Are Honey Bees Dying Because of Pesticides?

1.1 Introduction: Context

- **Colony collapse disorder** (CCD) is the phenomenon that occurs when the majority of worker bees in a colony disappear/die.
- One possible cause of CCD: a family of pesticides called **Neonicotinoids** (or neonics).

1.2 Introduction: Questions to Answer

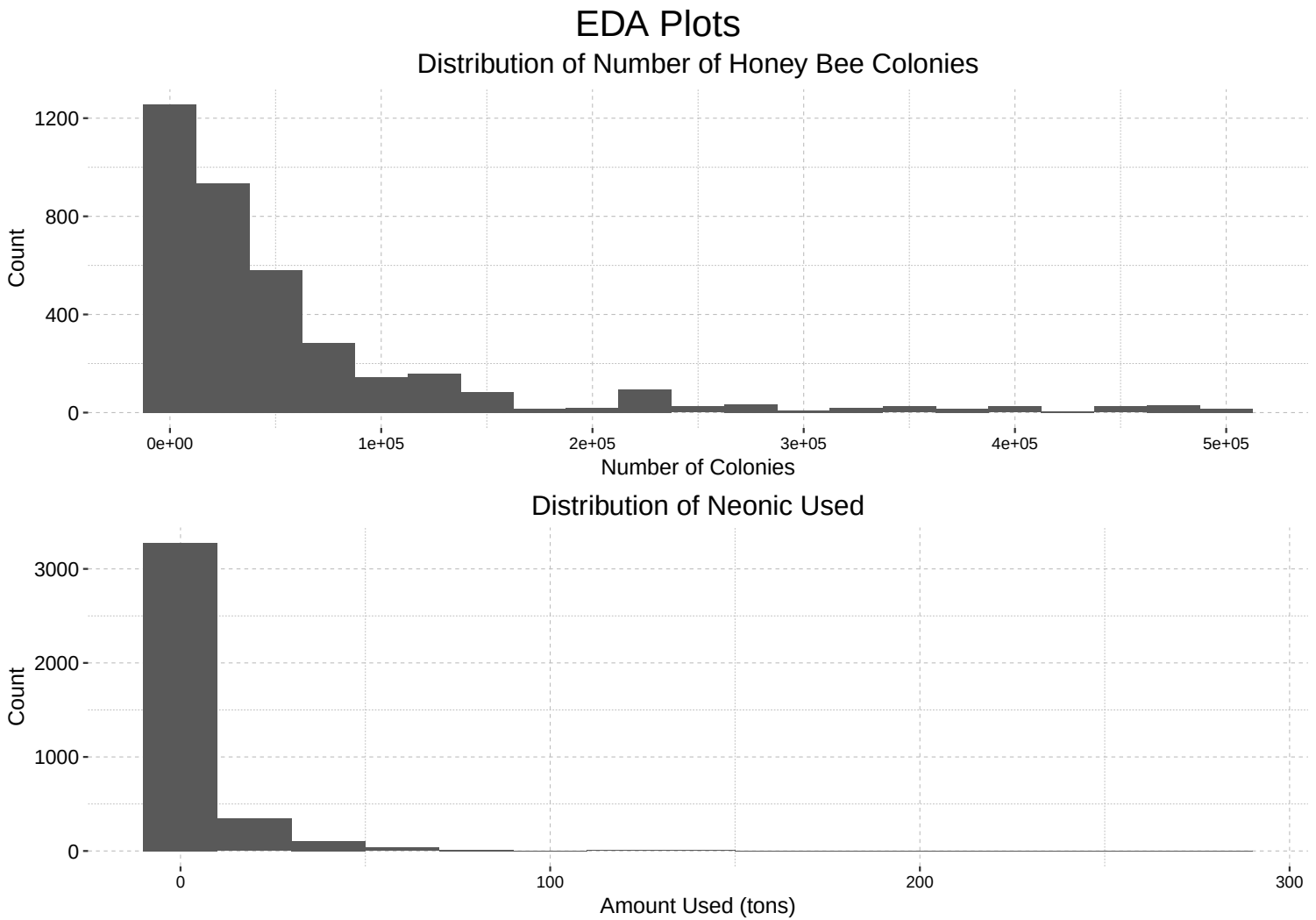
- How did the usage of neonicotinoids change over time in the US?
- Is there a relationship between the number of bee colonies and the use of neonicotinoids?
- Do different regions show different patterns?

1.3 Introduction: Dataset

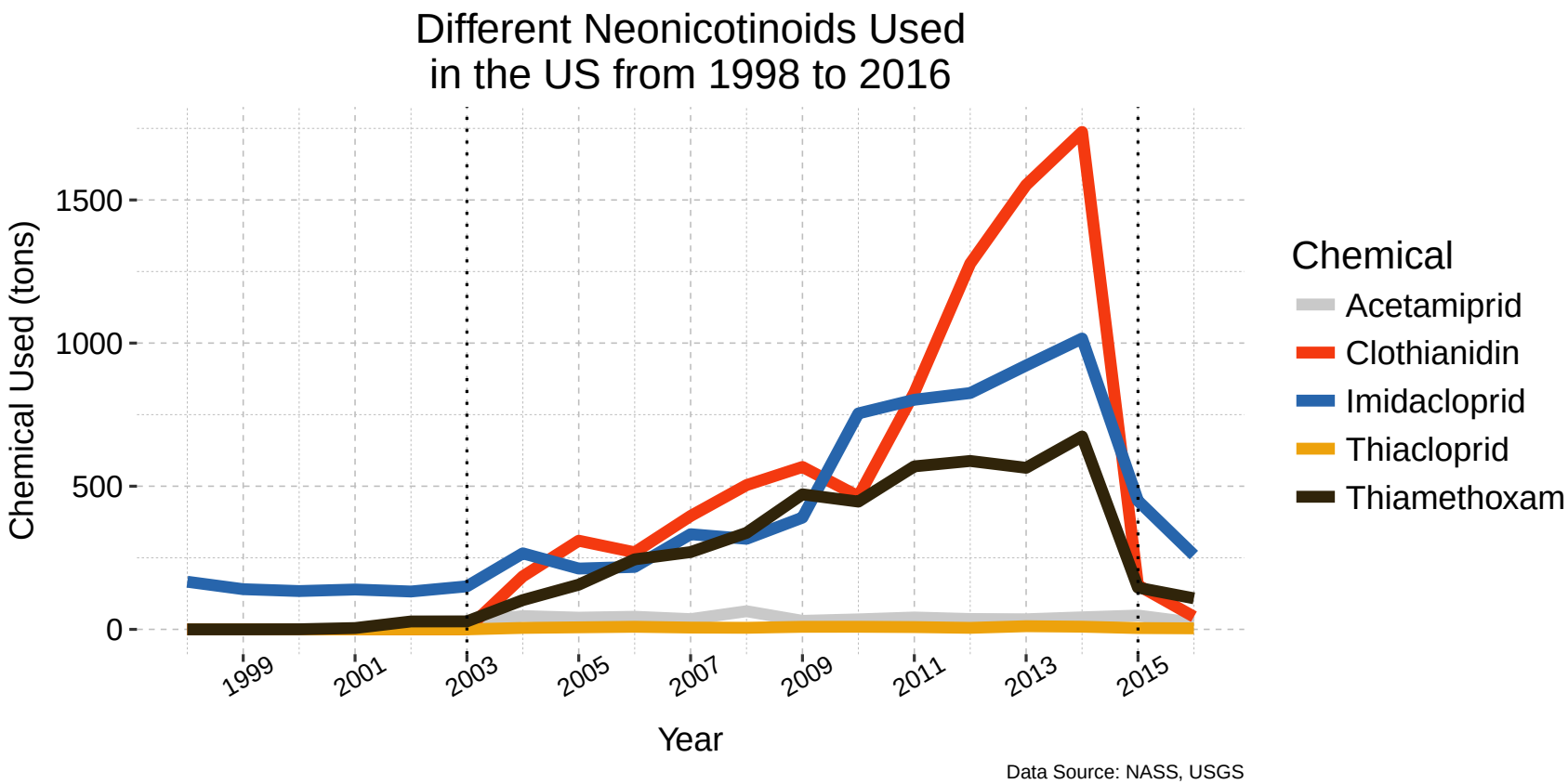
- Source: National Agricultural Statistics Service (NASS), United States Geological Survey (USGS)

state	region	year	timepoint	numcol	type_of_neonic	usage
alabama	South	1998	prior_2003	16000	clothianidin	0.0
alabama	South	1998	prior_2003	16000	imidacloprid	1836.3
alabama	South	1998	prior_2003	16000	thiamethoxam	0.0
alabama	South	1998	prior_2003	16000	acetamiprid	0.0
alabama	South	1998	prior_2003	16000	thiacloprid	0.0

1.3 Introduction: EDA



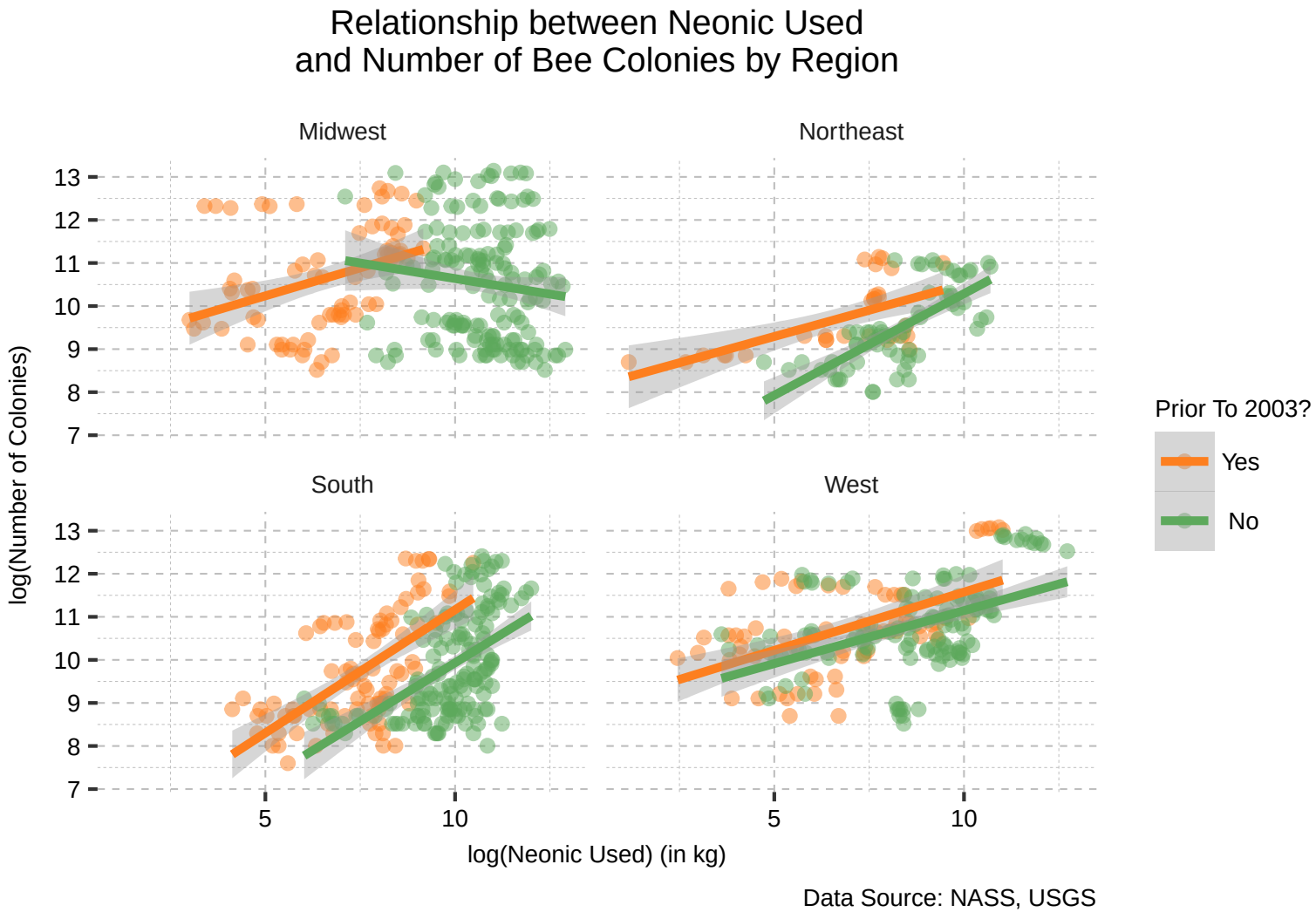
2 Methods: Graphic



2 Methods: Observation and Interpretation

- Pre-2003: limited use of neonicotinoids; not all types were used.
- 2003-2015: fast increase in the amount of neonicotinoids used; more diverse.
- 2015-2016: plummet in usage overall
    - **Saving America's Pollinators Act** (2015): This bill requires the Environmental Protection Agency (EPA) to suspend the registration of neonicotinoids.

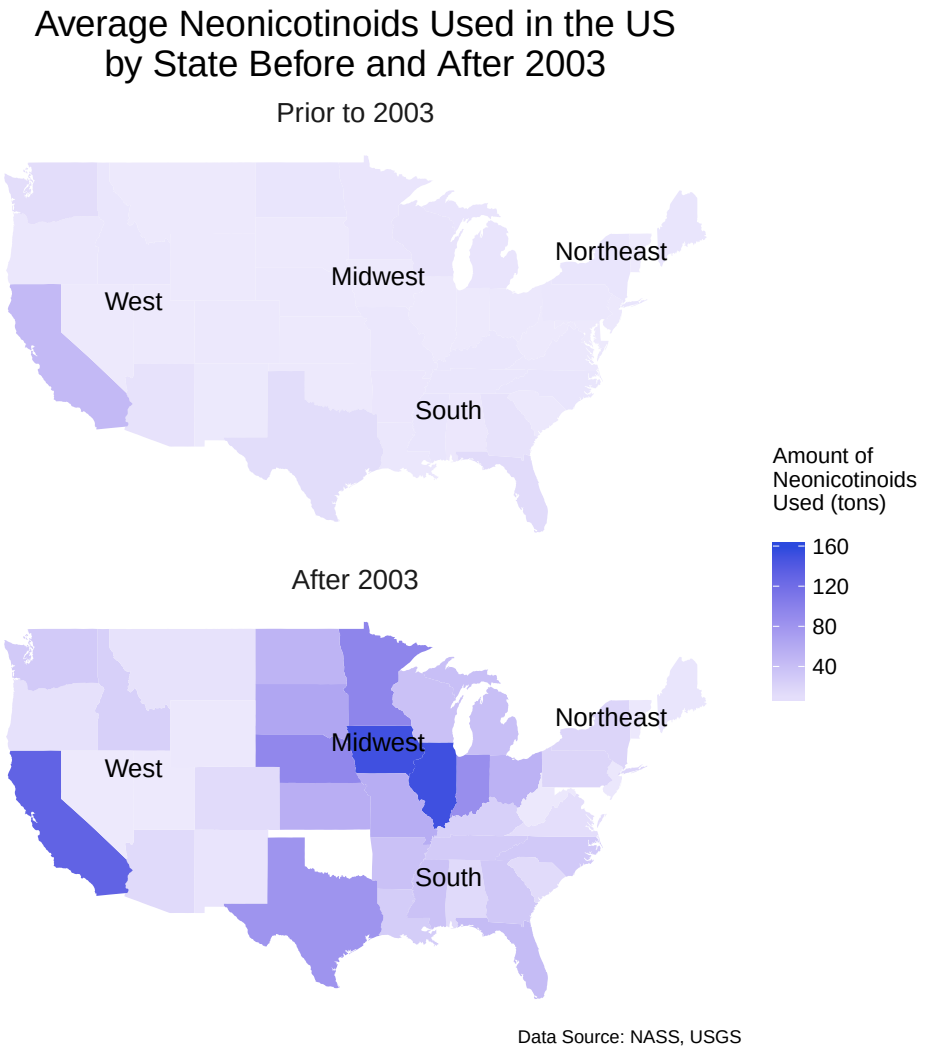
2 Methods: Graphic



2 Methods: Observation and Interpretation

- **Midwest**: Positive relationship *before* 2003 (i.e., low neonicotinoids usage) and negative relationship *after* 2003 (i.e., high neonicotinoids usage)
- Other regions: Positive relationship both before and after 2003.

2 Methods: Graphic



2 Methods: Observation and Interpretation

- Pre-2003:
  - All four regions in the US used few neonicotinoids, on average.
  - **West** used the most and **Midwest** and **Northeast** used the least, on average.
- Post-2003:
  - All four regions increased neonicotinoids use, on average.
  - **Midwest** became the region with the highest usage level, and uses a lot more neonicotinoids than other regions.

3 Conclusion

- From 1998 to 2016, there is an overall increase in the usage of neonicotinoids, though usage dropped drastically in 2015.
- The relationship between neonicotinoid usage and number of colonies could be dependent on region and on usage.

4 Discussion

Limitation:

- Correlational Study

Future Work:

- Investigate the problem using state-level data
- Look at more variables related to the health of honey bees
    - e.g., reproductive rate, birth rate, death rate