Why are honey bees dying? Neonicotinoids are back !

New Mexico
Supercomputing Challenge
Final Report
April 2, 2014

61
Sierra Middle School
YWiC

Team Members:
Mustafa Muhyi
Abigail Jones - Alberson

Teacher(s):
Susana Bali

Project Mentor:
Rebecca Galves

Table Of Contents

Executive Summary: Our project is based on neonics and honey bee death[Why are honey bees dying?:2014]. We found this perfectly fit our subject of New Mexico Botany. Neonics is a man made nicotine, used as an insecticide.[Do cornstalks attract bees?:2010] To figure this out we used StarLogo TNG. Our coding was slightly challenging, but we got it done quite well. Our biggest problem was to find the most common way of death for the bees[Honey bees are dying:2012]. We knew they died from the neonics. However, we had to consider the fact they can die in the field of energy loss. So, our bees also die out of energy loss.

[1] About.com; Why are honey bees dying? (2014)

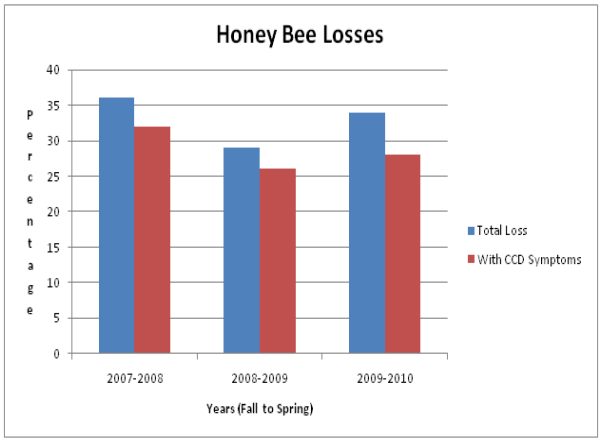
[2] Media, Demand; Do corn stalks attract bees? (2010)

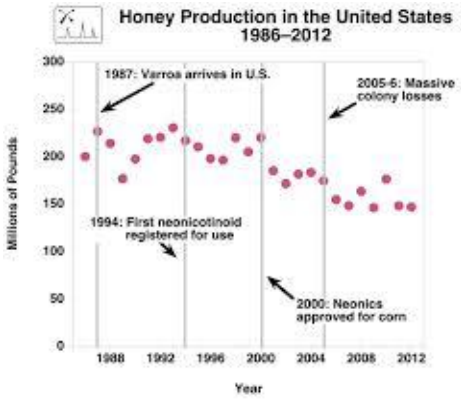
[3] Inc., Beesfree; Honey bees are dying (2012)

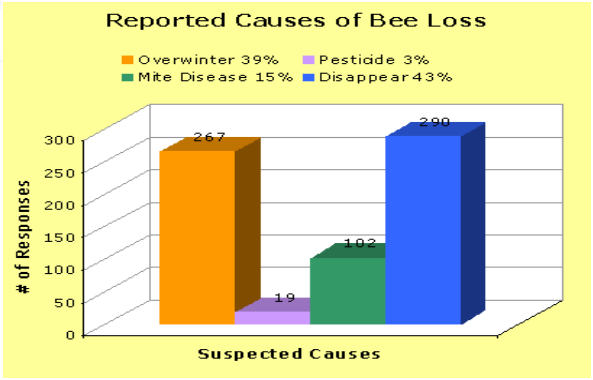
Introduction: This project was chosen because when we needed a project this was a rising problem in our community from an article we found quite interesting. This article was about beekeepers having significant deaths of their bees. Here in New Mexico we have the right beekeepers and plants for the bees to pollinate and pollute to make our delicious honey. Therefore, it was perfect for a New Mexico Botany project! Just like we wanted and it will help our community.

Project: Our project was conducted on StarLogo TNG. To get our info we talked to beekeepers in Las Cruces NM, and used internet sources(seen below). Our program contains 500 bees but each equal 140(math shown below). We used 3 plants: corn which has the neonics, rosemary for the high energy and smell that attracts the bees, and finally cotton for their bee attracting flowers and minimal energy. The bees also have energy, which is shown through their color on the program. High energy is shown as yellow, and average energy is orange, and being sick is red from the neonics, and they disappear(die) when they lose all their energy.

Results: From this project we have learned that most deaths come from the corn and not exhaustion or the plants. The cotton and rosemary in real life will only actually help with their production of honey. These graphs show honey bee deaths in New Mexico and their causes closely match ours! What we discovered is that the bees only die when it comes in contact with neonics. We learned that neonics are the most powerful insecticide ever used in the USA. It's now illegal Europe because of its harmfulness to the bees.







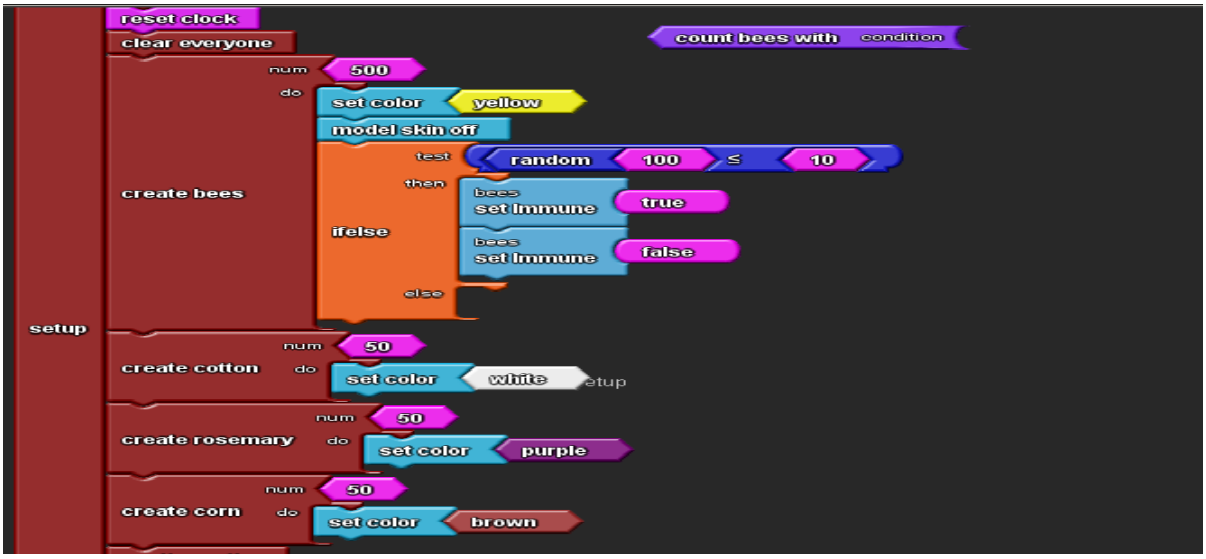
Conclusion: In conclusion we have gathered information showing that neonics are the main problem in the honey bee death. This is shown in the graph below. With the honey bee death less honey is being made and it is a way to lose money. Our biggest goal we achieved was getting the graph to follow our data and match the other ones. And by solving our problem the bees are dying because of the honey bee death. And the insecticide is so powerful. We have achieved that neonics one way or another it is still so deadly to the bees and the bees do die a lot from it and the bees are so busy and get a lot of pollen.

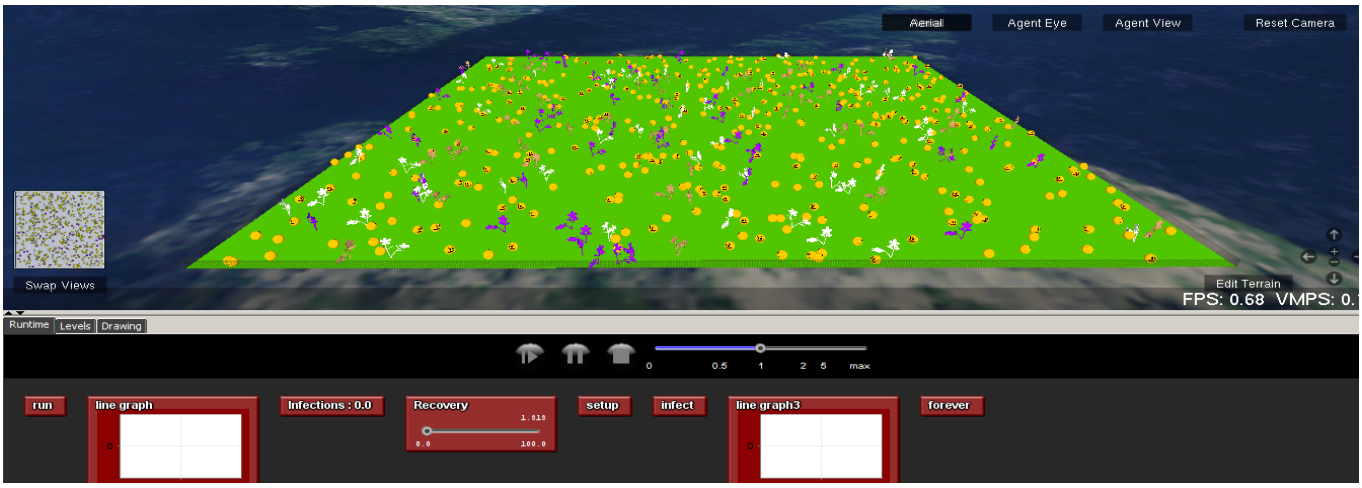
Acknowledgements: We would like to thank Rebecca Galves for introducing us, Noor Muhyi, Susanna Bali, and Laura and Gordon Solberg, as well as Rajaa Shindi.

The problem: How can this happen, all of our precious bees are dying?!? In the past 2 years there has been a wide spread of honey bee populations dropping! Why you may ask, neonicotinoids (neonics) that's why. Neonics have been a real problem to the insects, farmers, and especially the bees. Neonicotinoids are chemically close to nicotine and used as an insecticide. They were not used until 1980. They used them because they were less toxic than organophosphate, and carbamate. They also showed this insecticide is less toxic to mammals as well. Neonics have been banned from countries for being connected to honey-bee collapse disorder (CCD). The European Food Safety Authority showed neonics are a high risk to bees. The American Bird Conservancy and US Freedom of Information Act also banned Neonics on seeds for death of bees, birds, and aquatic invertebrates.Neonics are more than 24% of the market for insecticides. The goal of our project was to create a advanced, accurate, and a sophisticated model including: the bees and our 3 plants corn for the neonics, rosemary for the high level of energy it gives off, and finally cotton for it highly attractive flower for the bees. Each bee will have energy and can gain and lose it.

Solution: We had to make a program based on real world problems. So we could simulate that in a program because saying in literal form (real life) we would have to get a bunch of bees and that would be a hassle. So instead because this is super computing we used StarLogo TNG to simulate our program. But first research was made for this so we could figure out what neonics is and what it can do and how many bees in one hive we also found the bee's favorite type of plants were. And also real research was made in person not just online. So we could go to the bee keepers in Las Cruces or our university NMSU (New Mexico State University). And now with all this research we had we have got to make our wonderful program. And you may think TNG starlogo is for beginners, but we have incorporated so much that its just fun when it comes to StarLogo. Our Program is about 1 hive. And there' are 500 bees total, 1 bee represents 140 . Each bee has a certain amount of energy and when they move along the grid their energy decreases. But there are 3 different types of plants and they're rosemary, cotton and corn. The rosemary gives a lot of energy and the cotton gives some what amount of energy and the corn will just make their energy sink down a lot! The program shows that bees die if they have no energy or they run out of the energy they had.

Model: Our model is on StarLogo TNG. Our code consists of mostly collisions. Whenever they touch a plant , their energy level will change. If they touch corn, they will practically die. Rosemary restores and can even become greater than usual. Cotton is just a mutual plant it adds just enough. Whenever they move they lose energy, so the cotton fills it back up.





References:

About.com; Why are honey bees disappearing? (2014)

Berlew, Rusty; Better way to bee (2014)

Inc., Beesfree; Honey Bees are Dying (2012)

Inc.,Time; The trouble beekeeping in the anthropocene (2014)

Media, demand; Do corn stalks attract bees? (2010)

Mercola, Dr.Joseph; Beekeeping Industry 'Doomed' -- Might We See Destruction of Food Supply Before the End of This Decade? (2014)

NMSU;Honey bees in New Mexico (2013)

Tables:

Table 1. A Comparison of AHB and EHB Developmental Time and Longevity in Days.

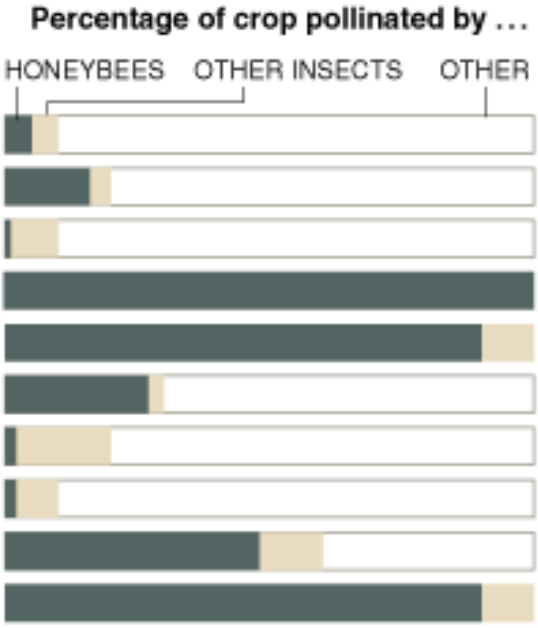
	Developmental Time (days)		Longevity (days)	
CAST	AHB	EHB	AHB	EHB
Queen	15	16	1-3 yrs	1-3 yrs
Worker	18.5	21	15-140	12-90
Drone	24	24	21-43	20-37

Type of adult bee	What they do	How many in a honey bee colony	How many in a bumble bee colony	What they look like in a honey bee colony	What they look like in a bumble bee colony
Queen	Lay eggs	1	1		
Worker	Take care of larvae, build and clean nest, forage	10,000-50,000	Less than 50 to over 400, depending on species		
Male	Leave nest to mate, then die	100-500	0-50, depending on species and season		

Relying on Bees

Some of the most valuable fruits, vegetables, nuts and field crops depend on insect pollinators, particularly honeybees.

	Crop value *in billions 2006*	Percentage pollinated by honeybees
Soybeans	$19.7	5%
Cotton	5.2	16
Grapes	3.2	1
Almonds	2.2	100
Apples	2.1	90
Oranges	1.8	27
Strawberries	1.5	2
Peanuts	0.6	2
Peaches	0.5	48
Blueberries *cultivated*	0.5	90

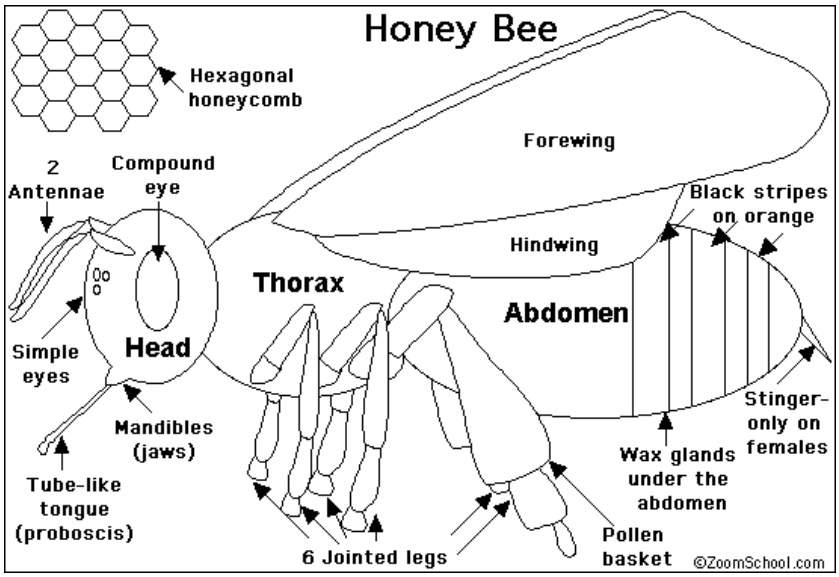


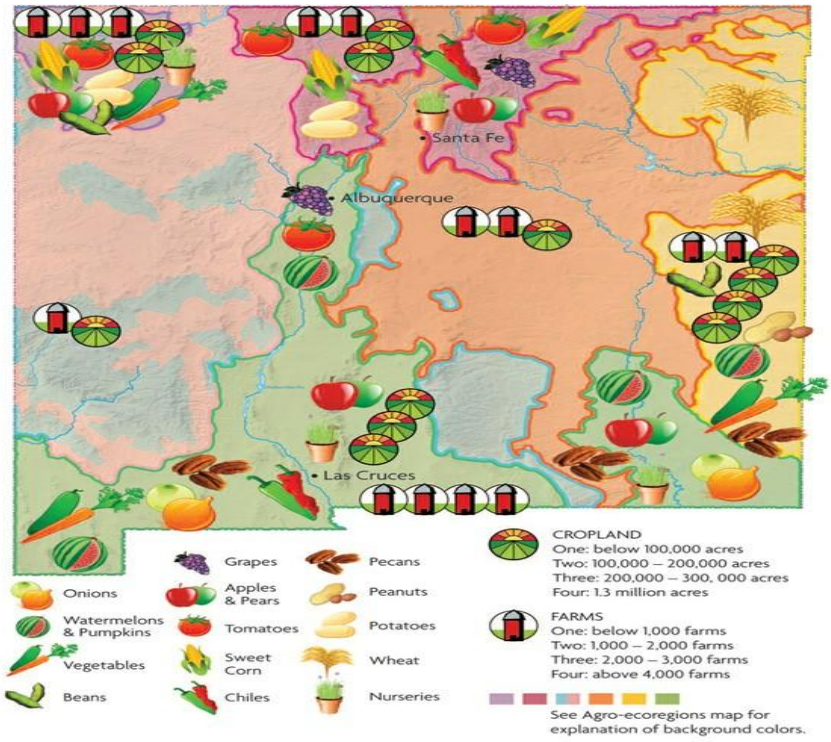
Besides insects, other means of pollination include birds, wind and rainwater.

Sources: United States Department of Agriculture; Roger A. Morse and Nicholas W. Calderone, Cornell University

The New York Times

Diagrams:


Honey Bee
Hexagonal honeycomb
Forewing
2 Antennae
Compound eye
Black stripes on orange
Hindwing
Thorax
Abdomen
Simple eyes
Head
Mandibles (jaws)
Stinger- only on females
Wax glands under the abdomen
Tube-like tongue (proboscis)
Pollen basket
6 Jointed legs
©ZoomSchool.com


Santa Fe
Albuquerque
Las Cruces
Grapes
Pecans
Onions
Apples & Pears
Peanuts
Watermelons & Pumpkins
Tomatoes
Potatoes
Vegetables
Sweet Corn
Wheat
Beans
Chiles
Nurseries
CROPLAND
One: below 100,000 acres
Two: 100,000 – 200,000 acres
Three: 200,000 – 300, 000 acres
Four: 1.3 million acres
FARMS
One: below 1,000 farms
Two: 1,000 – 2,000 farms
Three: 2,000 – 3,000 farms
Four: above 4,000 farms
See Agro-ecoregions map for explanation of background colors.