

In Need of Bees - An Agricultural Problem

Mekai Ely, Mark Cieslikowski, Roak Ely

Lincoln BCBs Community Team 07-0047

Linda Reynolds; teckteacher@yahoo.com

In Need of Bees - An Agricultural Problem

1. Pollinating Almond Trees

In California there are hundreds of thousands of acres of almond trees. Each February they produce beautiful white blossoms. This is the signal that they are ready for pollination and are desperately in need of bees. In fact, almonds are not the only fruit that are dependent upon bees for pollination. One of every three bites of food that you eat comes through the work of insect pollinators. And the honeybee is one of the most important pollinators. Crops like almonds, squash, pears, pumpkins, soybeans, cucumbers, melons, broccoli, cauliflower, blueberries, apples, cherries, and more all need bees. See FIG. 1. In fact, over 100 crops in the U.S. need bees, The bee moves pollen from the male and female flower organs lets the plant produce seeds and then fruit. Without them there would be a food shortage. [1]



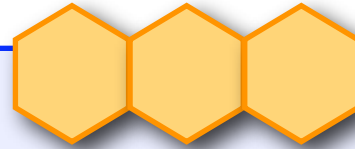
FIG. 1 Honeybee Pollinating an Almond Blossom

Photo: <http://www.npr.org/templates/story/story.php?storyId=6299480>

2. What Is the Problem?

1. Almonds are only fertile for 10-20 days a year around February and must be cross pollinated from tree to tree. This time of year can be cold, windy, and rainy. Bees don't like to go out under any of these conditions. Less bees going out, less almond crop, less profit.
2. The bee population has been steadily decreasing for 50 years. Hives have to be shipped in from farther away because there are less hives,
3. Mites have caused 98% of the wild bees to die off. [6]
4. Loss of wild habitat around orchards means less natural honeybees.
5. Bees are easily injured by the use of chemical sprays.
6. Thousands of beehives are lost for unknown reasons.
7. Bringing bees from other states and countries cause environmental problems. It takes fossil fuels to transport bees. Pests like beetles and fire ants may come along with the hives. Diseases may be transmitted.

2.1 Where Have All the Bees Gone?



Since 1950 the bee population has decreased about 50 percent and is still declining. This is due to pests, pesticides, diseases, and loss of natural habitat. Honeybees are very sensitive to chemicals like pesticides and herbicides. These chemicals make the bees very angry and they can even kill them. One pest that really hurts bees is the parasitic mite. They attack bees. The use of pesticides has caused stronger strains of parasitic mites. These stronger mites have harmed the bee population, Also, in 2005 over 250,000 bee hives in California were lost for unknown reasons.

On the other hand, the demand for almonds is increasing. Over 1.5 million tones of almonds are produced in the world on average each year. The United States is the largest producer of almonds and California grows most of those almonds. Almonds are California's 6th largest crop and the top agricultural export valued at over 1 billion dollars in 2003. The loss of natural habitats that used to surround the orchards and farms, has caused wild bees to decrease in numbers. This causes the need for commercial beehives. Beekeepers charge almond growers about \$100 per hive for pollination services. It takes 1.4 million colonies of bees to pollinate the almond orchards just in California. That is half of all the commercial beehives in the U.S. and around 50 billion individual bees. This is the largest managed pollination in the world. The bees come from 38 different states and some even come from foreign countries like Australia. [5]

3. Our Food Dependent on Bees, Nature's Workhorse

Many important products that we grow are dependent on pollination by bees. There has been something killing off hives all over the nation. Over the past few months about one fourth of the bee colonies have died mysteriously. This problem isn't only in the U. S. Other countries like Brazil and Canada have had the same problems this winter. Kevin Hacker from the USDA claims that bee loss could cause terrible problems for us, He said, "This is the biggest general threat to our food supply." Even our supple of beef is being affected because cattle eat alfalfa which depends on bees for pollination; no bees, no pollination, no alfalfa, no cattle, and that means no hamburgers. Scientists are trying to figure out why the bees are dying and fix the problem. The top four causes are a parasite, a virus, a bacteria or a pesticide.

(U.S. Department of Agriculture) [8]

4. Problem in California

With all of the demand for good, safe, economic almonds, California faces a problem if pollination becomes more difficult. Demand is increasing but production is being limited by pollination problems. The environment is being changed by increase in land use for houses and cities and less land for natural woods. This changes the bee population also. The Almond Board of California has set up the Bee Task Force to deal with problems with pollination. The Bee Task Force is a subcommittee of the Production Research Committee. Its job is to help make sure that there are enough bees to take care of the pollination process. They are searching for new technologies to help the bee problem.

The demand for almonds has increased because of new studies and new marketing strategies. Almonds are a good source of nutrition and are heart healthy. Eating them helps in lowering cholesterol and provide antioxidants. Tufts University did research on almonds and found they provide as much of the antioxidant called flavonoids as green tea and broccoli. Almonds also help to maintain proper body weight. The use of almonds in restaurants dishes has increased over 16% in the last year.

Almonds are an important crop in California. By the end of the decade the crop should be about 1.5 billion pounds and support thousands of jobs for Californians. California produces almost 100 percent of the domestic almonds. There are six thousand growers in the Central Valley and 580,000 acres of almond trees. See FIG. 2. Two thirds of California almonds go to other countries like Spain, Germany, Italy, France, and Japan. That's over 610 million pounds of almonds. The need to have good relations with other trade markets is important. Also having almonds that are safe is important. The industry is working on pasteurization of almonds. [1]

Photos- <http://www.bluediamond.com/almonds/index.cfm>



4/1 Almond Production in California

California's almond crop was worth \$1,626,000,000 dollars last year. It is the number 1 tree nut crop in the state. Finding ways to pollinate the growing almond trees is very important problem. In the California Central Valley there are about six thousand growers who have 580,000 acres of almonds. They produced over 912 million pounds of almonds during the 2005-06 season. California produces almost 100 percent of the almonds grown in the U.S. and about 80 percent of the almonds for the entire world market. [1]

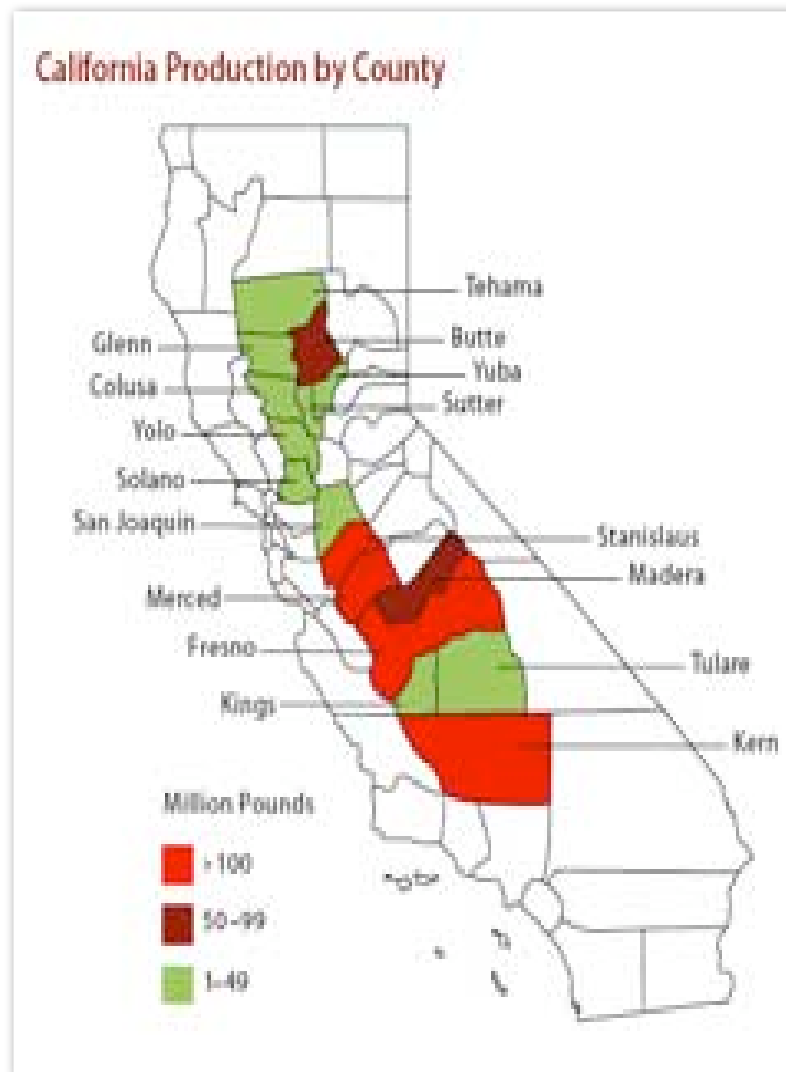


FIG. 2 California Production by County
Photo - <http://www.almondboard.com/files/PDFs/ALM%5F6060%5FAlmanac07lr.pdf>

Source: Almond Board of California, USDA, National Agricultural Statistics Service, California Field Office

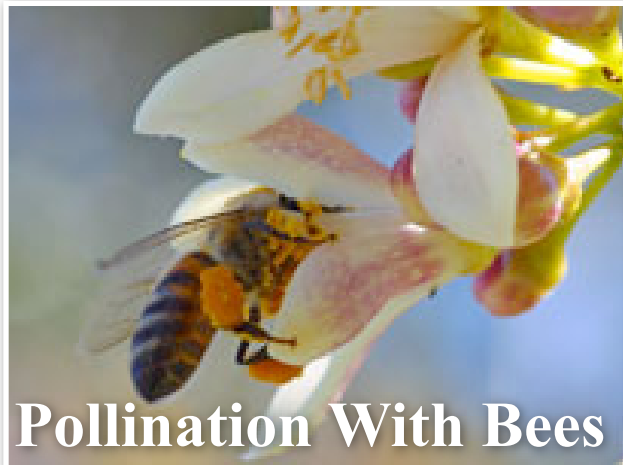


FIG. 3 Honeybee Gathering Pollen

Photo - <http://pdphoto.org/PictureDetail.php?mat=pdef&pg=8051>



FIG. 4 Bee Hives

<http://www.npr.org/templates/storyID=6299480>

5. Honeybees - Nature's Pollinators

Honeybees are an important pollinator for food production. A pollinator is an animal or insect that collects pollen and spreads it to other flowers. Some examples are bees, butterflies, moths, flies, wasps, and some nectar feeding bats.

Honeybees are the best pollinators. See FIG. 3 They are better than a lot of other insects because they search out pollen and carry it back to their hives. See FIG. 4. Other pollinators just seek out nectar. Bees use the pollen for their young. While doing this the pollen is spread to other flowers and fertilization happens. Pollen is taken from one flower to another flower and that causes the fruit to grow. [4]

Bees use pollen baskets called Corbicul to collect pollen and carry it back to its hive. [6] Their legs are covered with hairs that attract the pollen and it falls off when the bee walks on other flowers. See FIG. 5. In one hectare of orchards you need five to eight colonies of bees for pollination. Three and a half million acres of crops in the U.S. are dependent on honeybees



FIG. 5 Pollen Basket or Corbicul

Photos - <http://en.wikipedia.org/wiki/Pollen>

The weather affects bees a lot. They won't go out to forage if the temperature is below 11 degrees C. or in any kind of rain. Bees begin very active flying when the temperature is above 16 degrees C. Bees don't forage much if the wind is above 23 km per hour. They also don't go out as far from the hive if it is cloudy. [2]

Bees fill up their pollen basket and take the pollen back to the hive.

Bees are social insects. They live in colonies and depend upon each other. There are 50,000 bees in each hive. There are three types of bees in each hive, female workers, male drones, and one queen. Bees in just one hive will make 4.5 million trips to flowers in just one day. Also 1000 worker bees will die each day in the summer. California uses 1.4 million hives to pollinate its almonds. That's over 50 billion bees.

Bees face many dangers. One that is getting worse is the parasitic mite called *Acarapis woodi*, Mites have 8 legs making them arachnids like spiders. They live in the bee's breathing tubes and cause harm to the bee by sucking blood and fluids. This can kill the bee immediately or shorten its life. [2]

Modern use of pesticides and fungicides has caused great problems for bees. They are very sensitive to chemicals and refuse to go out and work in areas where chemicals are sprayed. Bee keepers have to remove the hives for 48 hours when orchards are sprayed. [3]

Honeybees are kept commercially. The wild bees that used to help in pollination are disappearing with their habitat, the woods and streams near orchards.

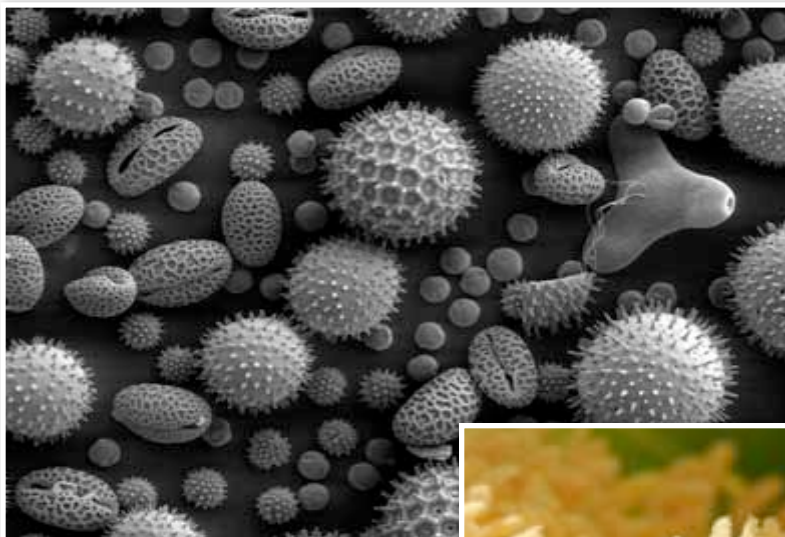


FIG. 6 Pollen Magnified



FIG. 7 Pollen Tubes

Photos - <http://en.wikipedia.org/wiki/Pollen>

Bibliography

Websites:

- [1] <http://www.almondboard.com/files/PDFs/ALM%5F6060%5FAlmanac07lr.pdf>
- [2] <http://www.dpi.vic.gov.au/dpi/nreninf.nsf/childdocs/-89E7A8DAFEA417624A2568B30004C26AC6A014FC88F23F19CA256BC700811628-26181E79F5B05B3F4A256DEA0027399A-258AA7889AF75995CA256C190007EF87?open>
- [3] <http://www.ebeehoney.com/Pollination.html>
- [4] <http://www.gpnc.org/honeybee.htm#POLLEN>
- [5] <http://www.npr.org/templates/story/story.php?storyId=6299480>

Books:

- [6] Michener, Charles D, The Bee Genera of North and Central America, Smithsonian Institution Press
- [7] O'Toole, Christoopher, Bees of the World, Blandford Publishing Que Publishing, 2004

Periodicals:

- [8] The Desert Sun, May 3, 2007 Bee Killer's Other Victim: Your Dinner