Ecosystem Services

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Ecosystem Services

Direct and indirect contributions of ecosystems to human wellbeing

- **Provisioning:** ie. food, water
- **Regulating:** ie. climate, pollination
- **Cultural:** ie. tourism, education
- **Supporting:** ie. ecosystem process maintenance

IUCN, 2020

Importance of Ecosystem Services

Clean air/water

Forests help maintain healthy aquatic ecosystems

Crop production

Provision of agriculture

Pollination

Animal droppings/dispersal

Flood control

Mangrove functionality

Source: Fao, 2023

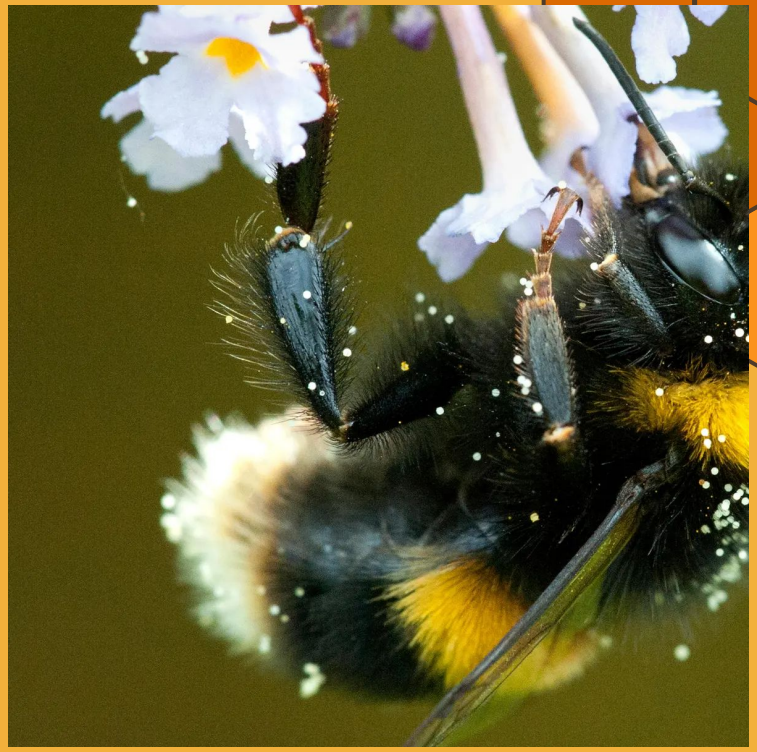
Bees.

Why Bees?

Human nutrition would likely suffer without bees (M. Petruzzello)

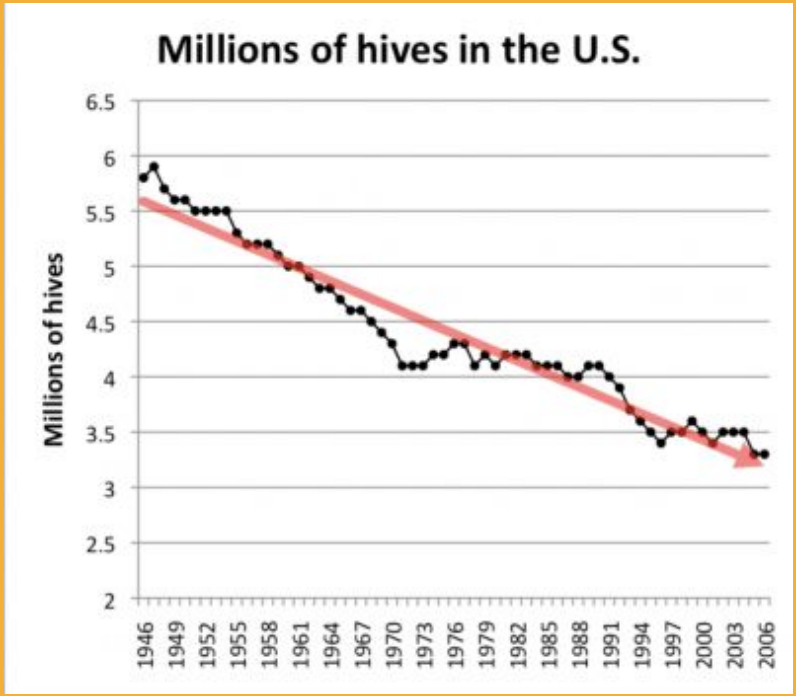
PROVISIONING, REGULATING, CULTURAL SERVICES

- Provide food and other products
- Food security
  - Plant and crops are able to reproduce from pollen distribution
- Value of products help deepen the science of bees and bring insight into their importance
  - Apiculture tourism



Photograph: Vanessa Slawson/Alamy

Bees are in trouble!
As pollinator species, particularly bees, experience population decline, people's livelihoods and the global food system are threatened



Major Threats to Bee Populations

- Human-BEEhavioral Impacts / Climate Change
  - Pesticide Exposure
  - Habitat Loss & Fragmentation / Lack of Genetic Diversity
- Environmental Threats
  - Diseases & Parasites
  - Death of the Queen / Lack of Instincts to Reproduce

3 Key Threats:

Varroa Mites

These parasitic mites attach themselves to honeybees and feed on their blood, weakening the bees and making them more susceptible to other diseases.

- Weakening and killing bees
- Spreading viruses
- Reducing honey production
- Reducing genetic diversity

Nosema

This fungal parasite infects the gut of bees, causing them to have trouble digesting food and weakening their immune system.

- Weakening and killing bees
- Impairing bee immune systems
- Reducing honey production
- Increasing winter losses

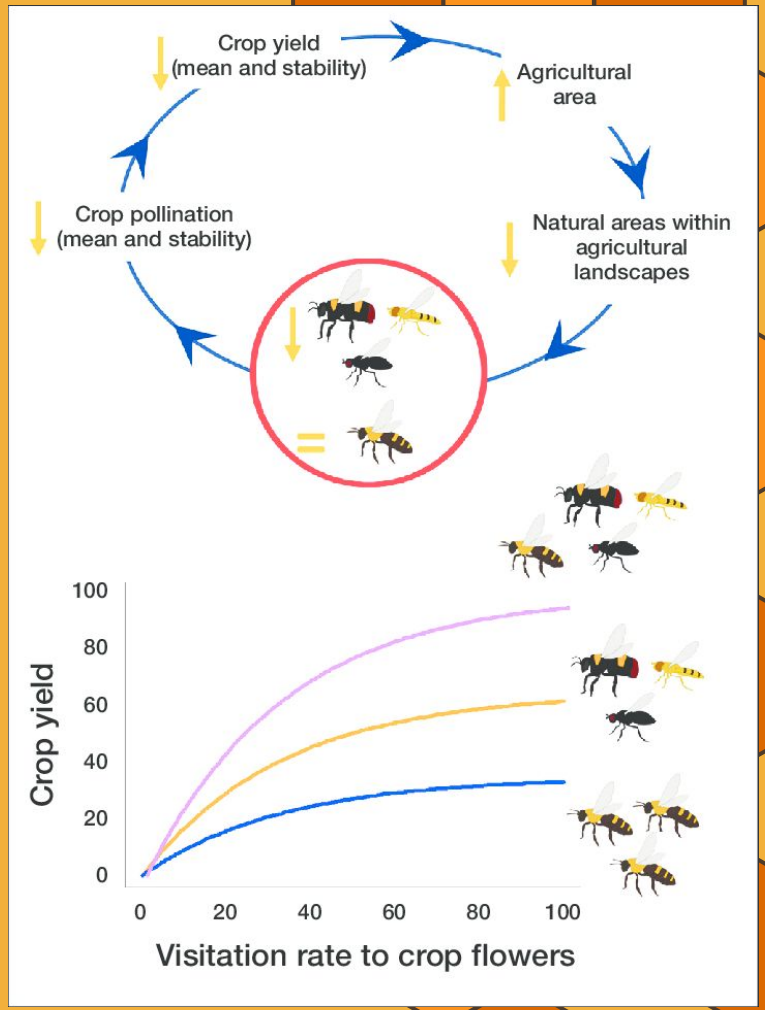
CCD

Colony collapse disorder (CCD) is a phenomenon in which the majority of worker bees in a colony disappear, leaving behind the queen and a few nurse bees. The exact cause of CCD is still unknown, but it is believed to be the result of a combination of factors including disease, parasites, and pesticide exposure.

- Loss of entire colonies
- Decreased pollination services
- Reducing honey production
- Increased cost for beekeepers

Who This Affects

- People who rely on agricultural systems for food (about 80% of crop species require pollination by an animal)
- People who rely on plant-based forage for food
- Workers in agricultural industries

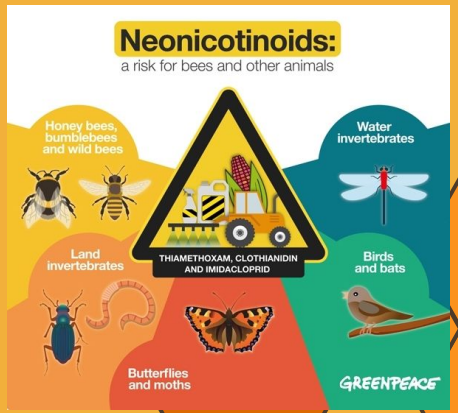


Continued...

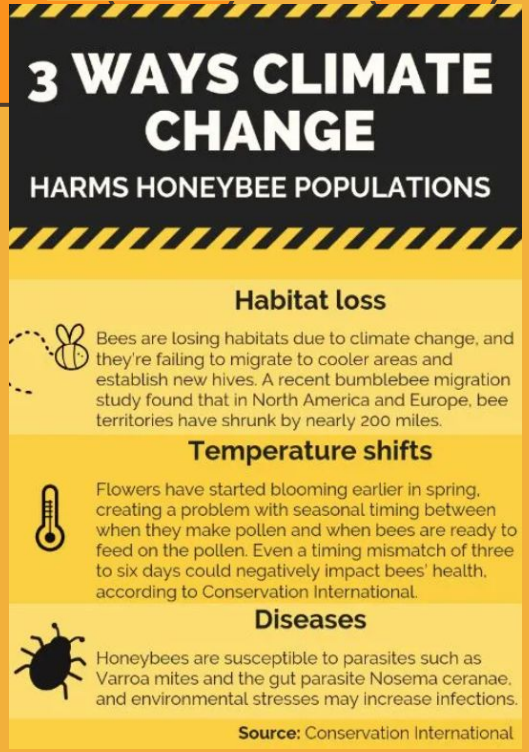
- Urban planners, landscape design architects, visual artists etc who rely on pollination of aesthetically significant species. Additionally, wild animals valued for aesthetic appeal like songbirds depend on forage from pollinators.
- Plant geneticists/nurseries: fruit bearing plants are more desirable in retail settings.
- Hobbyist beekeepers and recreational gardeners

Case Study: Bees and Blueberries

- **Location:** Maine, USA
- **Their impact:** Blueberries are a major crop in Maine, with an annual value of over $250 million
- **The problem:** Honeybees play a crucial role in pollinating blueberries, but in recent years, beekeepers in Maine have reported significant losses of honeybee colonies due to factors such as disease, parasites, and pesticide exposure namely Varroa mites and Neonicotinoids.



Important Ecological Components to Address



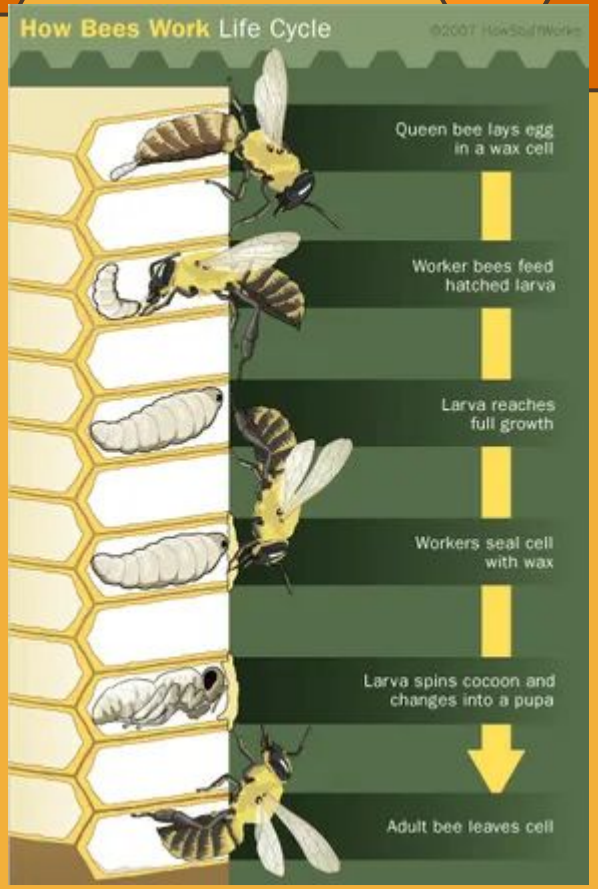
1. What are the main factors contributing to declines in bee populations and pollinators in the ecosystem, and how do these factors interact with each other?

2. What is the current state of biodiversity in the ecosystem, and how is this related to the provision of pollination services by bees and other pollinators?

3. What is the impact of climate change on the ecosystem, and how is this affecting bee populations and their ability to provide pollination services?

Areas for Natural Research

1. In beehives, if the queen dies and a new one is introduced, there is the possibility that the bees will not accept the new queen.
    a. This would ultimately result in the hive perishing
2. It would be interesting to do natural research about what kinds of things bees need (pheromones, ecological factors, etc.) would be needed to accept a new queen bee
3. Are there impacts from pesticides on the beehavior (haha) in accepting a new queen?



Important Social Components to Address

1. Given the impacts that bee population declines have on agricultural yield, what implications does this have for food systems and security?

2. How can Western scientific approaches, traditional ecological knowledge and indigenous perspectives be integrated to support bee population conservation efforts?

3. What are the ramifications on pharmaceuticals and therapeutic applications (for example, apitherapy) as a result of reduction in bee populations?

ENVIRONMENT U.S. & WORLD

Is a bee a fish? California court says it could be

By Hannah Murdock | Jun 6, 2022, 9:00pm EDT

CURRENT POLICY IN THE US: DISPROPORTIONATE FOCUS ON HONEYBEES?

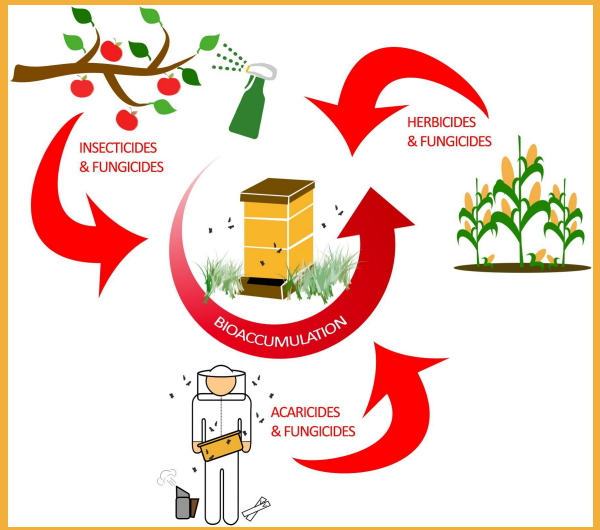
- Conservation Reserve Program
- Pollinator Habitat Protection Act (2007)
- Pollinator Partnership Action Plan (2016)
- Pollinator protection policy focus - CCD and honeybee versus protection of native bees

(Iwasaki and Hoogendoorn) (Colla and MacIvor)

- **EPA - interim proposed decision on neonicotinoids and existing pesticide action.**
- **Federal Strategy to Promote the Health of Honey Bees and Other Pollinators (2014)**
- **Endangered Species Act**

Current Policies and Future Suggestions

As of 2017, the EPA proposed measures to limit the amount and duration of exposure that pollinators would receive from harmful pesticides



a. This has been delegated to the state-level and is ultimately up to each individual state to enact
b. It's a good first step but there is still much to learn about long-term impacts on the hive as a whole and on behavior of bees as a result of this (not just death)
c. There should be more of a federal initiative to regulate this because bees travel and may cross states and different regulations across states could end up impacting bees colonies from where they originally came

Thank you !

Questions?

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