans (BRL) Anthony Nearman (BRL)

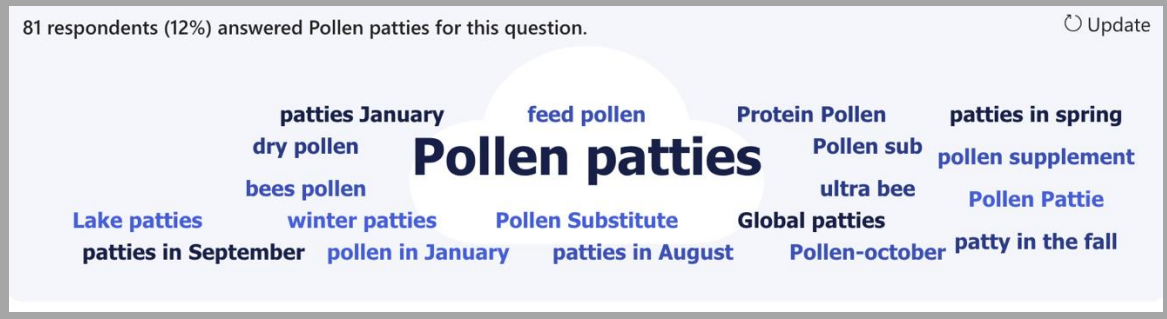
Question from Survey:

Did you supplementary feed your bees sugar or syrup? If yes, what months?

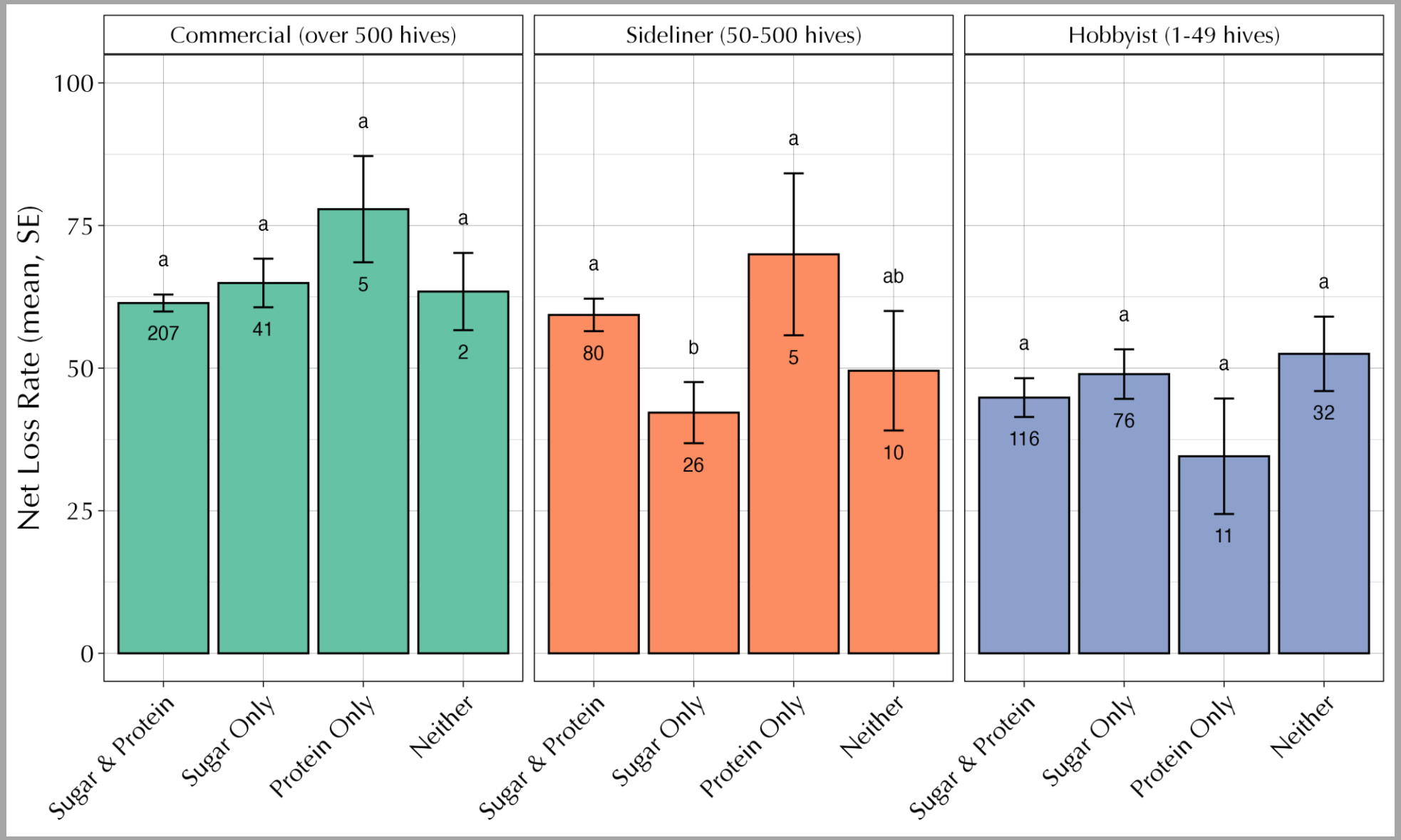
746 Responses

Question from Survey:

Did you supplementary feed your bees protein pollen, substitutes, etc.? If yes, what and when?

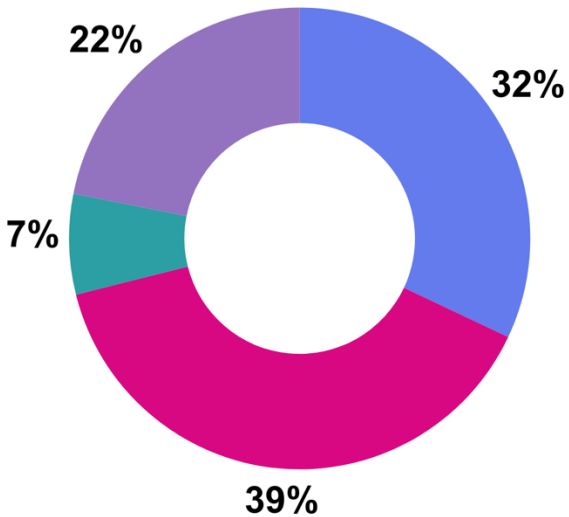


737 Responses


Commercial (over 500 hives)
Sideliner (50-500 hives)
Hobbyist (1-49 hives)
Net Loss Rate (mean, SE)
100
75
50
25
0
a
a
a
a
207
41
5
2
a
b
a
ab
80
26
5
10
a
a
a
a
116
76
11
32
Sugar & Protein
Sugar Only
Protein Only
Neither

What were your average Varroa mite levels in the Fall?

0-1 mites per 100 bees	237
2-5 mites per 100 bees	289
5+ mites per 100 bees	52
did not test	52



164 respondents (24%) answered time for this question.

Update

741

Mite treatments: Narayanan Kannan (Stoneville), Steve Cook (BRL), Frank Rinkevich (BR)

Estimating Total Colony Loss

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Not listed	46%	-	6
TOTAL		**1,123,959**	**702**

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How bad were the losses?

These results estimated 1,123,959 colony losses among respondents, resulting in the following immediate economic losses:

1. Direct Colony Losses

Conservatively estimated at
$224.8 million (based on $200 per colony replacement cost, not including labor, feed or treatments)

2. Economic Impact

Factoring in lost almond pollination income based on the survey results, which was estimated at $181 per colony in 2023, the lost income exceeds $428 million. The loss rate to US colonies that were not accounted for in the survey is estimated at an

additional $206.4 million, a total estimated economic loss of
$634.7 million

3. Additional Impacts

Additional impacts not included in this figure include the loss of honey production and pollination contracts for any crops following almonds.

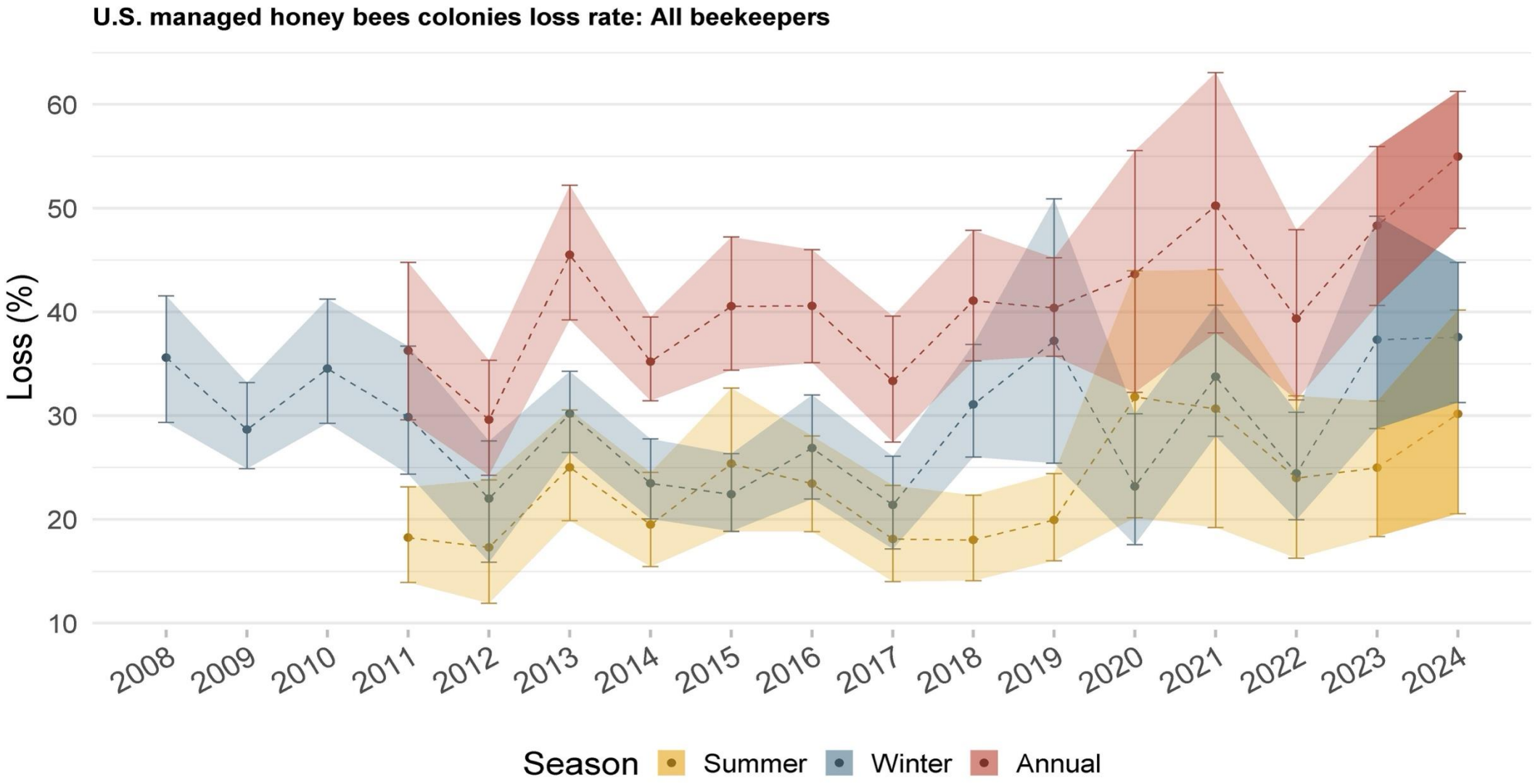
Many remaining colonies considered ‘alive’ are small and weak, more lost production and delayed rebuilding.

How does this compare to other surveys/ years?

- USDA NASS *Honey* report
  - Number of colonies producing honey (by state and U.S.)
  - Annual; since 1961
- USDA NASS *Honey Bee Colonies* report
  - Number of honey bee colonies, colony losses and health stressors
  - Quarterly; since 2016
- *US Beekeeping Survey*
  - Lead by Auburn University & AIA (previously, BIP and UMD)
  - Colony loss rates and risk factors
  - Annual; since 2008

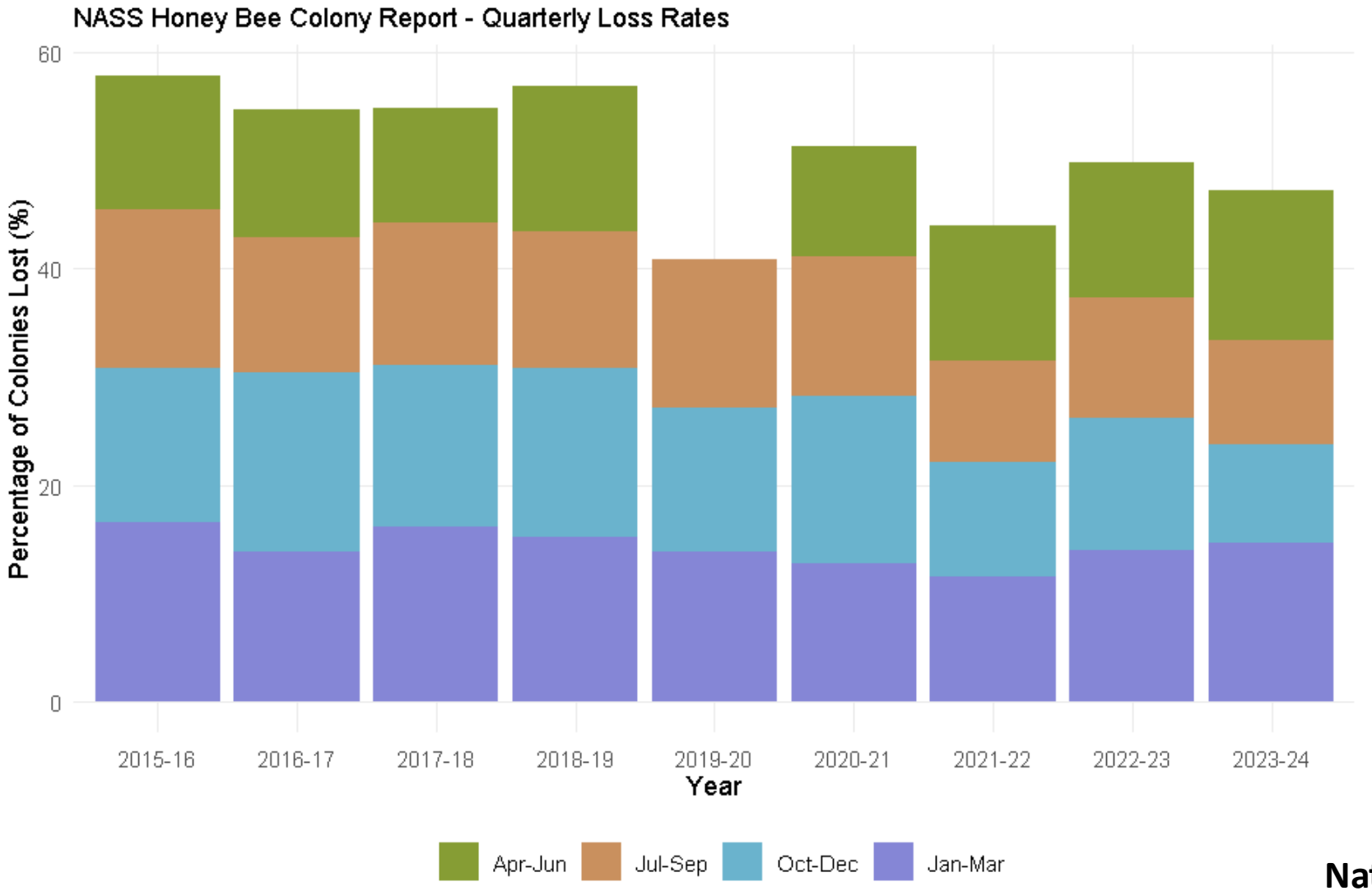
Survey Context:
Dr. Nathalie Steinhauer, OSU

US Beekeeping Survey: colony loss rate



vanEngelsdorp et al., 2007 to 2012; Spleen et al., 2013; Steinhauer et al. 2014; Lee et al. 2015; Seitz et al. 2016; 2016-17 Kulhanek et al.; Bruckner et al. 2023 ; Aurell et al. 2024 ; **Giacobino et al. 2025 (in prep)**

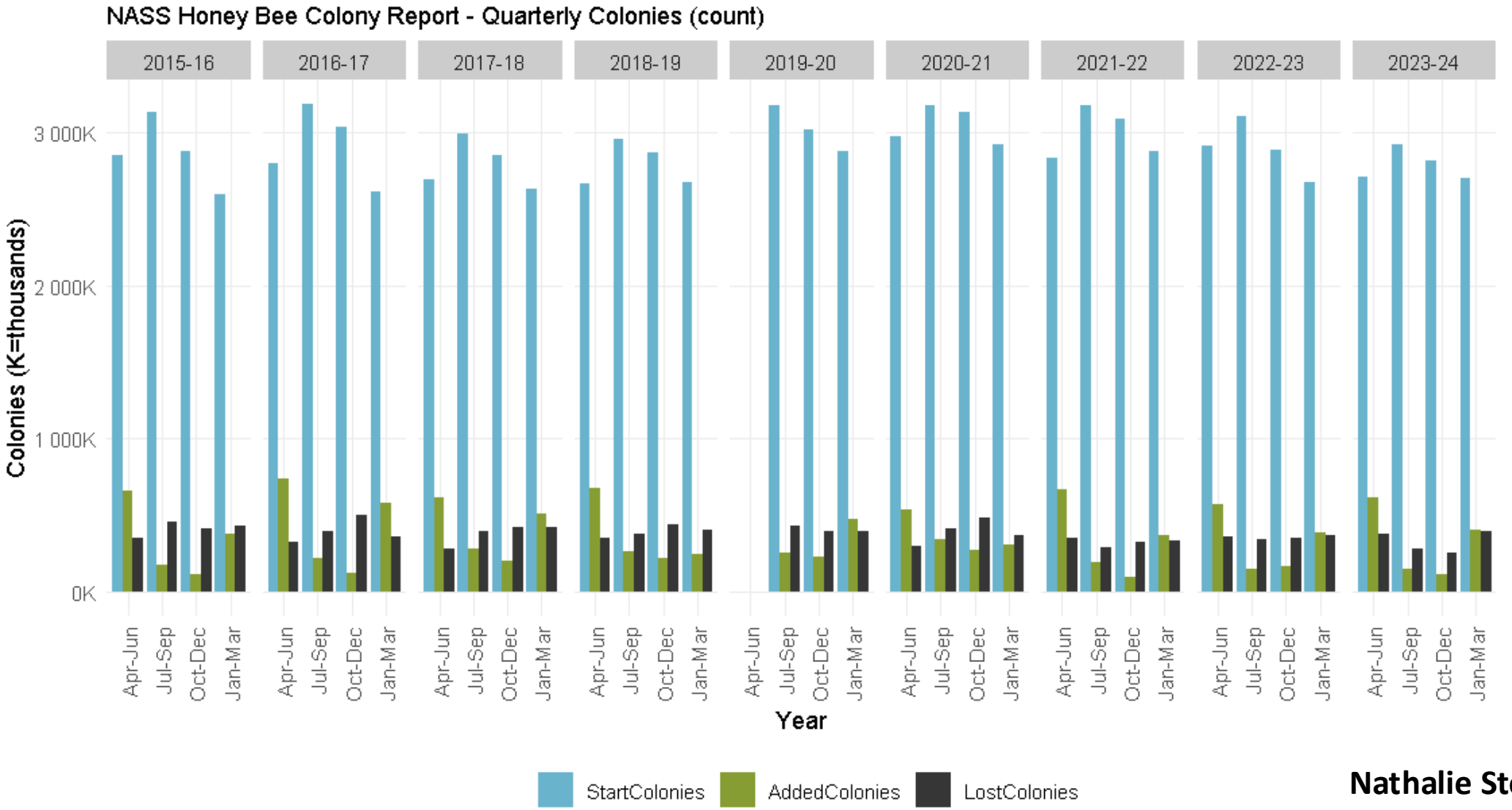
USDA NASS *Honey Bee Colony* report: % colonies lost (quarterly)



Nathalie Steinhauer, PhD
Research Associate, OSU

Source: https://usda.library.cornell.edu/concern/publications/rn301137d?locale=en

USDA NASS *Honey Bee Colony* report:

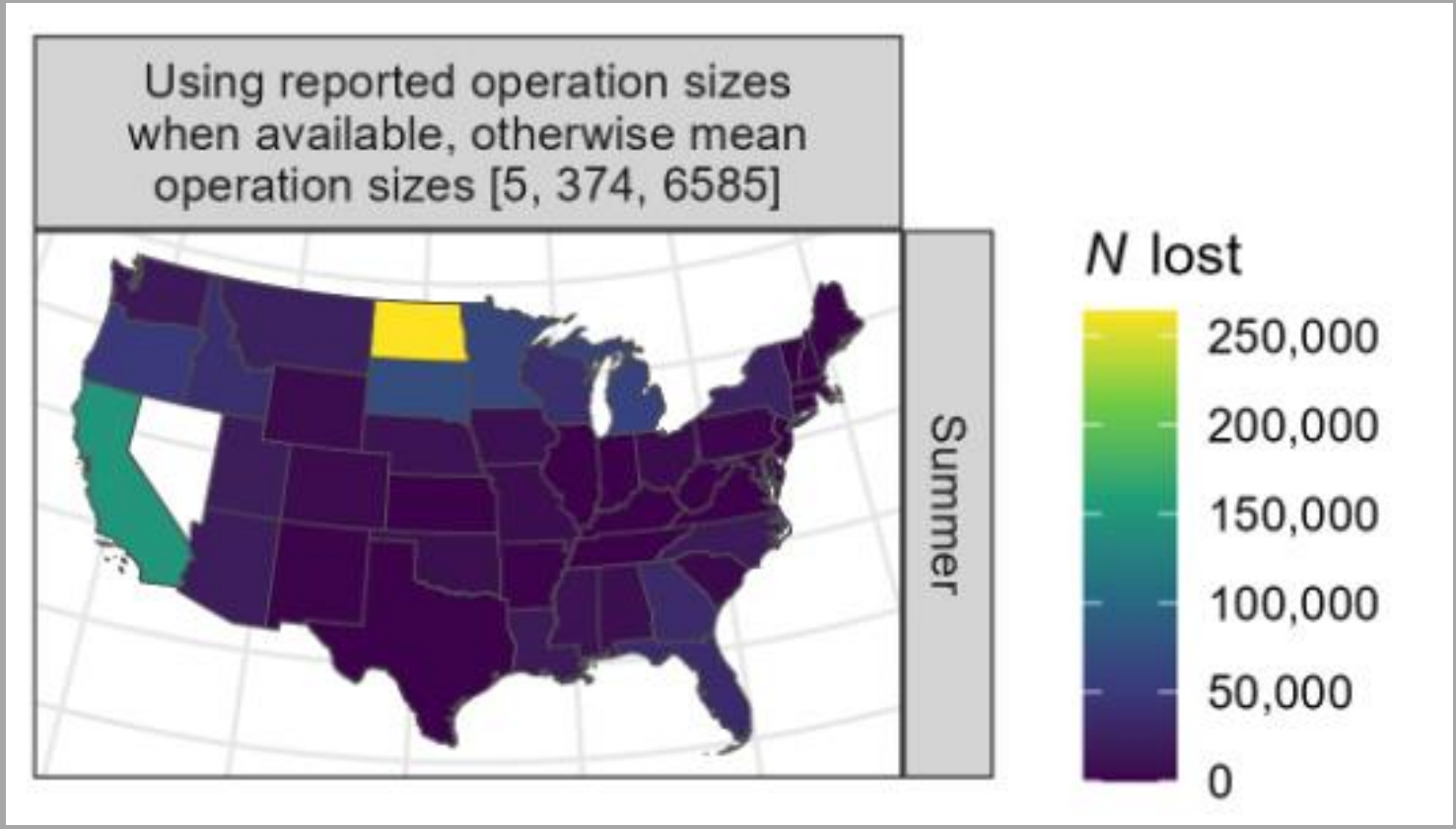


Nathalie Steinhauer, PhD
Research Associate, OSU

Source: https://usda.library.cornell.edu/concern/publications/rn301137d?locale=en

Nathalie Steinhauer, PhD
Research Associate, OSU

Estimated Number of Colonies Lost in Each State



Geography/states/regions: Chris Crawford (OCS)

Colony Loss Rate June 2024-Feb 2025 by state (Summer location)

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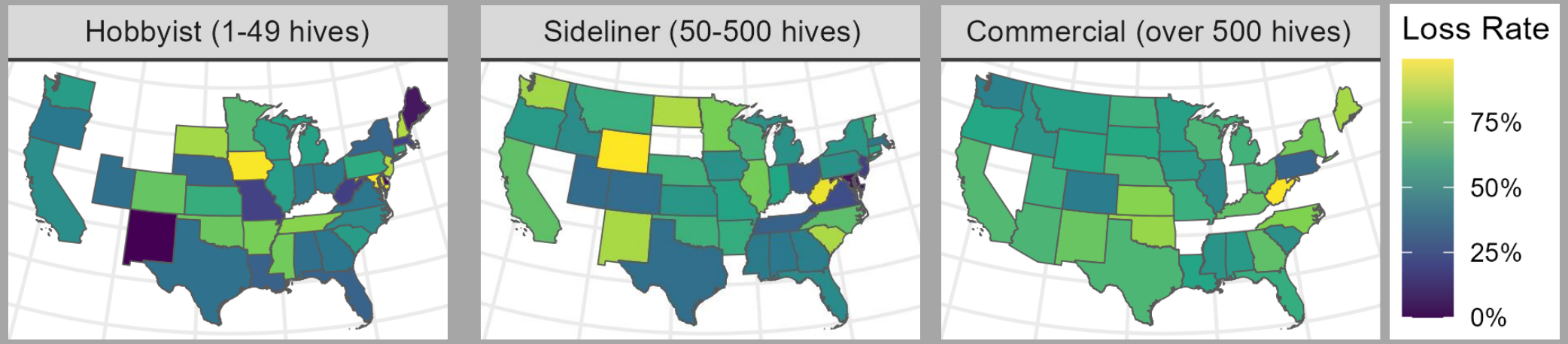
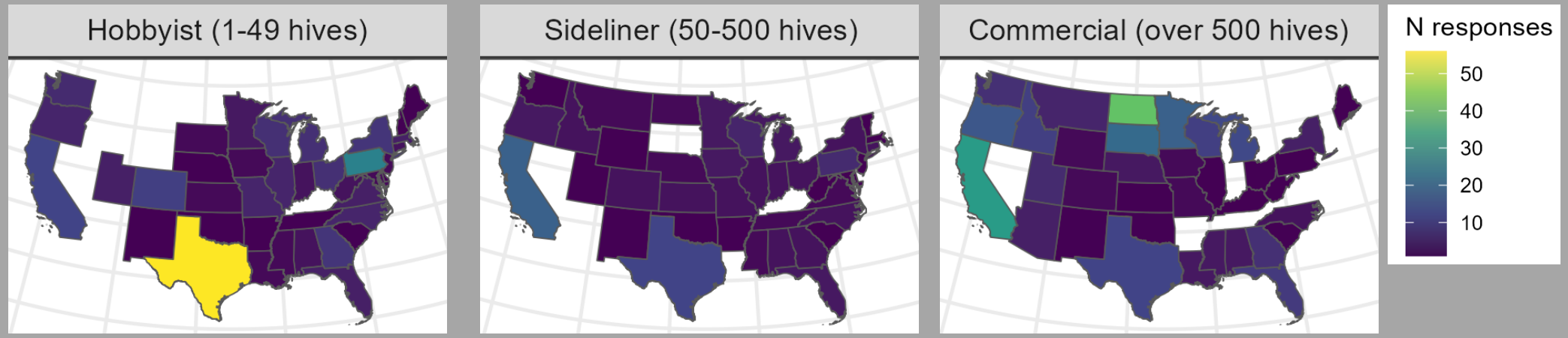
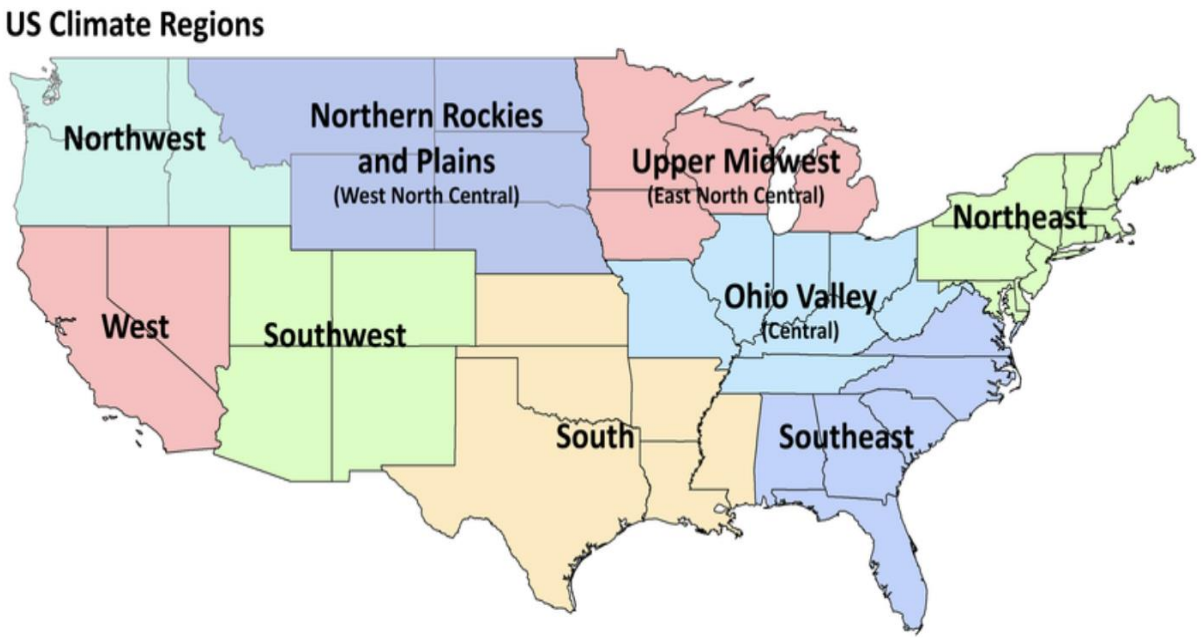
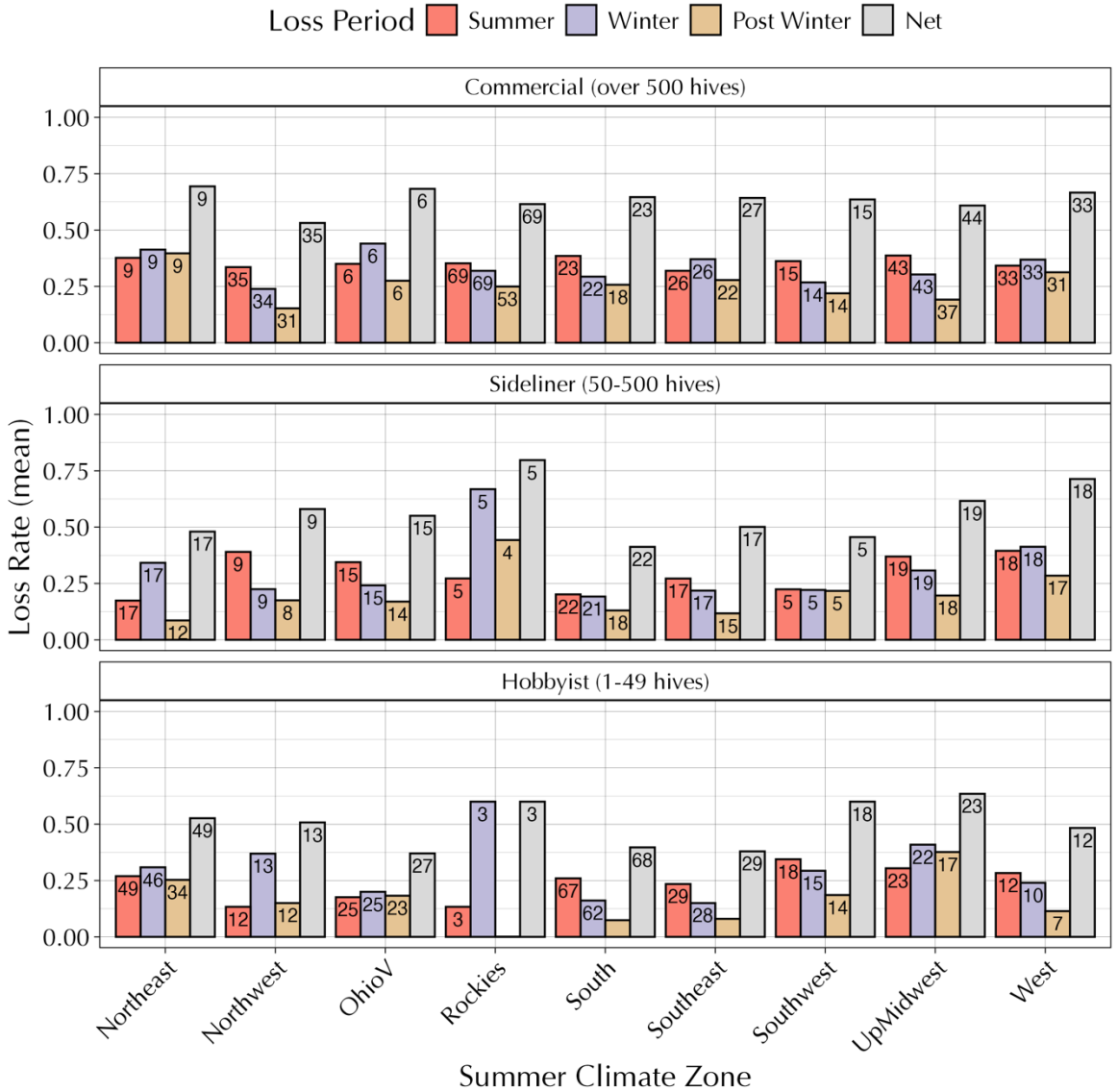


Number of Survey Responses (based on Summer location of hives)



Geography/states/regions: Chris Crawford (OCS)





Geography/states/regions: Anthony Nearman (BRL)

Samples Collected, from good and bad colonies in CA

500 samples,155 colonies and dead-outs, 9 operations

Live bees- snapshot of current pathogens, residues, health.

Bee Bread- Examine stored pollen for contaminating **Residues & Pollen Diversity**

Wax- longer term reservoir for residues.

Sample collection: Zac Lamas and Andrew Garavito (BRL)

Analysis of Samples

USDA ARS Bee Lab, Beltsville: four-tiered investigation to determine potential causes:

- **Pathogen Screening** – Testing for all known honey bee pathogens using molecular methods.
- **Pesticide Residues & Pollen Diversity** – Examining stored pollen for pesticide contamination and plant diversity.
- **Metagenomic Analysis** – Identifying previously unknown pathogens in colonies with high disease prevalence.
- **Microbiome & Host-Pathogen Interactions** – Assessing gut bacterial diversity and potential links to colony health.

Frank Rinkevich, USDA ARS Bee Lab, Baton Rouge: Varroa mite resistance to Amitraz

Scott McArt, Cornell University: Pesticide residue analysis in bees, wax and bee bread

With funding from One Hive Foundation

Pesticide Residue Analysis
Dr. Scott McArt, Cornell University

~500 samples for LCMS. Bees, bee bread (pollen), wax

Samples received this week, extractions start next week. (this is the fast track)

Results in 2-4 months.

Pesticide residue screen list on website here:

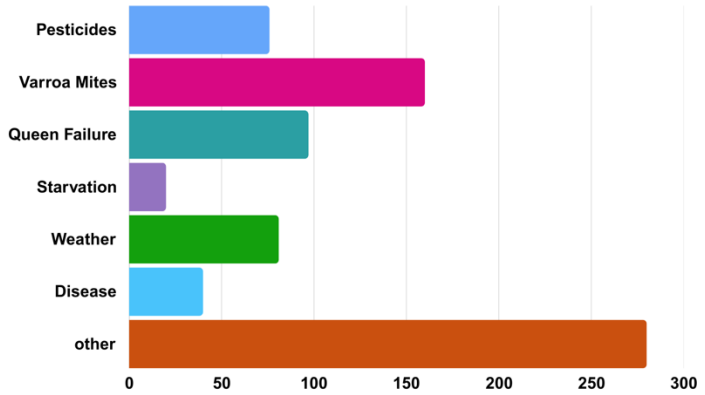
https://blogs.cornell.edu/ccecf/pesticides/

Samples will be split to run GCMS for pyrethroid insecticides and some non-polar fungicides later this summer/fall.

Has the survey data submitted about beekeeper's specific pesticide concerns

Recognizing this is just a guess, what factors caused your colony losses this year?

Pesticides	237
Varroa Mites	289
Queen Failure	52
Starvation	52
Weather	52
Disease	52
Other	52



Question from Survey:

If you suspect pesticide exposure contributed to your losses, please describe any details. (timing, region, crop, application of products used, etc.)

63 respondents (20%) answered sprays for this question.

Update

bees in that location
bee losses
Mosquito sprays
bee yards
bees
sprays
no pesticides
spraying of pesticide
pesticides
pesticide to kill
bees were dead
pesticide spray
dead bees
crops
pesticide exposure
airplane sprays
aphid spray
Hives
bean spray
bees on the bottom boards

335 Responses

Thank you!

USDA ARS bee research labs, especially Beltsville for responding to beekeepers quickly. Collecting samples, and leading ongoing analyses. Many other ARS Bee Labs will be assisting with ongoing work.

USDA Office of the Chief Scientist for leadership and data analysis

Other Scientists and Experts in honey bee research, who are offering time and insights.

USDA-ARS-Beltsville: Jay Evans, Judy Chen, Zac Lamas, Anthony Nearman, Steve Cook
USDA ARS Stoneville: Narayanan Kannan , Arathi Seshadri, Pierre Lau
USDA ARS Baton Rouge HBGBL: Frank Rinkevich (USDA-ARS-HBGBL)
USDA ARS Logan: Diana Cox-Foster
USDA ARS Tucson: Vanessa Corby-Harris
Oregon State: Nathalie Steinhauer
Penn State: Christina Grozinger and others (PSU/Beescape),
USDA OCS: Izzy Hill, Chris Crawford

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Thank you!

Industry Partners who collaborated to help with surveys and raise awareness.

Extension specialists, Apiary Inspectors, Bee Clubs near you.

Honey bee failures are linked to agriculture and food supply, thanks for helping raise awareness.

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Thank you!

- Beekeepers throughout the USA, who work tirelessly to provide the pollination services we all rely on.
- If you like to eat healthy food, you need healthy honey bees!
- Buying US honey helps our beekeepers stay solvent.

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