the Change

Vanishing of the Bees

Study Guide

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About the Film and This Guide

Vanishing of the Bees examines the issue of Colony Collapse Disorder, which has caused startling numbers of honeybees to disappear in recent years. Available in a 34-minute educational version and an 87-minute feature-length version, the film investigates possible origins of this phenomenon, explores the consequences for humans and our environment, and offers possible solutions.

This guide offers discussion questions, activity ideas, concept standards, and resources to help you use the film with your students. It is geared for students in Grades 6-10 and may be used in science, environmental science, agricultural education, or social science classes to introduce or enhance study on topics ranging from current environmental issues to plant science to food security to regulatory policy.

Synopsis of the Film (Education Version)

Honeybees live together in hives and collect flower pollen for food, and in doing so play a crucial role in pollinating crops. In fact, honeybees are essential for the production of a third or more of the food we eat. In 2006, U.S. beekeepers began reporting that astounding numbers of their honeybees had gone missing. They had literally disappeared, with no dead bees to be found and no obvious cause.

In 2007, U.S. scientists formed a task force to study the phenomenon; they identified its distinct symptoms and named it "Colony Collapse Disorder." While searching for the cause of the disorder, scientists investigated specific pathogens and diseases, including the varroa mite; a fungal bacterium called Nosema cerannae; Israeli Acute Paralysis Virus; and even cell phone use. When none of these appeared to be the root cause, they began to look at how farming practices might be affecting honeybees.

In the past, American farmers grew a variety of crops and animals on their farms, and often kept bees for pollination. Today, however, most U.S. crops are grown in monocultures, with a single crop grown over hundreds or even thousands of acres. These monocultures require pesticides, herbicides, and fungicides to thrive, and also depend on bees being brought in for pollination. Commercial beekeepers typically have thousands of hives, which they truck from crop to crop, releasing honeybees to pollinate the fields.

One likely contributor to Colony Collapse Disorder is a relatively new class of chemicals called systemic pesticides, which are enrobed on seeds or entrenched in the soil. They enter plants through their roots, and persist in the leaves, nectar, and pollen. Systemic pesticides are designed to inflict sub-lethal damage to pests, such as weakening the immune system and impairing memory. In France studies showed they caused honeybees to become disoriented and unable to collect pollen. Once they were banned, the bees bounced back.These pesticides are still being used in the United States and many other countries.

Although scientists have not yet identified a specific factor as the root cause of Colony Collapse Disorder, the general understanding is that this phenomenon is related to bringing bees into the monoculture farming system. While Colony Collapse Disorder continues to be a problem, some people view it as a blessing in disguise. This crisis has prompted awareness and concern for honeybees, as well as for human health and the environment. As the bees illustrate, everything is interconnected.

There are many things people can do to help honeybees and the environment, some of which are listed in the film and on the "What You Can Do?" handout on page **. Visit the film's website at www.vanishingbees.com for more information on how to make a difference.

Introducing the Film

Introduce the film by having students work with a partner to jot down 10 facts or details they know about honeybees. Encourage them to consider honeybees' lifestyle and their role in the ecosystem.
Invite several pairs to share one or two of their facts with the class. If no one mentions it, point out that people depend on honeybees to pollinate crops. Discuss:

- What is pollination? [It is the transfer of pollen from a stamen to a pistil of the same flower or another flower.]
- Why is it important? [Pollination is necessary for a flowering plant to bear fruit and develop seeds, and is a vital part of the plant's life cycle.]
- What might happen if honeybees were no longer able to perform that function? [We might not be able to grow many of our food crops.]

Ask whether anyone has heard of a phenomenon called Colony Collapse Disorder, which has caused huge numbers of honeybees worldwide to disappear in recent years. Explain that you will be showing the film Vanishing of the Bees, which examines this phenomenon.

Give each student a copy of the "Vanishing of the Bees Viewing Notes" handout on page **. Explain that as they watch the film, they should list possible causes for Colony Collapse Disorder presented in the film. For each possible cause, students should note whether scientists still believe it is a primary contributor to the disorder. They should also jot down three of the ways suggested in the film for helping honeybees.

"Vanishing of the Bees Viewing Notes" Answer Key

1. Possible causes of Colony Collapse Disorder described in the film (Y indicates that scientists still believe it to be a primary contributor, and N indicates that they do not):

   An immune compromise making bees susceptible to pathogens and disease (Y); varroa mite (N); the fungal bacteria Nocema ceranae (N); the rapture (N); a Russian conspiracy (N); cell phones (N); monoculture agriculture (Y); systemic pesticides (Y); more lax regulation of pesticides in the U.S. (N).

2. Possible answers for ways people can help:

   Reduce use of pesticides at home; buy organic or locally grown produce, when possible; plant a garden; raise awareness by spreading the buzz.

Discussion Questions

After showing the film, lead a class discussion about Colony Collapse Disorder and some of the issues introduced in the film. Ask questions such as:

- What are the symptoms of Colony Collapse Disorder? [Symptoms include: no dead bees in or near the colony; no mites or pathogens to explain the loss; only the queen and a handful of young bees are left.]
- What do you think causes Colony Collapse Disorder? What are your reasons for thinking so?
- What are the differences between holistic beekeeping and migratory beekeeping? How might the way honeybees are kept contribute to Colony Collapse Disorder?
- What is a monoculture? What are the advantages and disadvantages of monoculture farming? Why do monocultures require more pesticides than other types of farming? In what ways might monoculture farming contribute to Colony Collapse Disorder?
- How do systemic pesticides work to kill pests? What sub-lethal effects do systemic pesticides cause? What are examples of sub-lethal health problems humans may have?
- According to the film, how does the French regulatory system for approval of pesticides differ from the U.S. system? [For example, the French system is based on the Precautionary Principle.] What do the dissimilarities indicate about differences in our culture and values?
- Proponents of monoculture agriculture say that it is an economical way to grow food, while opponents say that the environmental costs of this type of agriculture are too high. With which point of view do you agree? Why? What middle ground might there be?
- The film suggests that Colony Collapse Disorder may be a blessing in disguise. What evidence supports that view? Do you agree or disagree with it?
- What things can people do to help honeybees? In addition to the ideas suggested in the film, can you think of any others?

Classroom Activities

Conduct one or more of the following classroom activities to explore more deeply some of the topics presented by the film. For more information, see the Resources section.

1. Bee Pollination

Many different types of animals—including bees, bats, beetles, birds, butterflies, flies and moths—as well as wind and water, can all help in pollination. Plants and pollinators have co-evolved characteristics that help them interact successfully. In this activity, students examine flowering traits of crops and other plants to determine which may be pollinated by honeybees. Some crops, such as corn and wheat, are pollinated by wind.

Procedure

Ask students whether they think honeybees intentionally pollinate plants, or whether pollination occurs by accident. What plant features might increase the odds that pollination occurs? [For example, sweet nectar attracts the bees, "nectar guides" point the way to the nectar, and landing platforms help bees reach the nectar.] Besides bees, what other animals or elements help pollinate plants?

1. Explain that different flowers have different shapes, structures, colors, odors, and nectar that attract different types of pollinators. Sets of flower characteristics are called "pollinator syndromes" and can be used to predict the type of pollinator that will be attracted to a particular flower.

2. Give students copies of the "Pollinator Syndromes Traits Table" from the U.S. Forest Service's Celebrating Wildflowers website: http://www.fs.fed.us/wildflowers/pollinators/syndromes.shtml. Point out that the headings at the top indicate the different types of pollinators, while the headings along the left side indicate various flower traits. Explain that students will use the table to predict whether specific crops are pollinated by honeybees or by other pollinators.

3. Make a class list of crops that people grow for food, feed, fiber, or fuel. Divide the list among student groups.

4. Direct groups to do an Internet image search to find a flower picture of their assigned crop. They should then use the table to determine which of their crops are pollinated by bees, by birds, by moths, etc.

5. Ask groups to share their findings with the class. Which crops are pollinated by bees? Which by other pollinators? Which type of pollinator seemed to be the most common? Do you notice any other patterns? [For example, grasses and grain are primarily wind-pollinated.]

2. Local Beekeeping

Students can learn about issues related to honeybees in their area by interviewing a local beekeeper, and conducting a taste test of locally-made honey. To find a beekeeper and local honey in your area, ask your local grocer or farmers' market, or search the Internet using the term "[your state or county] Beekeepers Association."

Procedure

1. Invite one or more local beekeepers to your class to talk about their hives, any experiences they have had with Colony Collapse Disorder, and what they do to prevent or reduce the disorder. If possible, arrange to have them bring an observation hive so that students can see a hive in action.

2. Procure two or more locally-made honeys for students to taste. If possible, get at least one from your beekeeper, and another made from a different flower or on a different farm.

3. Have students prepare for the visit by discussing what they would like to learn, and brainstorming questions to ask. On the day of the visit, introduce the beekeeper and have students interview him or her by asking the questions they have prepared and any others that come to mind.

4. Set out samples of local honey for students to taste, providing toothpicks or wooden coffee stirrers for dipping. (You may need to remind students to taste each honey just once, and to use a clean toothpick or stirrer for each taste.) Have students draw a chart like the one below for recording their observations. Encourage them to use as many descriptive words as they can for each characteristic.

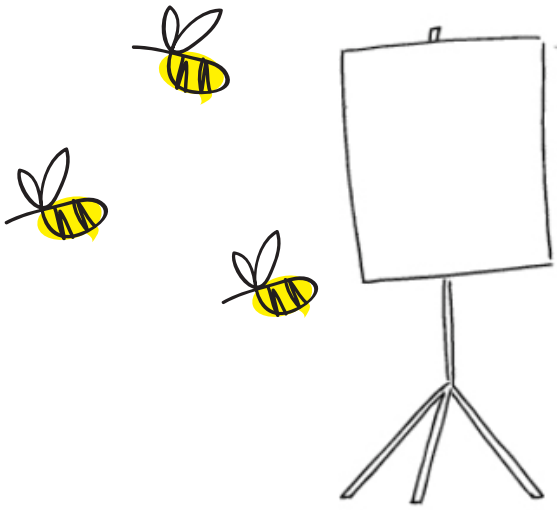
	Color	Sweetness	Flavor	Other Notes
Sample 1				
Sample 2 [and so on]				

5. Discuss: What do you learn about honeybees in our area? What issues do local beekeepers face? What is unique about our local honey? What can we do to support beekeeping locally?

3. Film Night

Students plan and host a viewing of Vanishing of the Bees for the school community, developing activities and materials to teach others about the issue.

Note: You might consider showing a longer version of the film, available by visiting www.vanishingbees.com and clicking on the "Host a Screening" button.



Procedure

1. Ask students what they learned from the film, and what they found provocative about it. What was their favorite part and why? Ask the students who else they think should see the film, and present the idea of planning and hosting a community film night.

2. Check the school calendar, and set a time, date, and location for the film night.

3. Discuss activities, posters, or handouts the class might provide to help film night participants engage in or understand the issue of Colony Collapse Disorder. For example, students might prepare a honey tasting, create posters on pollination, or distribute the handout on how to help honeybees.

4. Identify other tasks needed for the event, such as publicity, arranging the audiovisual equipment, planning for refreshments, set-up, and clean-up. Divide the class into teams for planning and carrying out each of the tasks. If they need further tips, they can download the Bee the Change campaign materials located on www.vanishingbees.com under Host a Screening.

5. After the film night, debrief what was successful about the film night and how students might continue to learn about or publicize the issue.

Other Activity Ideas

1. **Systemic Pesticides**
   Learn more about systemic pesticides. How do they work? Why do people use them? How do they impact bees and other organisms, including humans? What are people doing to minimize their effects?

2. **Environmental Regulation**
   Compare environmental regulatory processes in different countries, starting with a book review in the Journal of Political Ecology of Democracy at Work: A Comparative Sociology of Environmental Regulation in the United Kingdom, France, Germany, and the United States, by Richard Münch, et al (2001), at http://jpe.library.arizona.edu/volume_9/903schreurs.html. For each country, have students identify who has the most power and control in the process, and how much citizen input is allowed. In other ways do the countries' processes differ?

3. **Bee Quotes**
   The film uses quotes about bees as chapter titles. Have students find several bee quotes (by searching "bee quotes" on the Internet) and use them as a framework for writing a persuasive essay on how to help honeybees.

4. **Native Bees**
   Honeybees are not actually native to North America, but were introduced here from Europe in the 1600s. Have students research native bees to find out about their lifestyle, what plants they pollinate, and what people can do to protect their habitat.

5. **Bee Garden**
   Plan and plant a garden or container pots to attract bees. Before choosing the plants, research what plants would be appropriate for your area. Have students periodically monitor the plants for bee and other pollinator activity, and chart their findings.

Standards

The film and study guide help teach to the following content standards.

National Content Standards

- Science, Standard 4.1: Knows that reproduction is a characteristic of all living things and is essential to the continuation of a species. (Grades 6-8)
- Science, Standard 5.4: Knows that multicellular organisms have a variety of specialized cells, tissues, organs, and organ systems that perform specialized functions. (Grades 6-8)
- Geography, Standard 14.2: Understands the ways in which human-induced changes in the physical environment in one place can cause changes in other places. (Grades 6-8)
- Geography, Standard 18.3: Understands contemporary issues in terms of Earth's physical and human systems. (Grades 9-12)
- Career Education (Agricultural Education), Standard 2.3: Understands how concerns surrounding environmental issues (e.g., conservation of natural resources, pollution, global warming) have impacted the agricultural industry. (Grades 9-12)
- Career Education (Agricultural Education), Standard 6.1: Understands how insect behavior can be beneficial (e.g., pollination, eliminating other pests) or detrimental (e.g., destroying leaves, roots, stems, fruit) to plant populations. (Grades 9-12)

Source: Content Knowledge, On-Line Edition. Mid-continent Research for Education and Learning. www.mcrel.org/standards-benchmarks.

Common Core State Standards

- English Language Arts, Speaking and Listening, Comprehension and Collaboration, Standard 1: Initiate and participate effectively in a range of collaborative discussions with diverse partners on [grade-level appropriate] topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. (Grades 6-12)
- English Language Arts, Speaking and Listening, Presentation of Knowledge and Ideas, Standard 2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study. (Grades 6, 7)

Source: Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects. www.corestandards.org/assets/CCSSI_ELA%20Standards.pdf.

Resources

Following is a select list of resources about honeybees that you and your students may find helpful.

Bishop, H. (2005). *Robbing the bees: A biography of honey—the sweet liquid gold that seduced the world.* New York: Free Press.

Buchmann, S. (2010). *Honey bees: Letters from the hive.* New York: Random House.

Brackney, S. (2009). *Plan bee: Everything you ever wanted to know about the hardest-working creature on the planet.* New York: Penguin.

Ellis, H. (2004). *Sweetness and light: The mysterious history of the honeybee.* New York: Harmony Books.

Horn, T. (2005). *Bees in America: How the honey bee shaped a nation.* Lexington: The University of Kentucky Press.

Maeterlinck, M. (1901, 2006). *The life of the bee.* Mineola, NY: Dover Publications.

Ransome, H. M. (2004). *The sacred bee in ancient times and folkore,* Mineola, NY: Dover Publications.

Readicker-Henderson, E. (2009). *A short history of the honey bee: Humans, flowers, and bees in the eternal chase for honey.* Portland, OR: Timber Press.

Tautz, J. (2008). *The Buzz about bees: Biology of a superorganism.* Berlin: Springer-Verlag.

Von Frisch, K. and Seeley, T. D. (1993). *The dance language and orientation of bees.* Cambridge, MA: Belknap Press.

Wilson, B. (2004). *The hive: The story of the honeybee and us.* London: John Murray Publishers

Winston, M.L. (1987). *The biology of the honey bee.* Cambridge, MA: Harvard University Press.

Handout

Name

Date

Vanishing of the Bees

Viewing Notes

1. As you watch the film *Vanishing of the Bees*, list below possible causes for Colony Collapse Disorder described in the film. For each, note whether scientists still think it is a primary cause of the disorder.

Possible Cause of Colony Collapse Disorder	Primary Cause?
	O Yes O No
	O Yes O No
	O Yes O No
	O Yes O No
	O Yes O No
	O Yes O No
	O Yes O No
	O Yes O No
	O Yes O No
	O Yes O No

2. List three ways suggested in the film for how people can help honeybees.
   -
   -
   -

Handout

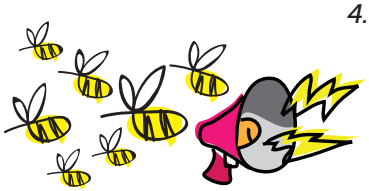
Vanishing of the Bees
What Can You Do?

The film *Vanishing of the Bees* explores Colony Collapse Disorder and its impact on honeybees, people, and the environment. Here are things you can do every day to help:

1. **Vote with Your Fork**
   Buying organic produce helps nurture the food systems that take care of bees and the environment.

2. **Stop Home Pesticide Use**
   Natural pest remedies are safer, more effective, and less expensive than toxic chemicals. Get rid of the pesticides in your cabinets, garages, and lawns.

3. **Plant a Garden**
   Grow yummy food, delicious herbs, and beautiful flowers. It improves your health and helps the bees. Even people in apartments can grow food in planters or raise a window garden!



4. **Raise Awareness**
   The first step to activate change is education. Let people know about the bee crisis and what they can do to help.

There are many other ways to help the bees—shop at farmer's markets, explore community supported agriculture, become a beekeeper, write to your senator or congressman or host a screening of this film. Visit the film's website for more information on how to make a difference: www.vanishingbees.com. And feel free to send any comments or questions to the filmmakers, Maryam Henein and George Langworthy, at info@vanishingbees.com.

www.vanishingbees.com