

Salvum Apes

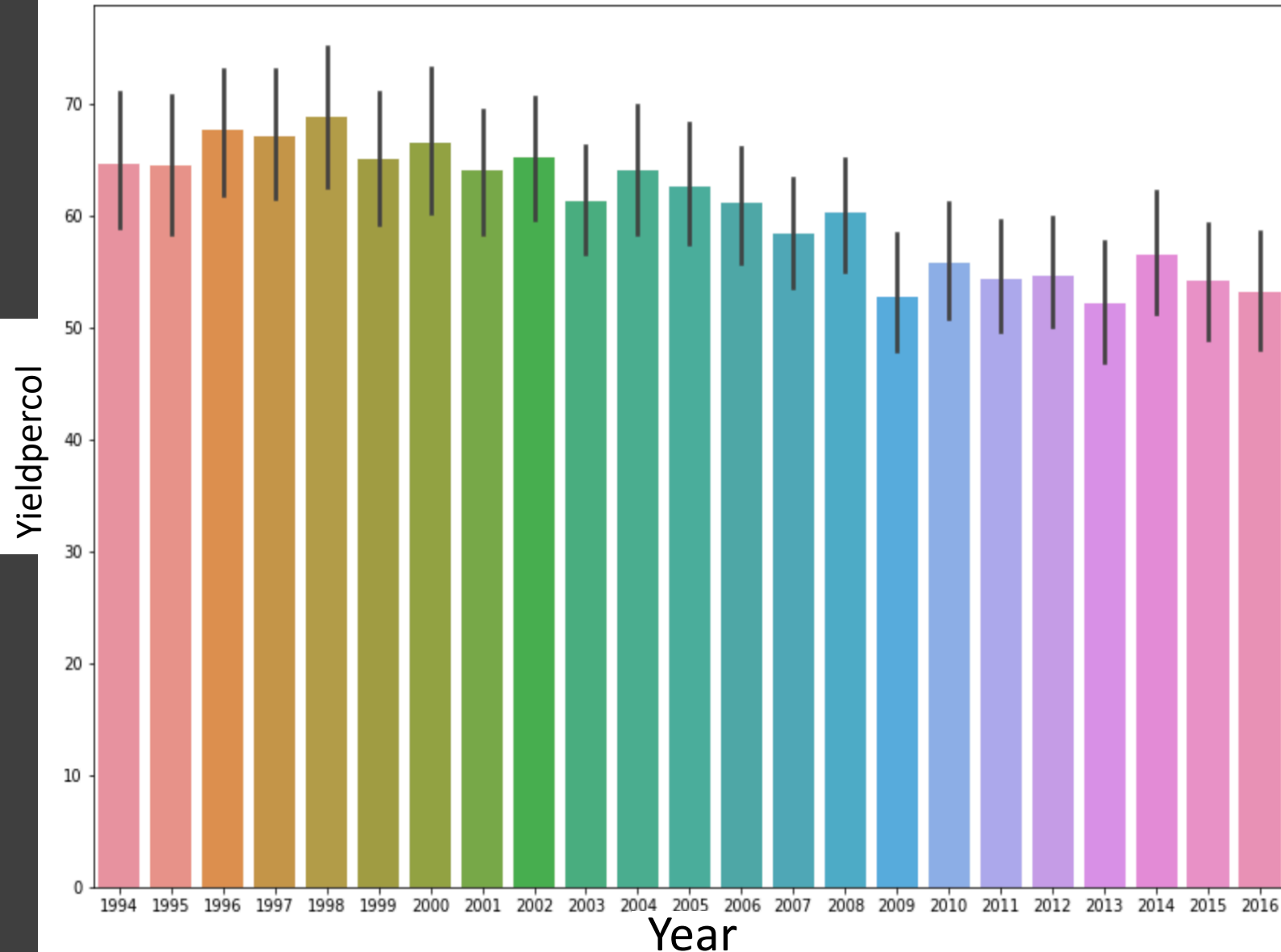
Saving the bees in your community

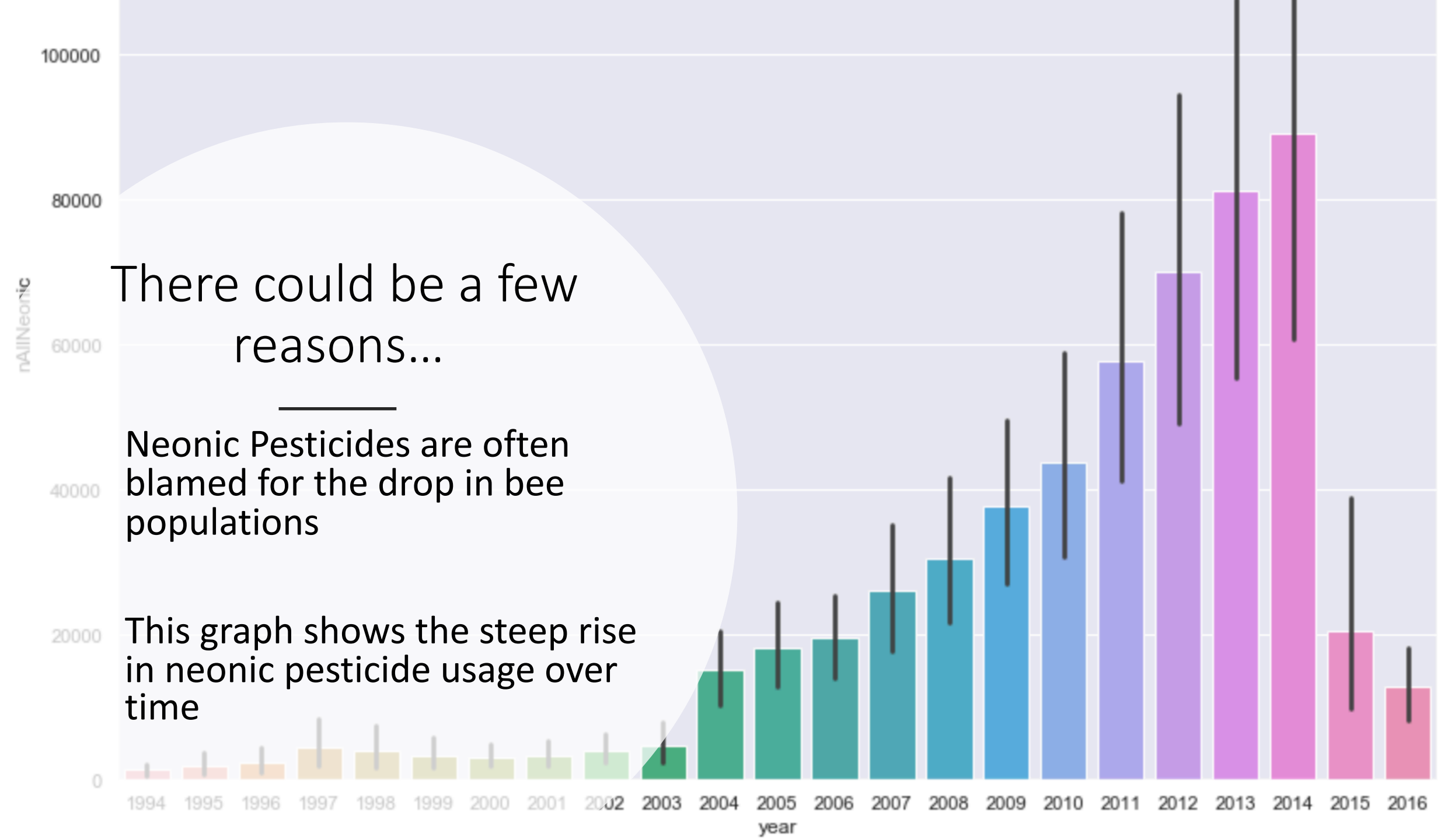


What's the bee-g idea?

- Bees around the world are suffering under ecological threats
- Specifically, this presentation deals with the honey bee in North America
- Honey bees are a key pollinator of many important agricultural crops
- What could be causing this? And how can we stop it?

Demonstrating yield per colony of bees over time





Statistically speaking

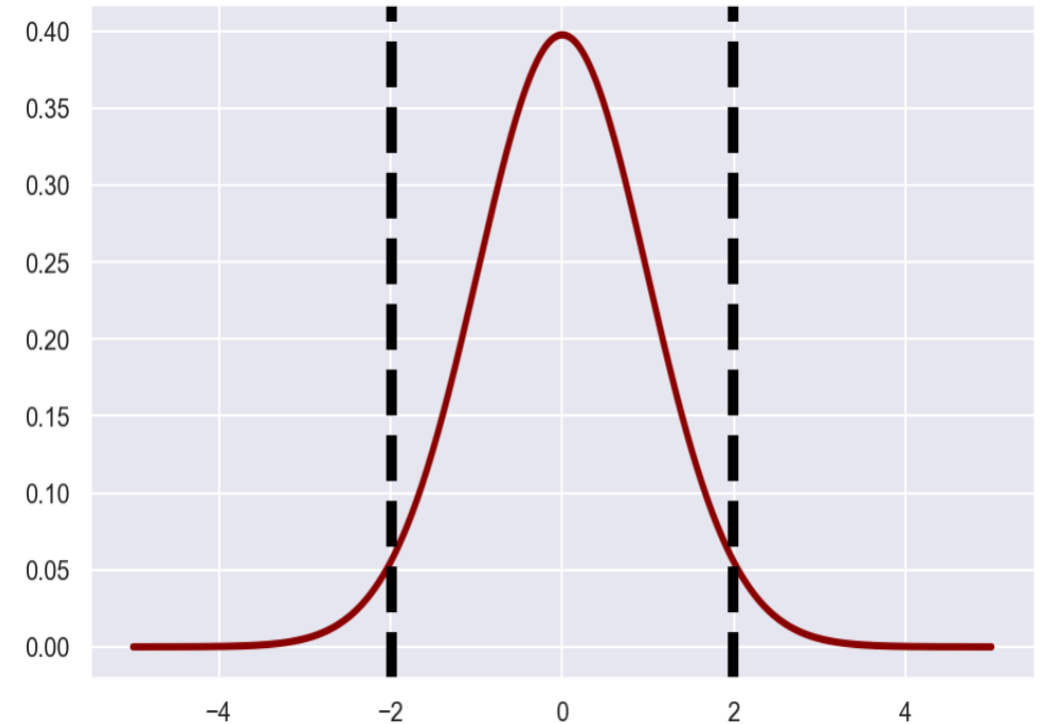
The visualisation here is to demonstrate if yield is decreasing over time

The image to the right demonstrates the values at which the null hypothesis (ie there is no decrease in honey over time) is true

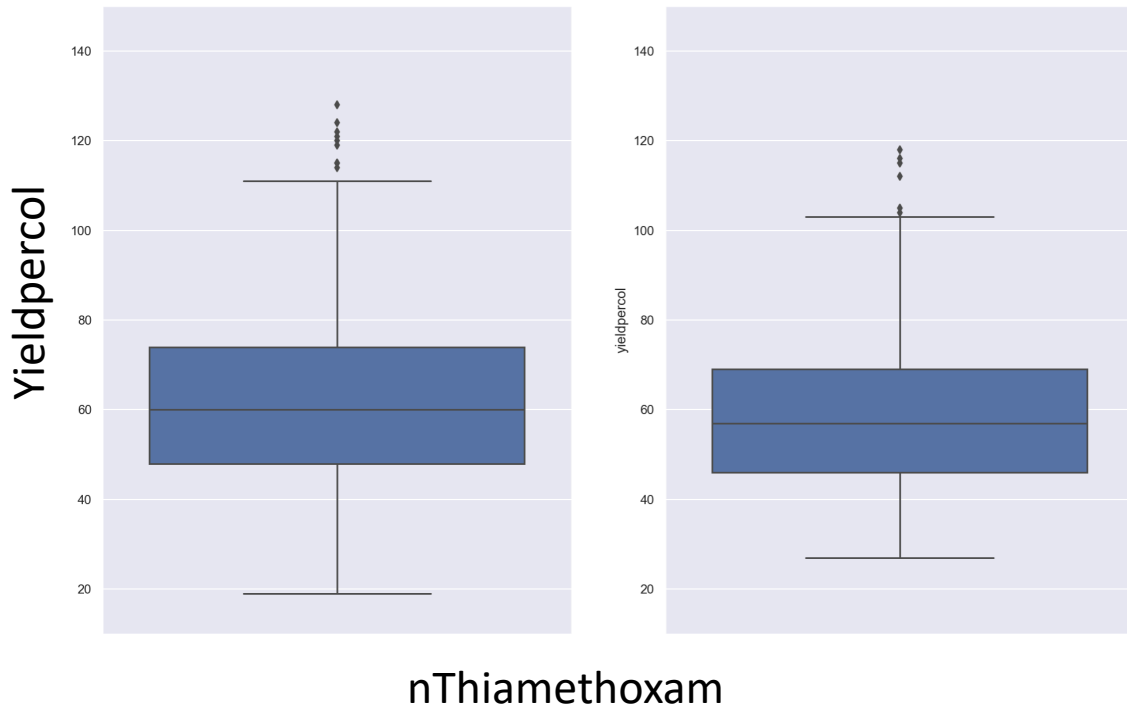
```
p_value = lower_tail + upper_tail  
print(p_value)
```

0.01335114710901333

However our p-value, being less than 0.05, shows that there is a statistically significant decrease in yield over time

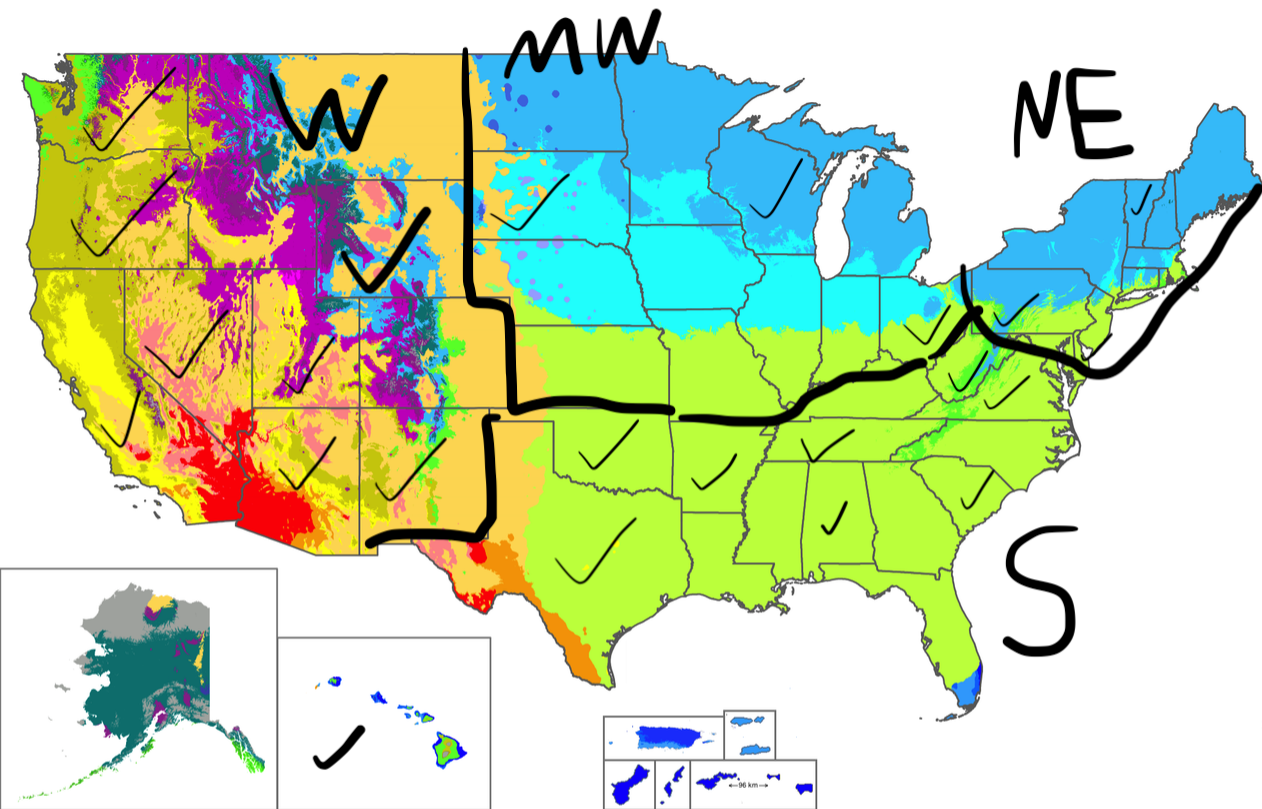


Further data – Which pesticides are the problem?



	sum_sq	df	F	PR(>F)
nCLOTHIANIDIN	2477.768761	1.0	7.284736	0.007086
nIMIDACLOPRID	422.136419	1.0	1.241097	0.265561
nTHIAMETHOXAM	3352.764196	1.0	9.857256	0.001747
nACETAMIPRID	975.821318	1.0	2.868952	0.090654
nTHIACLOPRID	2436.754233	1.0	7.164151	0.007574
Residual	302376.988404	889.0	NaN	NaN

Köppen climate types of the United States



Further data – could it just be the region?

	sum_sq	df	F	PR(>F)
C(Region)	31711.753820	3.0	33.505396	1.597397e-20
Residual	281100.715454	891.0	NaN	NaN

Multiple Comparison of Means - Tukey HSD, FWER=0.05

group1	group2	meandiff	p-adj	lower	upper	reject
Midwest	Northeast	-16.7078	0.001	-21.9019	-11.5137	True
Midwest	South	-3.4144	0.1096	-7.3112	0.4824	False
Midwest	West	-11.7763	0.001	-15.8931	-7.6595	True
Northeast	South	13.2934	0.001	8.174	18.4128	True
Northeast	West	4.9315	0.0779	-0.3573	10.2203	False
South	West	-8.3619	0.001	-12.3841	-4.3397	True

['Midwest' 'Northeast' 'South' 'West']

Köppen climate type

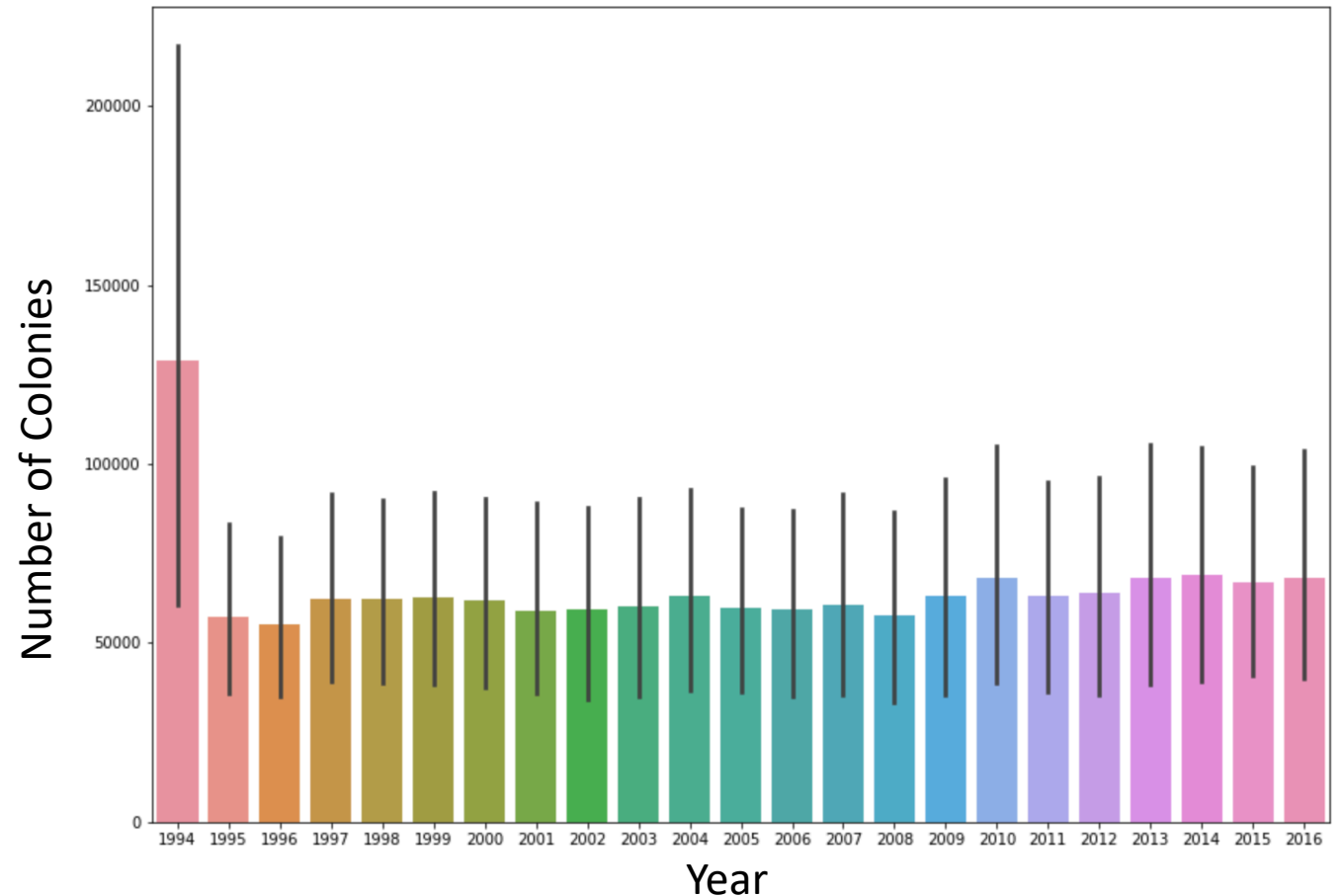
EF (Ice-cap)	Dsb (Warm-summer mediterranean continental)	Csa (Hot-summer mediterranean)
ET (Tundra)	Dsa (Hot-summer mediterranean continental)	BSk (Cold semi-arid)
Dfc (Subarctic)	Cfc (Subpolar oceanic)	BSh (Hot semi-arid)
Dfb (Warm-summer humid continental)	Cfb (Oceanic)	BWk (Cold desert)
Dfa (Hot-summer humid continental)	Cfa (Humid subtropical)	BWh (Hot desert)
Dwc (Subarctic)	Cwb (Subtropical highland)	Aw (Savanna)
Dwb (Warm-summer humid continental)	Cwa (Humid subtropical)	Am (Monsoon)
Dwa (Hot-summer humid continental)	Csc (Cold-summer mediterranean)	Af (Rainforest)
Dsc (Dry-summer subarctic)	Csb (Warm-summer mediterranean)	

*Isotherm used to distinguish temperate (C) and continental (D) climates is -3°C

Hang on – there
are still the
same number
of colonies!

So why is
production
decreasing?

Number of colonies over time



Neonicotinoids in bees: a review on concentrations, side-effects and risk assessment

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How can we
help save
the bees?



Further Steps

- More data needed on field impact on bees
- More research needed in decline per region
- More data needed on the impact of this decline continuing to the future

