

Honey Bee Colony Collapse Disorder Model

What's being modeled?

Back in 2006 scientists and beekeepers started to notice that bees were disappearing out of the blue. Entire colonies of bees were dying out with for no apparent reason. Things ranging from GMOs to alien encounters were being blamed for the decline of bees scientist now call Colony Collapse Disorder, but the most believable of these causes are Pesticides, the Varroa Mite, High Fructose Corn Syrup, and Deforestation

The model will simulate the population and cross pollination of Honey Bees and flowers when affected by various detrimental factors relating to Colony Collapse Disorder (CCD). The goal of this model is to find out how these different factors work together to cause CCD, a major issue currently affecting bee colonies all over the United States.

The CCD Factors:

Pesticides:

Use the mouse to spray pesticides onto patches on ground which hurt bees that fly over them

The Varroa Mite:

Flip on the mites? switch to turn on blood sucking Varroa Mites that affect the infected portion of bees by damaging them every five ticks

High Fructose Corn Syrup:

Flip on the corn-syrup? switch to start feeding bees High Fructose Corn Syrup in place of pollen. The bees will gain energy but have a much weaker immune system

Deforestation:

Use the mouse to construct roads where flowers can't grow. The roads will alter the behavior of bees and flowers and cause clustering near the hive.

Results:

The results of the model with default settings show that pesticides and mites cannot cause CCD on their own but that when either is coupled with High Fructose Corn Syrup, bee colonies collapse almost every time.

The same thing happens when deforestation and pesticides affect the hive together since the roads block in the hive to a more limited physical space which causes clustering among flowers and bees, so bees are affected more by pesticides in that enclosed space

The Importance of Honey Bees

“...According to the U.S. Department of Agriculture, these under-appreciated workers pollinate 80 percent of our flowering crops, which constitute one-third of everything we eat. Losing them could affect not only dietary staples such as apples, broccoli, strawberries, nuts, asparagus, blueberries and cucumbers, but may threaten our beef and dairy industries if alfalfa is not available for feed. One Cornell University study estimated that honeybees annually pollinate \$14 billion worth of seeds and crops in the U.S. Essentially, if honeybees disappear, they could take most of our insect pollinated plants with them...”

- Maria Boland, “The Importance of HoneyBees”
Mother Nature Network, May 3, 2010

The Agents:

Bees:

The bees spawn from the hive and collect pollen from flowers. Once they have over 5 pollen, they deposit it into the hive

Flowers:

The flowers gain pollen over time and are pollinated by bees. Once pollinated they will release seeds and spawn new variant flowers

The Hive:

The hive turns pollen into nectar and spawns bees. It also grows another hexagon every 500 pollen deposited

