

Declining Bee Populations



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Why Bees Are Necessary

Of the 20,000 known species of bees, all are pollinators. That means that bees help spread pollen from male flower organs to female flower organs. Pollination is an essential part of plant reproduction because it produces new seeds and fruits. It might be surprising to learn that 90% of wild plants and 75% of global food crops rely on pollinators!

Bees greatly contribute to food security and biodiversity. Crops that depend on pollination (e.g., blueberries, apples, and almonds) can't grow on their own. Most pollination-



dependent crops are nutrient-rich, and without those crops, our diets would be imbalanced. An estimated 173 million people would have vitamin deficiencies without bees!

Besides pollinating food crops, bees also create other useful products. Honey is a natural sweetener that has antioxidant and antibacterial properties. Beeswax is used in cosmetics, candles, surfboard wax, and sewing thread conditioners. Propolis, another bee product, is an antibiotic that can be found in pharmaceuticals. These products all benefit our lives.

Pollinators also contribute to the world's economies. Globally, crops that rely on pollination produce \$235 to \$577 billion every year. Bees also provide business opportunities for people. Beekeepers, beekeeping assistants, researchers, apiary inspectors, and bee removers all owe their jobs to bees. Bees are job creators!

Challenges

The bee population has been declining since the 1990s. The rate of extinction of pollinators is 100 to 1,000 times higher than last century due to farming practices, habitat loss, pesticides, climate change, globalization, parasites, and diseases.



Mono-cropping, a farming practice that involves growing crops on the same land over and over again, is harmful for bees. Bees need nutrients from a variety of plants, but mono-cropping destroys biodiversity, which harms bees' immune systems, making them more susceptible to pests, diseases, and pesticides.

Intensive farming practices also lead to habitat loss for bees. And the increase of urban areas and the changes in the way we use our land contribute to habitat loss. Without enough trees and flowers, bees can't find a nesting space or obtain sufficient food.

Pesticides that contain neonicotinoids can also harm bees. Contact with pesticides can disrupt bee reproduction. It can also interfere with bees' ability to navigate and resist diseases.

Climate change contributes to the declining bee population as well. Rising temperatures affect the bloom times of flowering plants, which disrupts the synchronization between bees and flowers. Bees are getting less food, and crops aren't being pollinated. That's a problem!



Rising CO₂ levels have caused some plant proteins to become diluted, so bees are consuming less protein. That dietary change impedes bee reproduction, which results in a decrease in the bee population.

Globalization has made bees more vulnerable to pests and diseases than previous in generations. Pathogens travel through trade, making them more widespread. Industrial hives also create the ideal breeding environment for those pests and diseases. Although industrial hives have some benefits, they can be harmful for bees if they aren't taken care of properly.

The Varroa destructor is a parasitic mite that contributes to the declining population of bees. The varroa mites spread viruses to bees and feed on a tissue in bees that holds fat cells. The varroa mites affect Asian and European honeybee drones and worker bees. Australia is the only country that is free of varroa mites.

Solutions

The main challenges that bees face are habitat loss, pesticides, farming practices, and diseases. While climate change and globalization contribute to declining bee populations, they are only part of the bigger problem.



Green-Tech Solutions

Planting native flowers and trees can help combat bee habitat loss. A quick online search reveals native plants that benefit bees. [Specify Your Location's Native Plants Finder](#) is a great website that helps users find native plants in the United States. Some native plants can also be grown in pots, so it isn't necessary for you to have lots of space.

Trees also provide food and shelter for bees, who use resin and leaves for nesting and tree cavities as shelter. Joining a local tree planting program is a simple but effective way to help out the bees.

Making a bee hotel is a fun way to provide a safe nesting place for solitary bees that don't live in hives. These hotels use hollow reeds, drilled wood, or even clay to mimic natural nests that bees make. [National Geographic's Build Your Own Bee Hotel](#) has some instructions to help you get started!

Like humans, bees need water to survive. You can make a bee water fountain by filling a shallow plate with water. You can add rocks, sticks, or marbles to prevent bees from drowning while they are drinking.

Using toxic pesticides can harm bees, so it's best to avoid using them in your garden. Alternatives to pesticides work just as well as the toxic chemicals, and they don't harm bees.



Introducing plants that repel certain bugs in the garden can help get rid of any plant-eating insects without harming bees. Examples of such plants include garlic, catnip, peppermint, and chrysanthemums. These plants can keep out ants, aphids, slugs, beetles, and mosquitos. Here's a link to more information: [15 Garden Plants That Repel Pests Naturally](#).

Carnivorous plants can also help you with pest control in your garden. You can use butterworts, sundews, and pitcher plants to catch ants, aphids, flies, beetles, slugs, and snails. Carnivorous plants can separate pollinators from the insects they prey on. Because flowers are taller than traps and usually bloom first, it's unlikely that the carnivorous plants will eat the bees.



Just like plants, certain beneficial insects can help you get rid of pests. Ladybugs, wasps, and praying mantises are just a few of the insects that can help you control pests in your garden.

Organic pesticides can reduce harm to bees, but some are still harmful to bees, so it's best to know what you're buying. Organocide 3-in-1 garden spray is an example of an insecticide, miticide, and fungicide that's safe for bees.

You can also make homemade pesticides with a tablespoon of dish soap and a cup of vegetable oil. A quart of water in two teaspoons of the solution will suffocate pests. You can find a variety of recipes that work better for certain gardens. Here's a link to other pesticides: [8 Natural & Homemade Insecticides: Save Your Garden Without Killing the Earth.](#)

Completely avoiding pesticides is the best way to protect bees, but you can reduce damage to bees if you must use pesticides. Finding pesticides with active ingredients that aren't toxic for bees is essential. Here is a chart about the active ingredients in pesticides and the level of toxicity of each ingredient: [Toxicity of Pesticides to Pollinators and Beneficials.](#)



First and foremost, always read and follow the instructions of pesticides so you aren't causing more harm than necessary. One easy way to ensure that you don't harm bees while spraying is to make sure that there are no bees on the plants you're spraying with pesticides. You also shouldn't use pesticides while crops are blooming, but if you must do so, it's best to use a fast-drying spray.

It's essential to pay attention to the weather when spraying pesticides. For example, the wind can spread pesticides. Changing nozzles or using less pressure when spraying can reduce pesticide drift. It's always good to be aware of your surroundings while using pesticides!

You can replace mono-cropping and other intensive farming methods with ecological farming, a type of farming that prioritizes biodiversity so natural habitats aren't destroyed. Eco farming uses a mixture of plants without using harmful chemicals such as those in pesticides or fertilizers. You can also use natural compost to restore nutrients in the soil.

Bio-Tech Innovations

Low-tech solutions prioritize habitat loss, pesticides, and farming methods. Technological innovations focus on the pests and diseases that threaten bees.



Many bees have poor nutrition as a result of habitat loss, which weakens their immune systems. That means that bees are becoming more vulnerable to pests and diseases.

SeedLabs is a California-based company experimenting with a product called BioPatty, a bee food that's packed with probiotics to improve bees' immune systems. With better immune systems, bees are less likely to get infections and more likely to survive the threat of pesticides.

Research has shown that bees that consumed BioPatty have fewer pathogens than bees in control groups. Researchers are still experimenting to determine the best way to use BioPatty to feed bees and the specific effects of the food.



Varroa mites can be devastating for bee colonies. There are already treatments for getting rid of these mites, but not all of them are safe for bees.

The Thermosolar Hive is a specially built hive that uses the sun to kill varroa mites. The hive has four parts: an outer cover, a

thermosolar ceiling, thermosolar boxes, and the varroa bottom. The most important parts are the outer cover and thermosolar ceiling.

The outer cover contains insulation that acts like the on/off button for the warming process. When the outer cover is off, it starts getting warmer. A special color applied to the thermosolar ceiling helps turn light radiation to thermal radiation. Glass placed on top of the surface creates a greenhouse effect.

During the warming process, the temperature inside only kills the mites and ensures that the bees are safe. All the mites are killed in the process, the only ones that survive are those attached to bees outside the hive.

This innovation not only kills the varroa mites, but the solar energy allows colonies to develop faster in the spring. It's also easier for bees to survive during the winter. [Thermosolar Hive](#) has more information about how the hive works.

Bee Innovative is an Australian company that created the BeelD, a product that uses facial recognition to collect data to help identify diseases or pests. This product prevents outbreaks altogether.

Conclusions

Bee populations are declining because of habitat loss, harmful farming methods, the use of pesticides, parasites, and diseases.

Planting native flowers and trees, making a bee hotel, and creating a water fountain are easy ways to reduce habitat loss. If we replace harmful farming methods with ecological farming techniques, we can reduce bee habitat loss. Alternative solutions and using pesticides correctly can also reduce harm to bees!



Organizations all over the world are working on large-scale solutions to help bees. Companies are using innovations like Thermosolar Hives, BioPatty, and BeelD to help bees fight parasites and diseases that them.

Although the COVID-19 pandemic has been devastating for humans, it has actually been good for bees because it has reduced air pollution from cars. Less pollution in the air means that bees can smell the scents from flowers, and they have to make shorter trips to find food.

While researching bees for this report, I was surprised to learn that pesticides had such a huge impact on bees. Growing up, I knew that pesticides had a bad reputation, but I didn't know just how harmful they were to bees. Now I know that pesticides had a bad reputation for a reason!

The solutions that I liked the most were the bee hotel and water fountain because anyone can create them with the right materials. I think that this would be a great activity to do with children because you can have fun while helping bees at the same time!

Resources

[Welcome to the United Nations](#)

[Bee-ing grateful to our pollinators | FAO Stories](#)

[Why bees are finally getting a break.](#)

[Decline of bees, other pollinators threatens US crop yields: Largest study of its kind highlights risk to global food security](#)

[How Rising CO2 Levels May Contribute to Die-Off of Bees](#)

[Worldwide occurrence records suggest a global decline in bee species richness](#)

[Pollination Facts](#)

[Honey and other bee products - Celebrate World Bee Day](#)

<http://www.fao.org/pollination/background/bees-and-other-pollinators/en/>

<https://www.pnas.org/content/116/5/1792>

<https://www.bbc.com/future/article/20200506-why-lockdown-is-helping-bees>

<https://thebeeconservancy.org/10-ways-to-save-the-bees/>

<https://www.masterclass.com/articles/garden-plants-that-repel-pests-naturally#15-garden-plants-that-repel-pests>

<https://www.science.org.au/curious/everything-else/bees>

<https://friendsoftheearth.uk/nature/what-are-causes-bee-decline>

<https://www.nationalgeographic.org/media/build-your-own-bee-hotel/>

<https://insider.si.edu/2015/06/how-carnivorous-plants-avoid-eating-their-pollinating-insect-friends/>

<https://infonet-biovision.org/News/Ecological-Farming-Seven-Principles-Food-System-has-People-its-Heart>

[In a Nutshell - Technology of Thermosolar Hive™ | thermosolarhive.com](#)

<https://beeinnovative.com.au/>

<https://seed.com/seedlabs>

Acknowledgements

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Website: <https://www.flickr.com/>

Photo: <https://www.flickr.com/photos/krayker/4312985916>

Photographer: <https://www.flickr.com/photos/krayker/>

Photo: <https://www.flickr.com/photos/iwmi/15891050438>

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Website: <https://unsplash.com/>

Photo: <https://unsplash.com/photos/hAYy2mFLjS8>

Photographer: <https://unsplash.com/@coolcalm>

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