

Pollinators with focus on Honey bees



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Pollinators

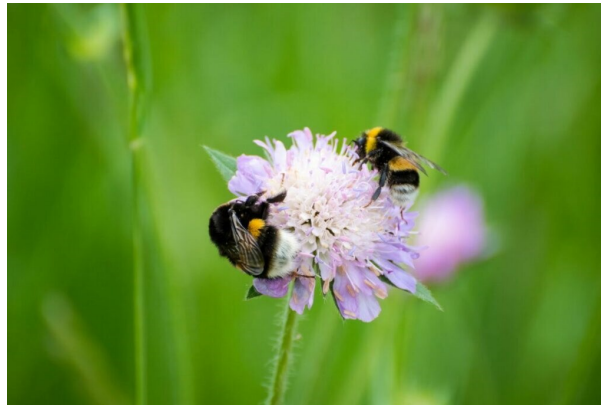
1. Honey bees
2. Bumble (native) bees
3. Wasps
4. Humming birds
5. Butterflies
6. Ants
7. Moths
8. Mosquitoes
9. Flies
10. Sun bird
11. Honey eater bird
12. Humans

Bee History

- Bee fossils date back 150 million years.
- Bees existed at least 14 million years ago in North America.
- The new analysis shows western honey bees (*Apis mellifera*) originated in northern Europe around 780,000 years ago before spreading through southeast Europe into East Africa and Arabia roughly 660,000 years ago. The bees then headed south into sub-Saharan Africa around 192,000 years ago.
- Honey bees were brought to North America in the 1620's by immigrants.

North American Native Bees

- 4000 different species of native bee including, bumble, carpenter, leaf cutter, sweat, long horned mason and miner bees to name a few.
- 400 different species of native bee in New York alone.
- 200 different species of native bee in New York City.



Native Bee Facts

- Most native bees are called “buzz pollinators”, especially bumble bees.
- They vibrate their bodies to shake pollen free, making them 2 to 3 times better at pollination.
- Honey bees do not vibrate to pollenate.
- Not one native bee produces true honey. Not one!
- Most native bees live alone (solitary).
- Most of them have no queen.
- Unfortunately, native bees are overshadowed by honey bees!

Honey Bee History

- New York has a long history of beekeeping and equipment design to improve colony health and inspection practices, example replacing domed straw Skeps with Langstroth, Reverend from Philadelphia), boxes and removable frames.



Honey Bee History

- Much thought went into the design of the Langstroth hive. From the adjustable entrance, stackable boxes for expansion, movable frames for splitting hives, honey removal and inspection. All internal parts are spaced to deter bridge comb or propolis buildup. The magic number is $\frac{3}{8}$ of an inch, called bee space. Devices like queen excluders, feed frames, drone frames and screened bottom boards are used.
- New hive designs, Flow, Top-bar, Warre, & Horizontal.
- In the early 1900's beekeepers began recording bees losses, called spring dwindling, disappearing disease, May disease, Autumn collapse, believed due to loss of forage, pesticide use and parasitic mites.

Typical Honey Bee Illnesses/Threats

- Small hive beetle (pest)
- Wax moth, worms (pest)
- Sac brood virus (virus)
 - Chalkbrood (fungal)
- Tracheal mites (pest)

Typical Honey Bee Illnesses/Threats

- American foulbrood disease, (bacterial spores) burn equipment
 - European foulbrood disease, (bacterial spores)
 - Nosema, microscopic (fungal)
 - Dysentery, poor food & long containment
 - Septicemia, (bacterial) blood disease

Farming Practices

- The advent of modern agriculture in the 1930's ushered in several detrimental practices.
- Large, single source food plots, spraying of fertilizers, pesticides, fungicides and herbicides.
- Boxing and moving bees around the country to pollinate crops.
- Beekeepers noticed commercially raised bees were especially vulnerable to disease due to colony density.

Recent Honey Bee Illnesses

- 1980's the first varroa mites were introduced to the US.
- Varroa mites were indigenous to Asia.
- The mites spread quickly in the US due to not realizing the scope of the threat. Bees were being moved throughout the country in large quantities for pollination and through large scale sale of packaged bees.
- The mites affect the immune response of the honey bees making them much more vulnerable to illness.
- Deformed wing virus, acute and chronic paralysis viruses (Kashmir bee virus or Israeli complex) that affects the bee's RNA.

Recent Honey Bee Illnesses

- Introduction of Neonicotinoid pesticides especially devastating in the 1990's. Neuro-active insecticide chemically similar to nicotine.
- 2006 large quantities of overwintered colonies in north America were found to have virtually no adult bees. Coined "Colony Collapse Disorder". This started the recent call to action to save the bees.
- The causes are not fully understood because only survivors are tested (since most of the bees left the colony).
- Possibilities are a new Nosema, viral infections, varroa mites, environmental stresses, poor nutrition, pesticides, migratory beekeeping practices, weather, cell phone radiation and genetically modified crops.

Pest Control Management

- Called “IPM” Integrated Pest Management which includes:
 - Educated hive inspections
 - Screened bottom boards
 - Removal of old comb in hives frequently
 - Cleaning of hive tools
 - Beetle traps
 - Brood Brakes, drone brood freezing via (queen trapping and/or green drone frames)
 - Late season requeening

Pest Control Management

- Natural methods, sugar wash, thyme leaves and rhubarb leaves (oxalic acid).
- Treatments, organic, soft chemical:
 - Natural oils and extracts.
 - Thymol, eucalyptus, menthol & camphor
 - Oxalic acid vapor, drip or sublimation (372F).
 - Formic acid (naturally in bee venom)
- Treatments, inorganic, hard chemical:
 - Amitraz

Numbers

- Despite all the challenges and stories published, there are more bees on the planet today than at any time in history. Bees are resilient, with survivors adapting to withstand challenges.
- Over 25 million colonies on the planet. Some estimates are higher.
- In the US, over 3 million colonies, from lows in the 1960's of 1.5 million. Recently updated to 3.8 million.
- Because honey bees are a domesticated/managed species we have been able to increase their numbers. Unfortunately native bees are not increasing to the same degree and all bees are under stress.
- Honey production is down to 150 million pounds today from over 200 million pounds in the 1990's.

Numbers

- Three-quarters of our crops depend on pollinators to some extent, but only one-third of global crop production does. This is because many of our largest producing crops (staples such as cereals) are not dependent on them at all.
- In 1973 the US passed the ESA (Environmental Safety Act) to protect plant and animal species that are of esthetic, ecological, educational, recreational and scientific value to our nation and its people.
- The list is evaluated by the US Fish and Wildlife Service and the National Oceanic and Atmospheric Administration.
- There are currently 9 species of native bees on the list.

Challenges Ahead

- Honey and native bees under pressure from weather, pesticides, insecticides, fungicides, herbicides and uneducated beekeepers.
- Pesticides are now showing up in the wax and honey.
- Native bees are under tremendous stress, much more than honey bees, with some species near extinction due to:
 - Lack of floral food sources and habitat due to urbanization.
 - Lack of floral food sources due to single crop farming.
 - Lack of floral food due to competition with honey bees.
- TROPI mites not in US yet. In Thailand and Korea. Do not feed on brood.

Challenges Ahead

- Asian (Eastern) giant hornet, or Northern giant hornet or murder hornet. Spotted on West coast.
- European Hornet.
- Yellow legged hornet or Asian hornet. Spotted in Georgia.

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Recent Promising Findings, Honey Bees

- Roughen the interior of the hive boxes to promote propolis coverage by the honey bee. It is a resinous substance collected from tree sap. Often referred to as bee glue. It has antifungal and antibacterial properties that provide bees with some defense against pathogens.
- Hygienic behavior is an inherited activity that helps maintain the health of the colony. Improving the speed and effectiveness at which the workers remove infected, dying or dead brood and mites from cells is important.
- Some beekeepers are breeding new bee variants, selecting queen bees that produce worker bees that excel in hygienic behavior.

Recent Promising Findings, Honey Bees

- One method is freezing a section of capped brood cells in a hive with liquid nitrogen and returning the frame to the hive. The number of cells uncapped with dead brood removed after a determined amount of time shows which queen is preferred and used for future generations.
- Another method is spraying a section of capped brood cells with a pheromone similar to that of the varroa mite and returning the frame to the hive. The number of uncapped cells after a determined amount of time shows which queen is preferred.

Goals for Native and Honey Bees

- Reduce the amount of pesticides, insecticides, herbicides and fungicides used.
- Native bees benefit from a bit of a mess. Don't rake up every leaf or cut back every plant in the fall. Leave fallen branches and debris in place.
- Grow/plant diverse, flowering plants and trees that bloom throughout all seasons. Secondary benefit is carbon absorption.
- Build habitat boxes for native bees. Reed boxes (mason bees) and double chamber (bumblebees).
- Continuous education with more emphasis on native bees.

Goals for Native and Honey Bees

