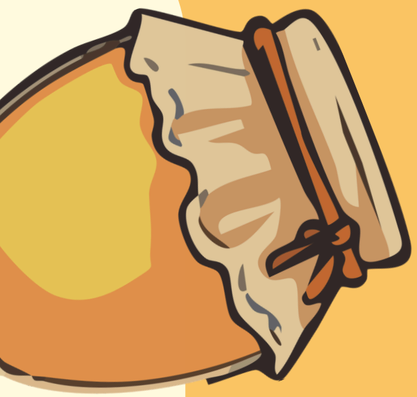

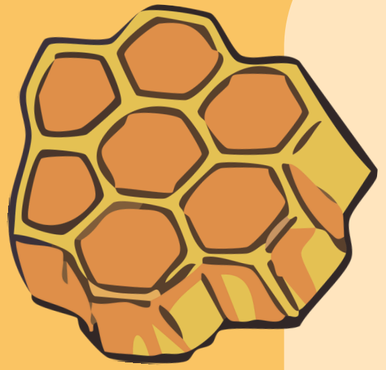





TO BEE OR NOT TO BEE

EXPLORING HONEY BEE COLONY LOSSES ACROSS THE US

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SHOUTOUT TO OUR WONDERFUL TAS



INTRODUCTION

Honey bee pollination contributes more than $18 billion annually to U.S. crops!

But... Colonies face threats such as Varroa mites, disease, pesticides, and other pests.

So... How do colony losses vary across states, seasons, and years, and how are they related to these threats?

Investigate the RQ through variations of:
regions ---> years & quarters ---> threats
... and combined!

OUR DATASET: SAVE THE HONEY BEES (USDA)

1,453
OBSERVATIONS

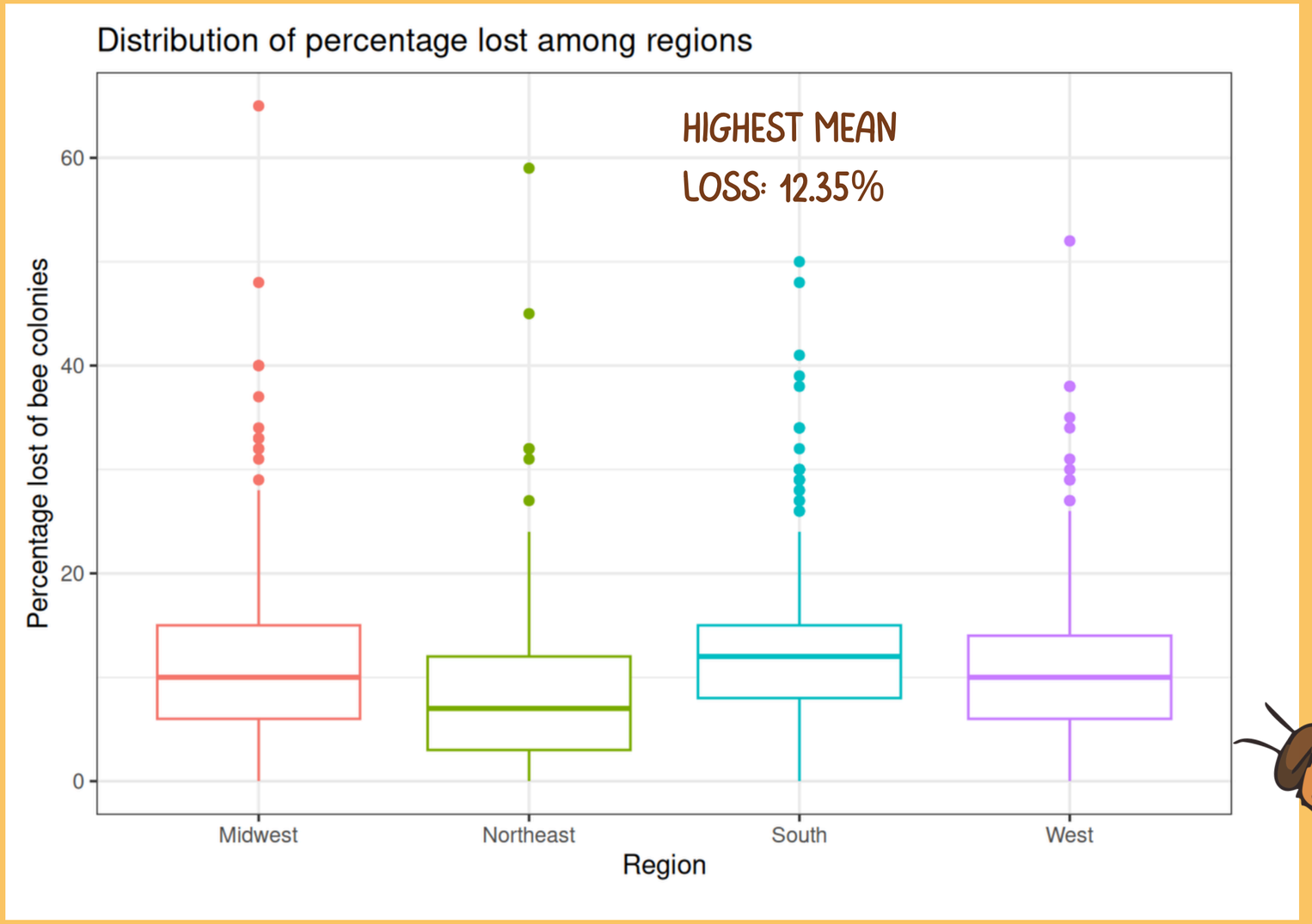
17
VARIABLES

YEARS:
2015 - 2022



BEE COLONY LOSS ACROSS REGIONS

- Assigned each state their region
- Southern regions have highest mean and median values of percentage colony loss, and northeastern regions have the lowest.
- Regional IQRs are fairly similar

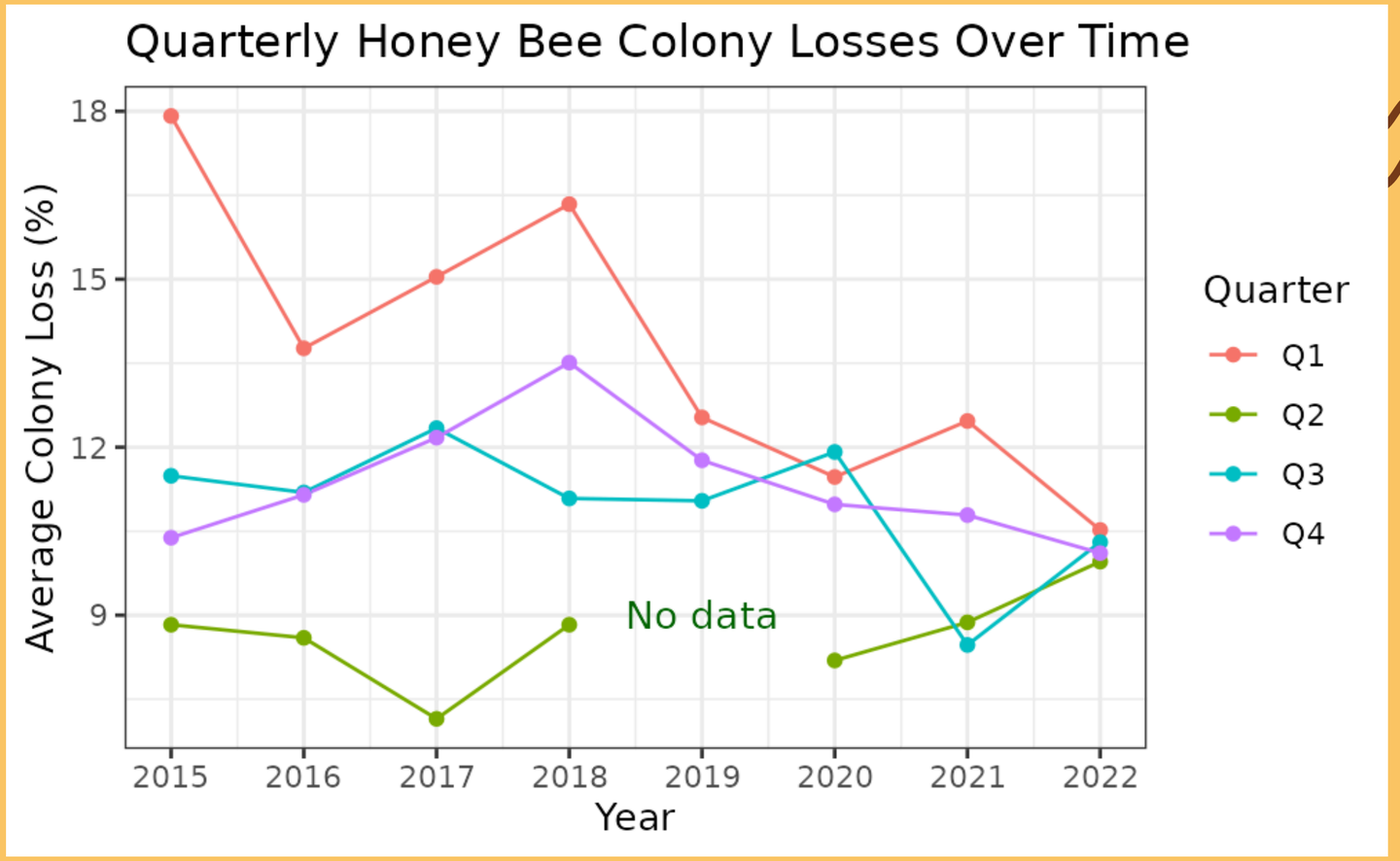


CHANGES OVER TIME

18% → 10.5%

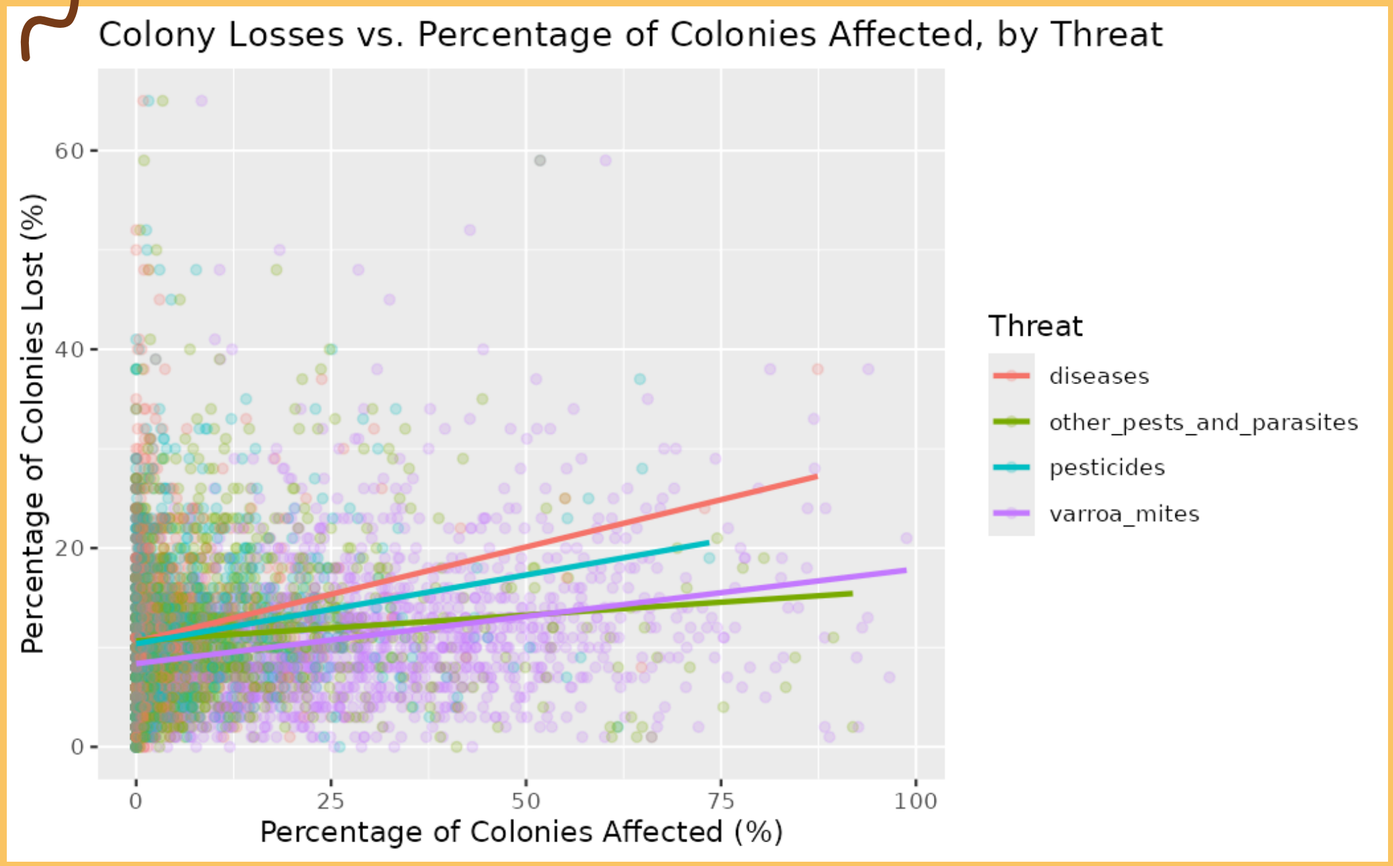
Q1 AVERAGE COLONY LOSS, 2015–2022

- Did seasonal patterns remain consistent?
- Q1 generally most losses
- Most losses converged to around 10% by 2022
- Seasonal differences became less pronounce over time
- Note: Missing data for Q2 means we can't make complete comparsion for 2019





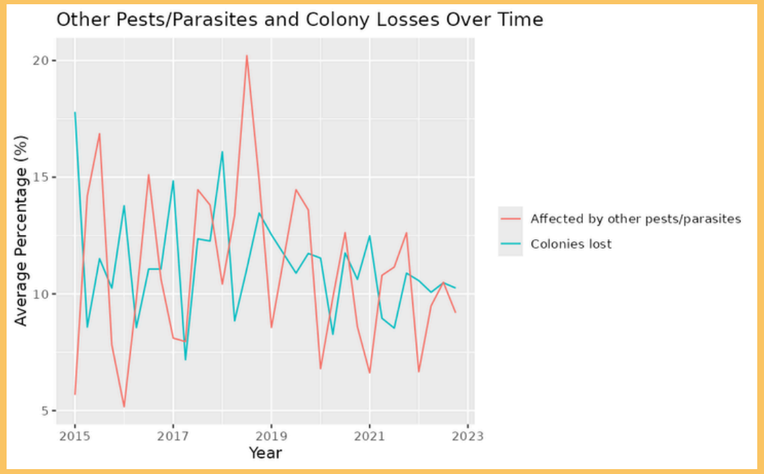
COLONIES LOST BY THREAT

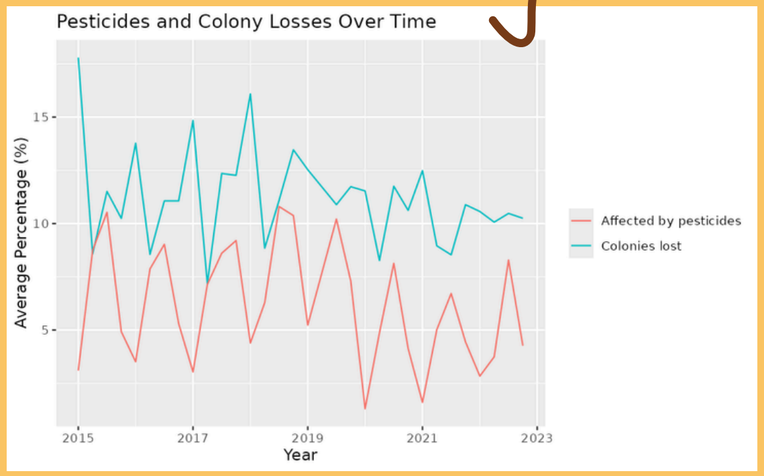


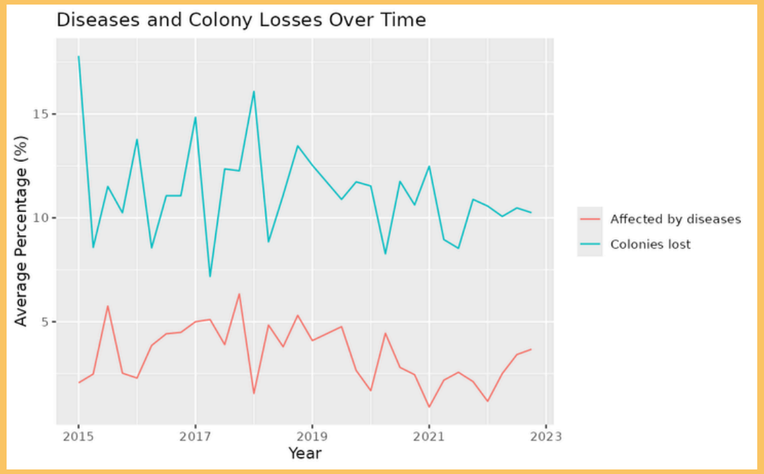
The graph suggests that diseases have the strongest impact on colonies lost, with the steepest slope (strongest relationship) between colonies affected and colonies lost.

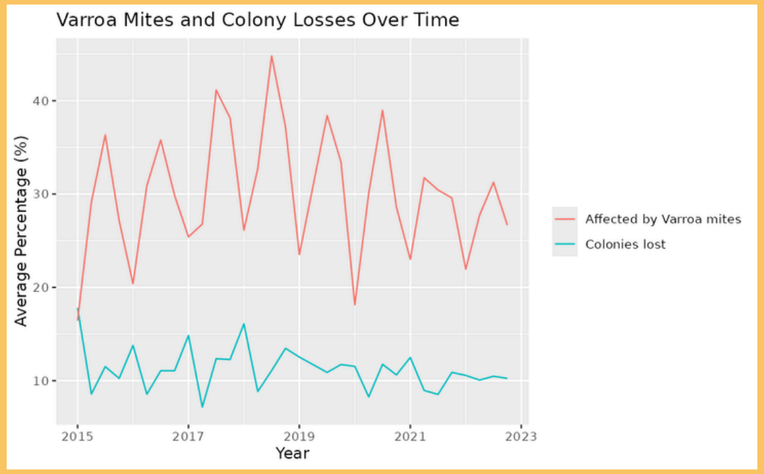
Varroa mites are the most likely to affect a colony.

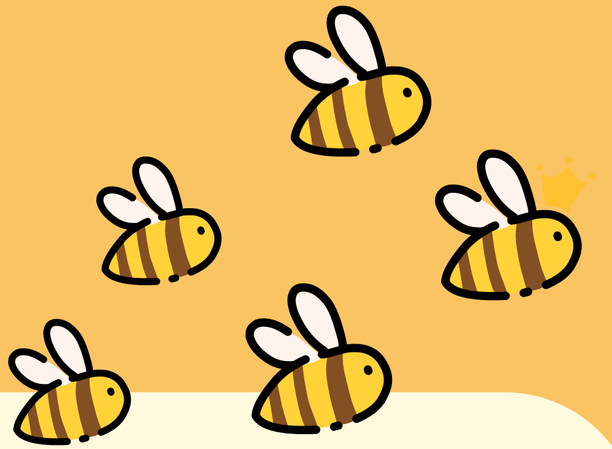
COLONY LOSS BY SPECIFIC THREATS











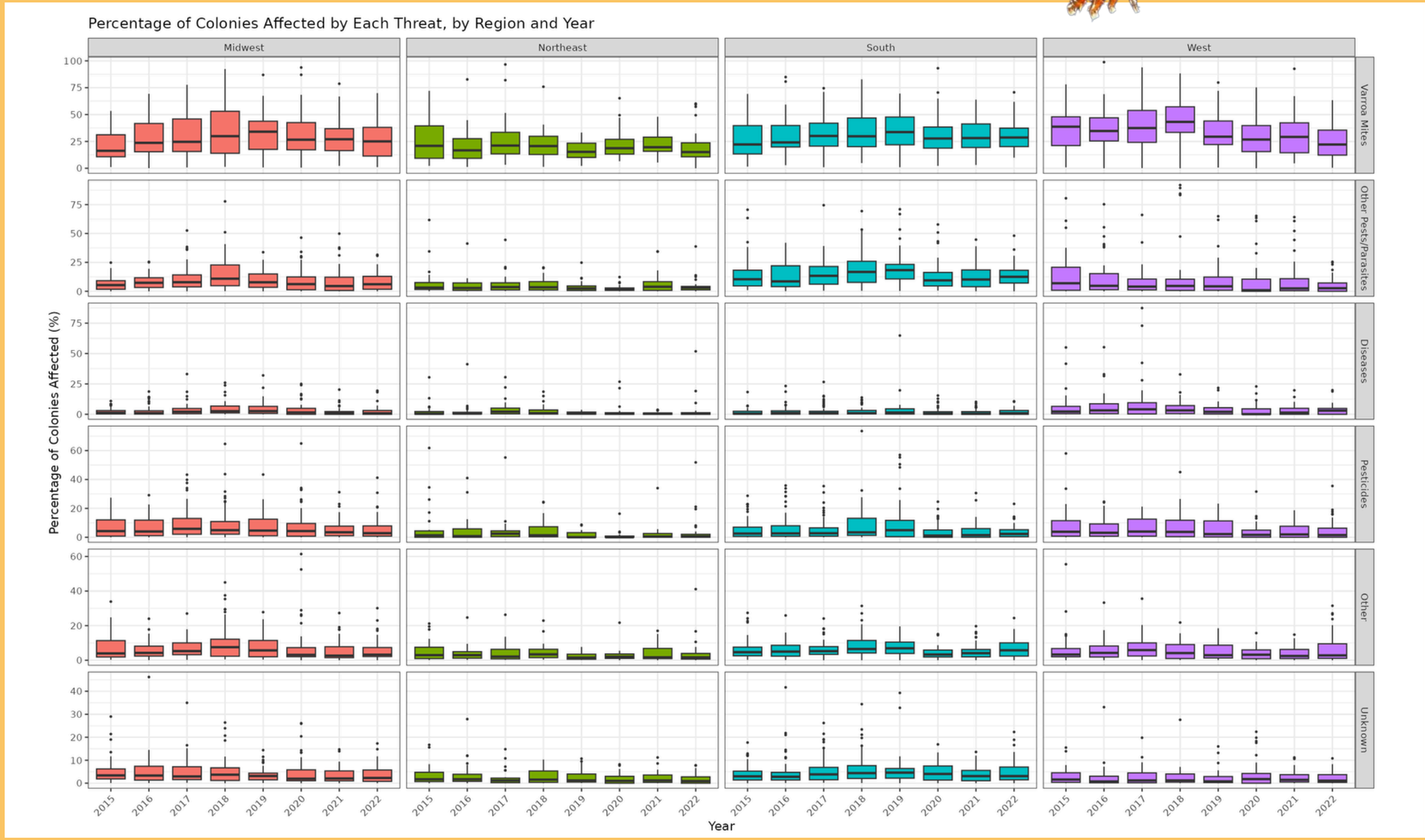
These graphs suggest that colony loss is more affected by season than by biochemical threats.

One interesting trend is the spiking of threats in the 3rd quarter (summer) while colony death spikes in the 1st quarter (winter).

GENERAL OVERVIEW OF FACTORS



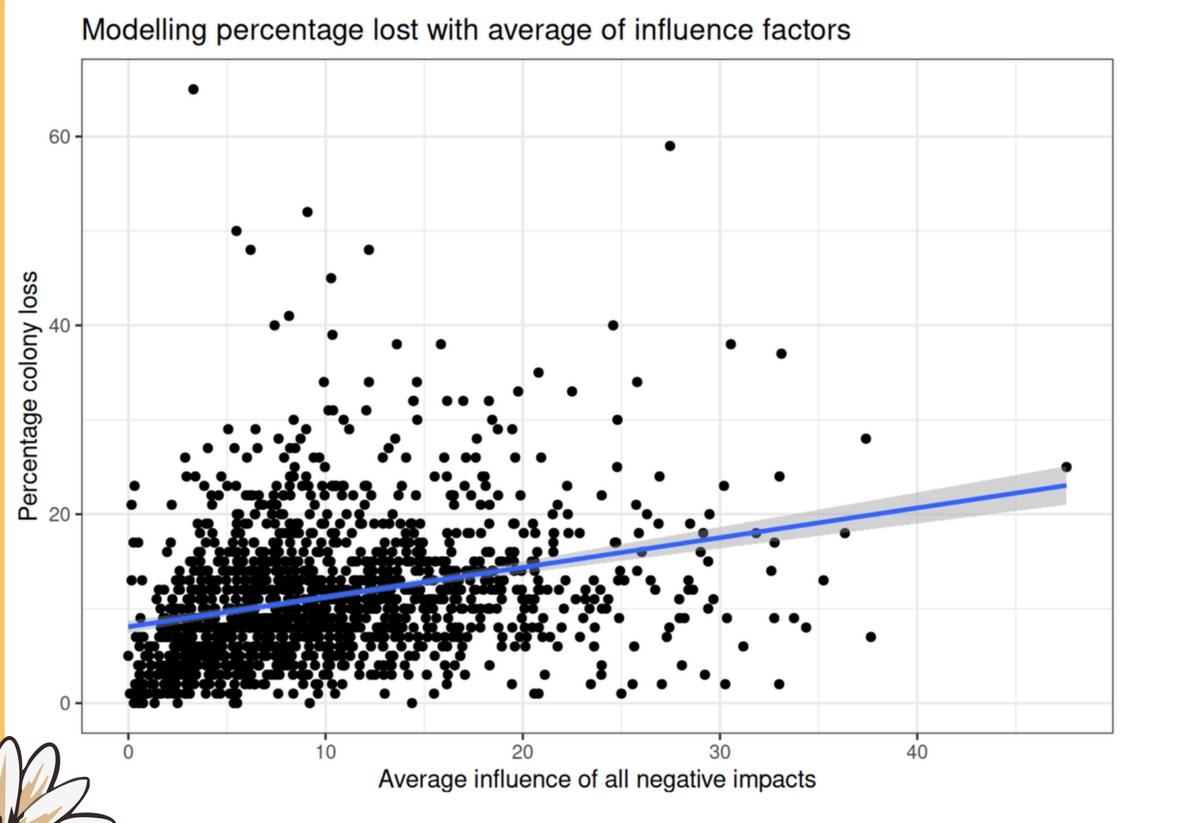
- Six threats compared across regions and years
- This is the % of colonies affected by each threat, by region
- Varroa mites affect the most colonies (25-45%)
- Diseases, pesticides, other, and unknown stay low (below 10%)
- Varroa pressure varies



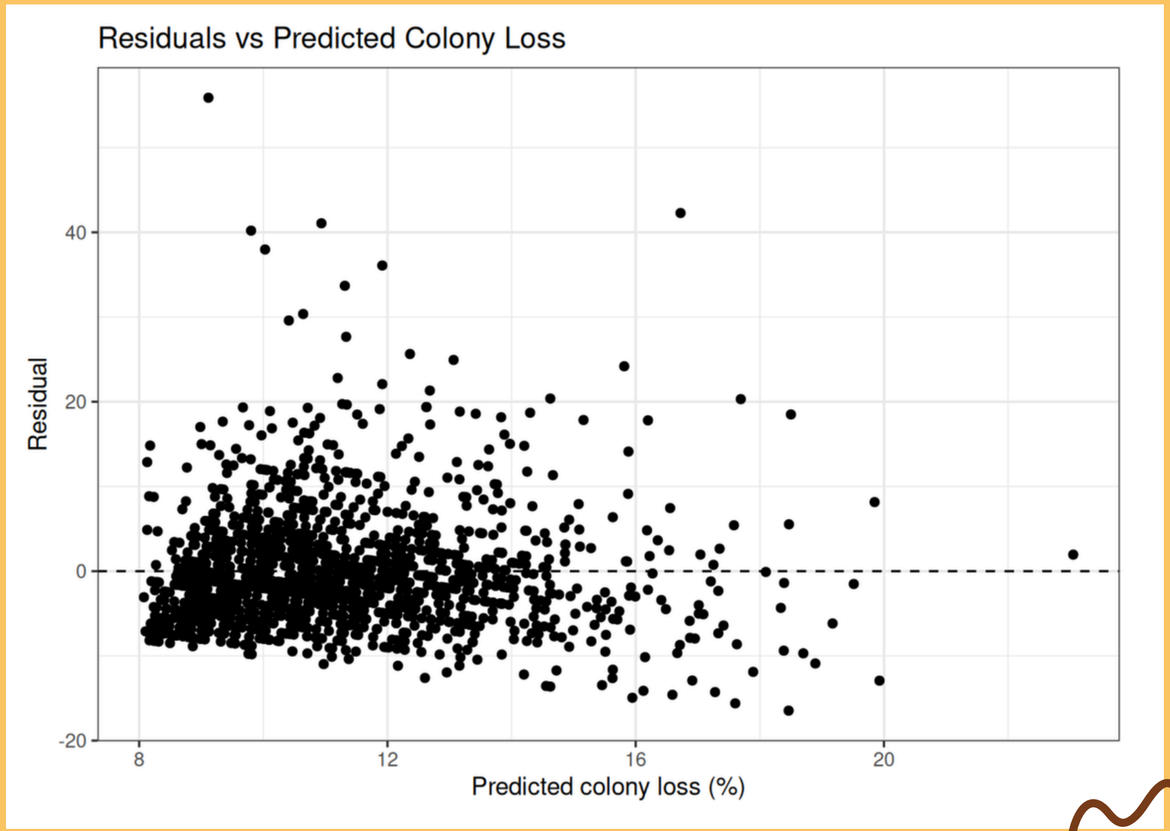
BUILDING A LINEAR MODEL

Linear regression model of percentage colony lost against the average of threats.

Slope: 0.315, Intercept: 8.08



Residuals become more spread out at higher predicted losses --> the model does not explain variation equally well across the range of predictions.



CONCLUSION, DISCUSSION, LIMITATIONS

Conclusion

- Colony losses were highest in Q1 and the South.
- Seasonal differences narrowed between 2015 and 2022.
- Varroa mites were the most prevalent threat, but diseases are the most deadly

Discussion

- Threat prevalence was weakly positively associated with colony losses
- Seasonal and regional patterns suggest colony loss is more complex than any single factor

Limitations

- Missing observations for Q2 of 2019
- No direct temperature or urbanization measurements
- Observational data cannot establish causation



THANK YOU FOR LISTENING!





