Pollinator Health and Safety Conference.
November 20, 2014

Factors Effecting Bee Mortality

John Skinner

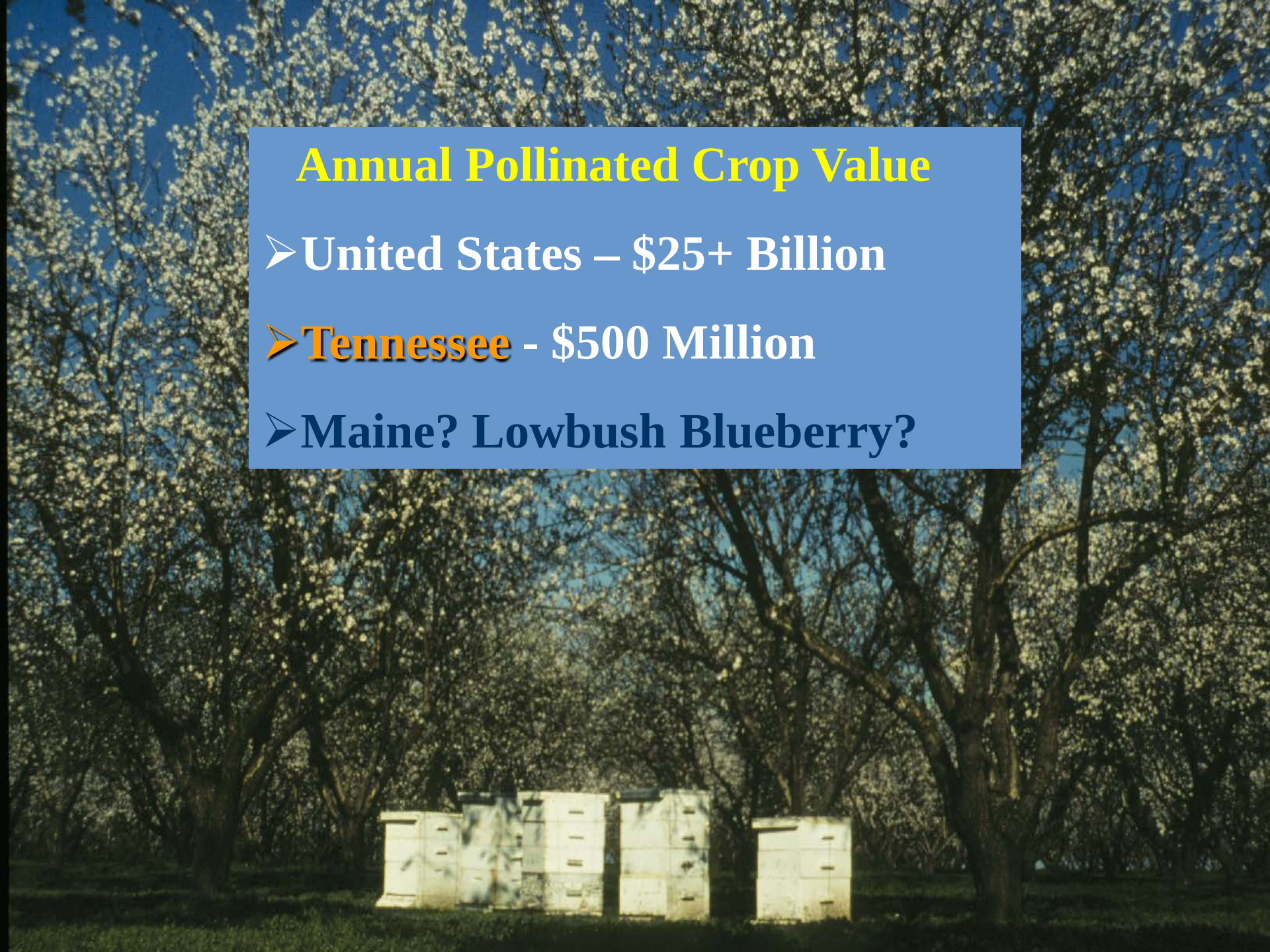
Entomology, Plant Pathology and Nematology

Good

YUCK!

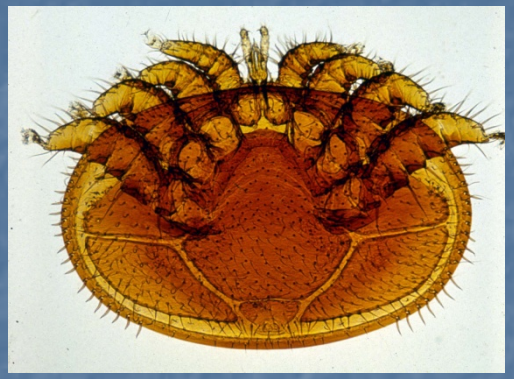
Why Do We Need Bees?

Fruit and Vegetable Production Requires Pollination


Annual Pollinated Crop Value
United States – $25+ Billion
Tennessee - $500 Million
Maine? Lowbush Blueberry?

Colony Collapse Disorder? What is Happening?

What Are We Doing?

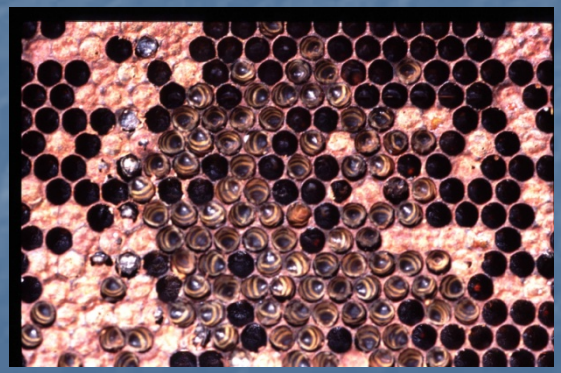


Mites?

Diseases?

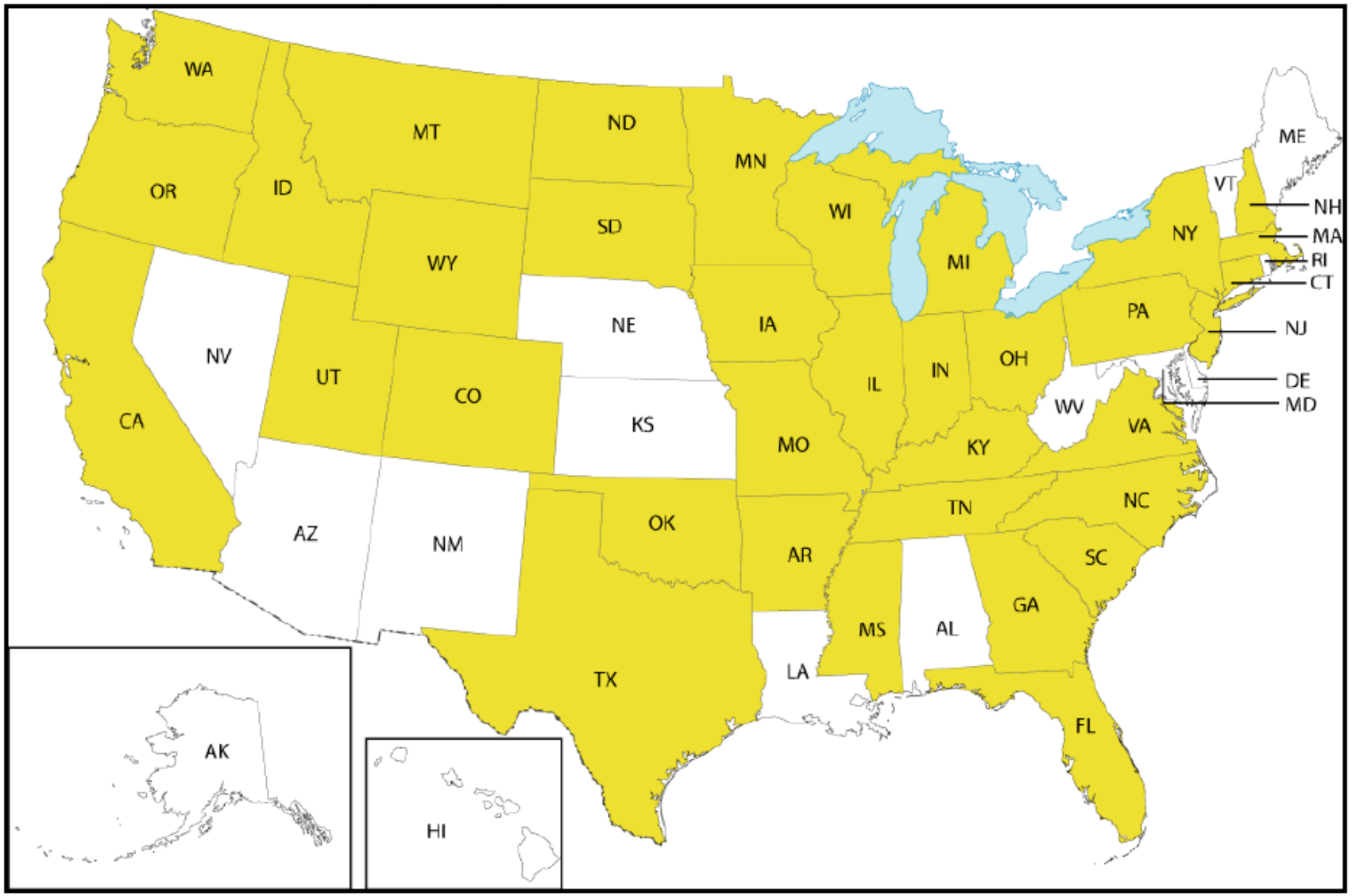
Pesticide Contamination?

Beetles?



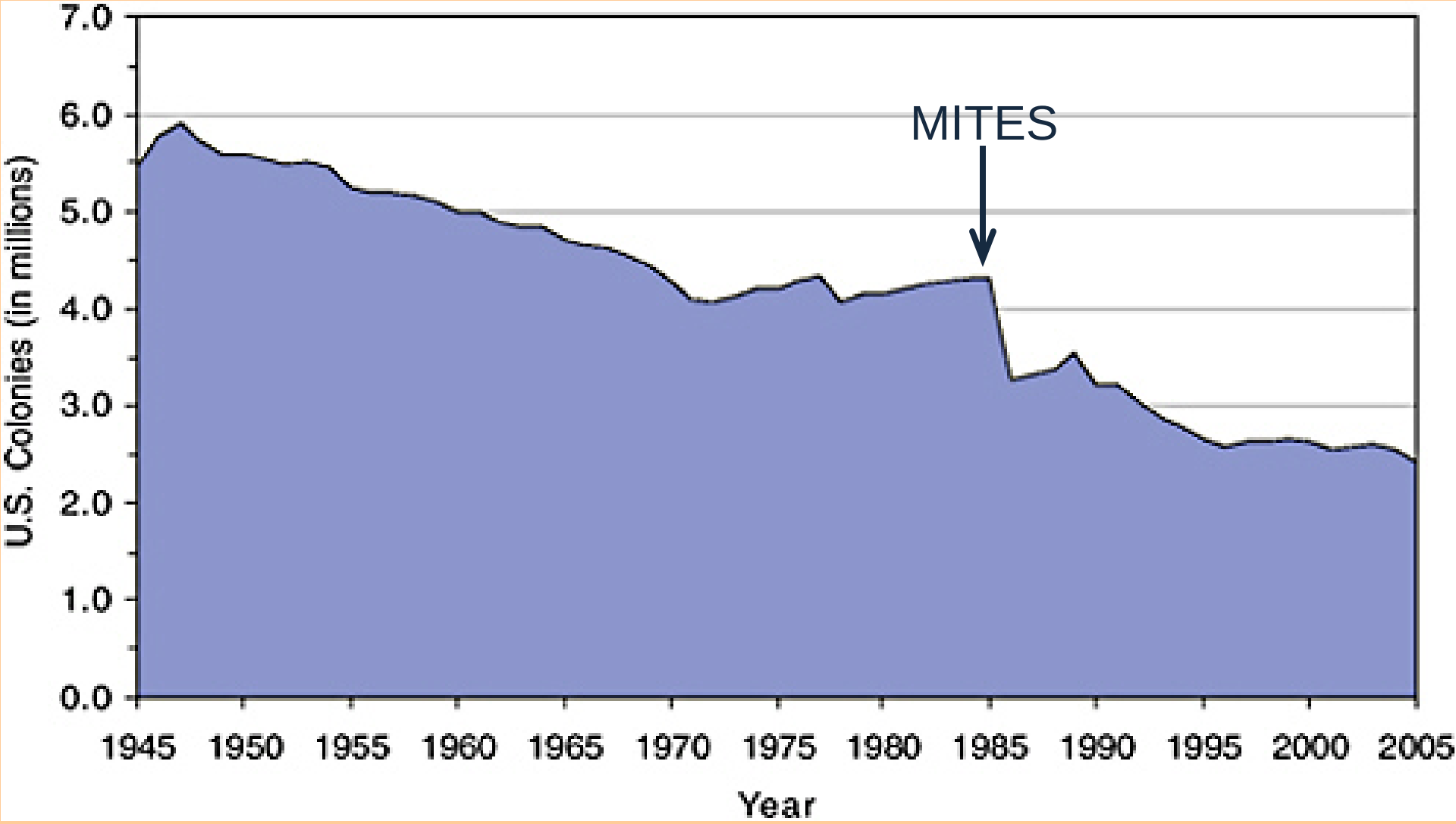
Nutrition?

Figure 1. Colony Collapse Disorder, Affected States, June 2007



Source: Bee Alert Inc., "Latest U.S. CCD Map," [http://www.beealert.info/]. Shaded areas show reported affected states.

DECLINE IN NUMBERS OF US BEE HIVES (NASS STATS)



What is Colony Collapse Disorder (CCD) ?

SYMPTOMS

- **Bees Fail to Return to the Hive**
- **Few or no Adult Bees Present**
- **Small Clusters of Young Bees and Queen**
- **COLONY LOSSES WERE RAPID - MUCH BROOD PRESENT**

Does CCD Exist?

1) Colony Losses Are Similar To Period Before CCD

2) Extent Of Problem May Be Exaggerated?

3) Similar Past Episodes: "Dissapearing Disease?"

4) **BUT**, Disturbing **"NEW" SYMPTOMS** May Indicate A **NEW PATHOGEN (or PROBLEM)**

5) CCD Could Actually Stimulate New Studies on Bee Decline, **a much bigger problem**!

What is being done about CCD ?

NC 217: Sustainable Solutions to Problems Affecting Honey Bee Health

35 participants from 23 states

Resulted in:
Coordinated Agricultural Project (CAP)
Protection of Managed Bees

$4.1 million

CAP Objectives:

I. ***Determine the cause of CCD***: **study the interactive effects of disease agents (pathogens, parasites) and environmental factors (pesticides, nutrition) on honey bee health.**

II. **Breeding - Incorporate traits that will help honey bees resist pathogens and parasitic mites and increase genetic diversity.**

III. **Conserve non-*Apis* pollinators through study of factors that impact them: new or emerging pathogens/parasites, environmental and nutritional stresses, and habitat degradation.**

IV. **Extension -Translate research knowledge to beekeepers and growers - develo technology transfer for queen breeders, Formulate a Best Management Practices guide for *Apis* and non-*Apis* managed pollinators, and make this readily available at an eXtension website.**

Specific Parts of the CAP Grant

PERMANENT RESEARCH APIARIES

CAGE AND FIELD STUDIES

PESTICIDE STUDIES

BREEDING FOR RESISTANCE

EXTENSION/eXtension

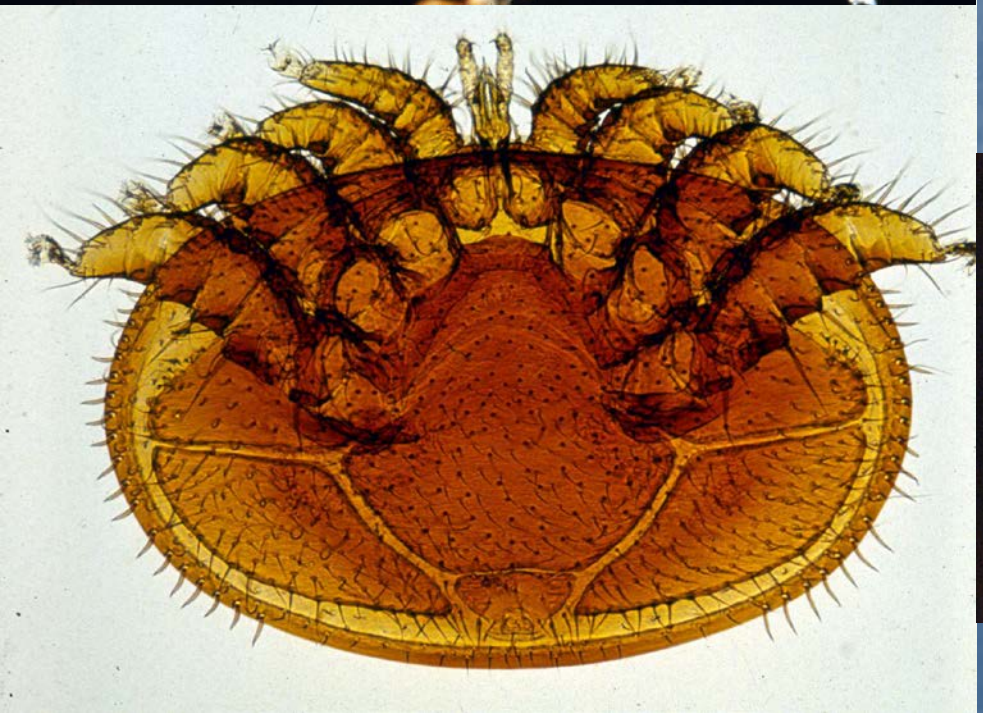
POSSIBLE CAUSES OF CCD

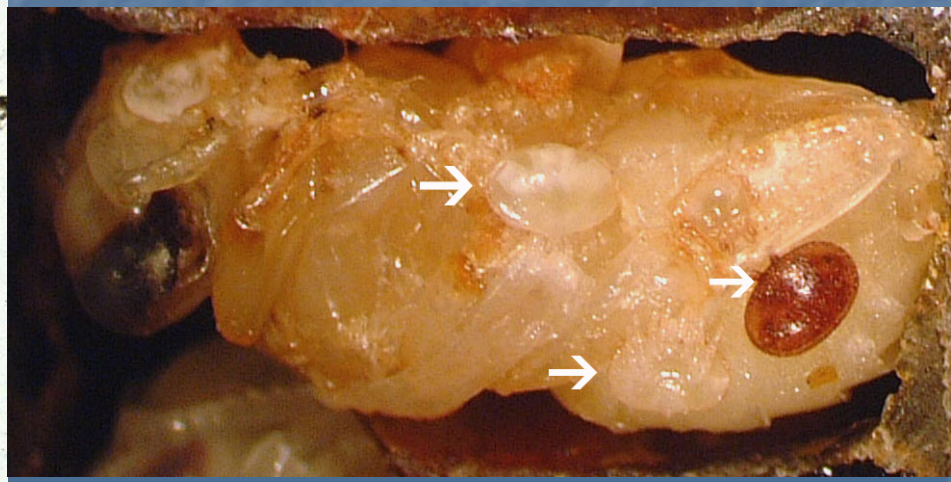
- existing parasites, mites, and disease
- new or more virulent pathogens
- poor nutrition -
- lack of genetic diversity
- stress in adult bees
  transportation, overcrowding
  environmental, biological
- chemical contamination
  In wax, food, or from new types of pesticides
  exposure to chemicals for mites
- a combination of these and/or other factors

Varroa Mite


Varroa adult on bee pupa

- Severe Pest – Will Kill Colony Unless Managed.
- Reproduce in Capped Brood Stage – Protected from Chemicals.

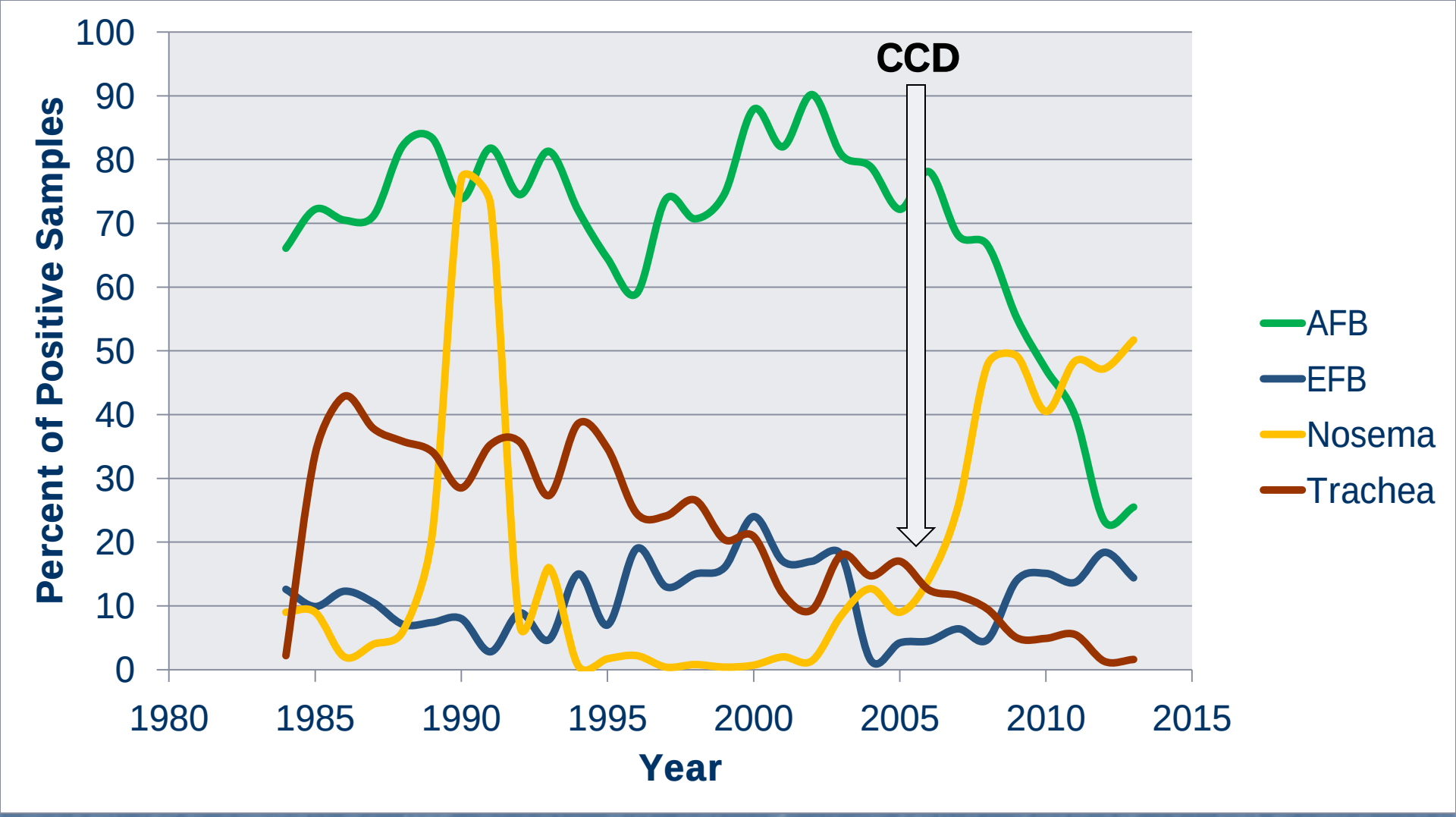




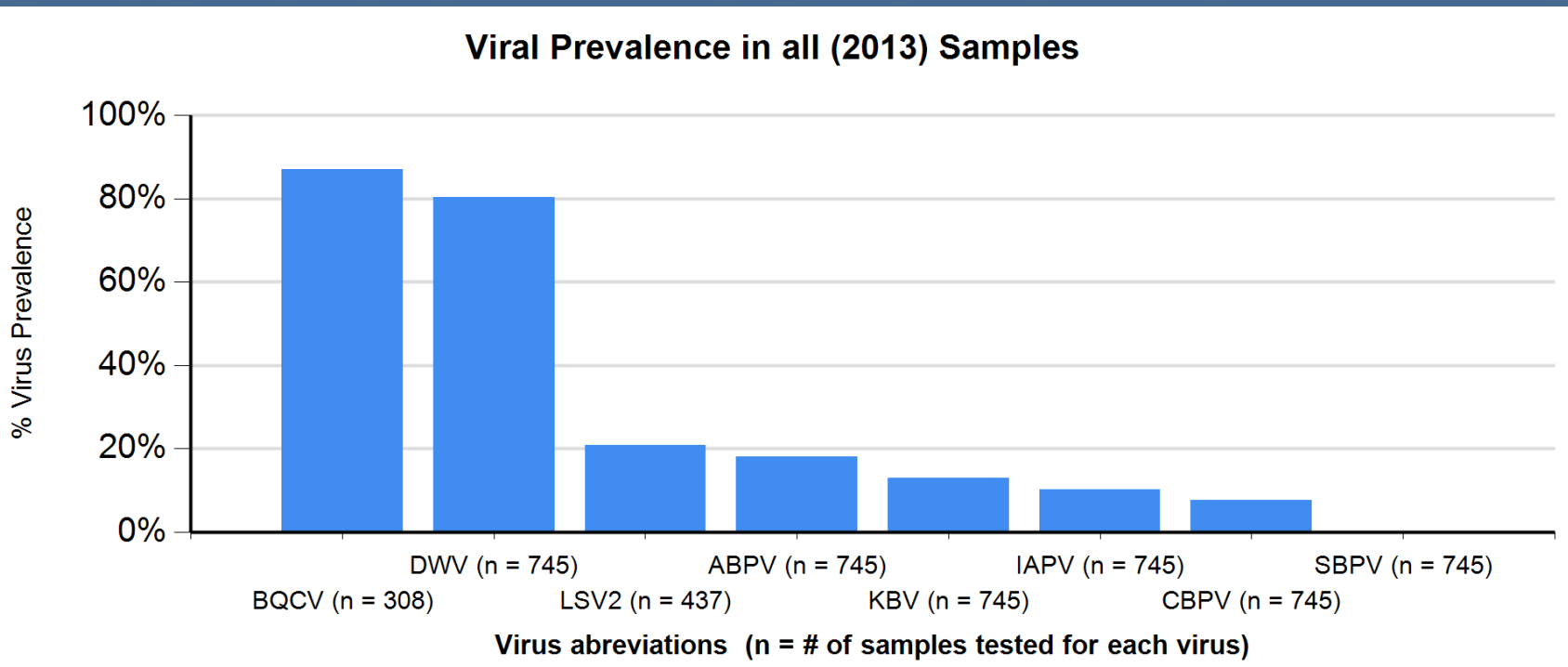
New Viruses and Nosema Found in Samples

Disease Agent	Number of positive samples (% positive of samples tested)		
	CCD (n=30)	non-CCD (n=21)	Total (n=51)
IAPV	25 (83%)	1 (5%)	26 (51%)
KBV	30 (100%)	16 (76%)	46 (90%)
N. apis	27 (90%)	10 (48%)	37 (73%)
N. ceranae	30 (100%)	17 (81%)	47 (92%)
All 4	23 (77%)	0 (0%)	23 (45%)

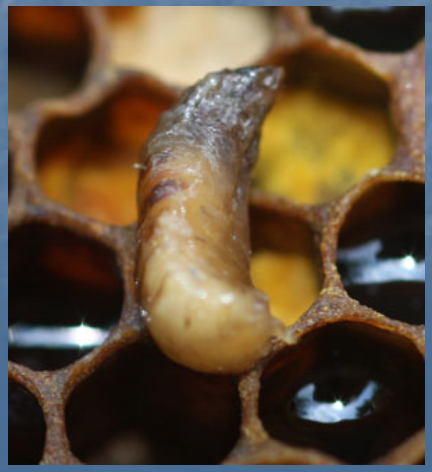
Science Magazine Article - Fall 2007



Percentage of Positive Samples for a Honey Bee Pest or Disease from the USDA Bee Disease Diagnostic Lab. Keep in mind that this data is not from random sampling, but rather from samples sent by beekeepers to the lab, which biases the sampling toward apiaries that are having problems.



2013 USDA-APHIS National Honey Bee Pests and Diseases Survey, Virus Prevalence Results (Virus abbreviations: BQCV=Black queen cell virus; DWV= Deformed wing virus; LSV2= Lake Sinai virus 2; ABPV= Acute bee paralysis virus; KBV= Kashmir bee virus; IAPV= Israel acute paralysis virus; CBPV= Chronic bee paralysis virus; SBPV= Slow bee paralysis virus)



Managed Pollinator CAP
Coordinated Agricultural Project

A National Research and Extension Initiative to Reverse Pollinator Decline

Michael Wilson, John Skinner, Keith Delaplane and Jeff Pettis; University of Tennessee; University of Georgia; USDA-ARS, Beltsville, Maryland

Bee Health @ eXtension.org: a web platform for the creation and dissemination of science-based recommendations

eXtension
more mind reach

USDA
ARS

Improving Honey Bee Health, Survivorship, and Pollination Availability

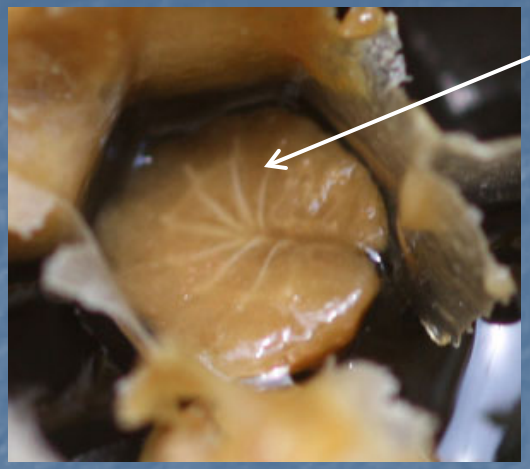
POSSIBLE CAUSES OF CCD

- **Existing parasites** – Varroa Mites alone?
- **Viruses vectored by Varroa**
- **Poor nutrition** – Multiple pollen sources better than single source
- lack of genetic diversity – We need to broaden the genetic base
- **Nosema and other diseases**
- stress in adult bees
  - transportation- migratory effects
  - overcrowding – Too many colonies per location?

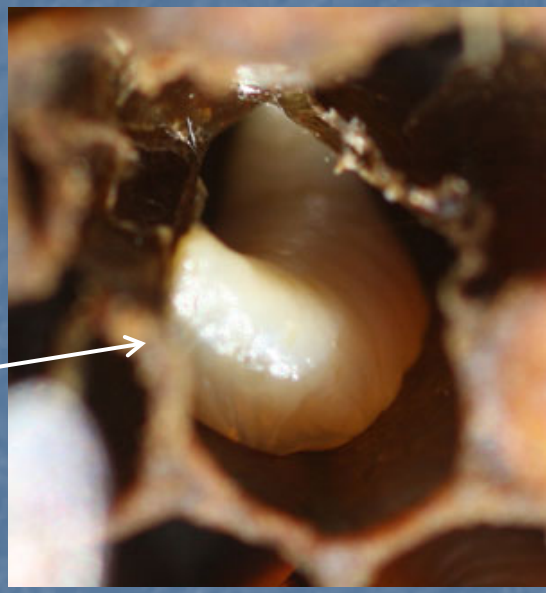
- **Pesticide Exposure** and contamination
  - In wax, food, or from new types of pesticides
  - Synergistic effect between mite and crop chemicals
- **A combination of these and/or other factors**

New Diseases? European Foulbrood (EFB)

Brood Pattern Spotty



Trachea visible



Larvae curled
Color yellowish pinkish
Not **Pearly white**

New - Pesticide Interaction

- Honey Bee Miticides – In combination interfere with bees' capacity to detoxify these pesticides through cytochrome P450 monooxygenase activity.
  - coumaphos (Checkmite+TM)
  - fenpyroximate (Hivastan TM)
  - tau-fluvalinate (Apistan TM)
- Bees treated with a sublethal dose of coumaphos were 14 times more susceptible to Apistan
- Pre-treatment of bees with the fungicide prochloraz, however, increased the toxicity of coumaphos (72 times) and tau-fluvalinate (1118 times).
- Ergosterol biosynthesis inhibiting fungicides can inhibit cytochrome P450-mediated detoxification of pesticides in honey bees

Pesticide Related Causes of CCD

- Pesticide Exposure and contamination
  - In wax comb – sublethal to brood
  - food – pollen bee bread and nectar
- New pesticides – Neonicatinoids (Imidicloprid)? ?
- Synergism between mite and crop chemicals increases toxic effects

Presidential Memorandum Signed June 20, 2014- Created a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators

- Develop a public education plan to increase awareness of the importance of pollinators
- Increase integrated vegetation and pest management and pollinator friendly management on Federal land
- Increase acreage of pollinator habitat under USDA-NRCS programs
- Develop pollinator right-of-way guidelines with the Dept. of Transportation
- Create pollinator habitat restoration projects through Dept. of Defense and Army Corp of Engineers
- Assess the effects of pesticides on pollinators and rule on a potential neonicotinoid ban from the EPA

Bee Health

Honey Bee Viruses, the Deadly Varroa Mite Associates

If your bees have Varroa, your bees have viruses. >Read More

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Honey Bee Health

- Honey Bee Biology
- Small Hive Beetle
- Varroa Mites
- Foulbrood
- Nosema
- Viruses
- Pesticides
- Nutrition

Our People

Michael Wilson

Upcoming Webinars

November 7

All Bugs Good and Bad Webinar Series: Where Have All the Honey Bees Gone? Hope for the Future.

SEE MORE

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There are over 4,000 species of native #bees in the U.S. #pollinators

Retweeted by eXtension4U

Platform, or toolset for Research, Education, Extension, and other professionals (Such as Apiary Inspectors) to do their job.

Resources

Honey Bee Health

- Honey Bee Biology
- Small Hive Beetle
- Varroa Mites
- Foulbrood
- Nosema
- Viruses
- Pesticides
- Nutrition

Beekeeping

- First Lessons in Beekeeping Series
- Basic Beekeeping Techniques
- Advanced Field and Lab Techniques
- Beekeeping Equipment
- Queen Rearing and Bee Breeding

Research

- Managed Pollinator CAP
- Pollination Security of Northeastern Crops
- Citizen Science
- Honey Bee Lab and Organization Links

Videos

- A Year in the Life of an Apiary
- Bee Pest and Disease Videos
- Webinars and Seminars
- YouTube

Native Bees

Frequently Asked Questions

Facebook

Frequently Asked Questions

Bee Health | September 15, 2014 | Print

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Beekeepers are almost by definition curious individuals. The nature of beekeeping, as with any environmental relationship, is complex. Even some of the most experienced beekeepers are confounded by the mysteries of a bee hive. That is what makes honey bee research a rewarding and never-ending journey.

Below is a list of commonly asked questions and links to the best answer at the time it was asked. As more information becomes available, perceptions shift, and may render a formerly correct answer invalid. The following list is only a starting point and one should always seek a second opinion on any difficult or important subject. Local knowledge is especially important as geographical variables cannot be resolved in this universal forum. If your question is not listed below, consider using the Ask an Expert function.

Two "expert" bee researchers ponder a quandary: "well, what do you think?" Cre Zach Huang

- Are there plants that produce nectar that is poisonous to either honey bees or humans?
- How can bees make honey from nectar that is poisonous to them?
- What is the life cycle of the bumble bee?
- How can farmers, gardeners, and applicators reduce risks of honey bee injury from pesticide application?
- What steps can beekeepers take to protect their colonies from pesticide injury?
- How can I tell the difference between small hive beetle larvae and wax moth larvae?
- What are wax moths and what kind of damage do they make in a hive?
- How many bee hives do I need to pollinate a crop?
- What causes purple brood?
- What is a "pollen bee" or a "non-apis" bee?
- Has research been done on comparing 5.4 mm comb cell size with 4.9 mm?
- What are small hive beetles and where did they come from?
- What is the best way to introduce a queen into a colony?
- What plants in my vegetable garden attract or need bees?
- What are some suggestions for keeping bears out of active beehives?

eXtension Ask an Expert
America's Research-based Learning Network

Ask a Question

Give your question a title

Question

Normal text | Bold | Italic | Underline | Small

Philip Moore -The University of Tennessee

Bee Health | June 30, 2014 | Print

Like 1 Tweet Pin it +1 0

Philip Moore is the current *content manager* for the **Bee Health** community of practice on **eXtension.org**. Prior to beginning this position he completed a Master of Science degree in Entomology at The University of Tennessee under the supervision of Dr. John Skinner, *State Apiculturist* and *Professor and a* Bachelor of Science degree in Agricultural and Natural Resource Economics at The University of Tennessee in Knoxville. Prior to completing his degrees he studied Web Page Design and Development at Belmont University in Nashville Tennessee.

Philip's interest with bees sprouted during his undergraduate program. He was recruited to join the *Bees and Beekeeping* extension program after a fruitful internship with the U.T. Institute of Agriculture, Organic and Sustainable Crops Farm. He began by learning honey bee colony management, IPM, and honey extraction. Then he initiated the U.T. Apiaries involvement with th burgeoning U.T. Farmers Market. As the market reached more consumers and added diverse vendors, Philip's market repertoire expanded; U.T. Apiaries begun selling *Ten Year Aged Honey Cut Comb Honey, Beeswax Lip Balm, Hand and Body Salve, Gift Baskets* and more!

Philip's academic interests are with the pollination services of bees rather than their honey reward. His Masters thesis was titled *Evaluating the Pollination Ecology of Pityopsis ruthii (Asteraceae)*, which was funded by a fellowship from The Garden Club of America. He is currently employed by the University of Tennessee as an Extension Assistant.

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Managed Pollinator CAP: Coordinated Agricultural Project

Bee Health January 28, 2013 | Print

www.beeccdcap.uga.edu

Research Updates from the Managed Pollinator CAP: Coordinated Agricultural Project

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- Watch Later

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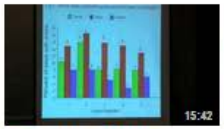

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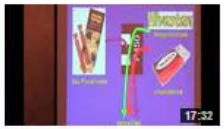

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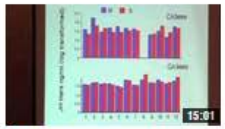

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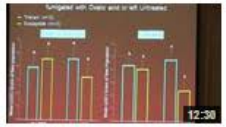

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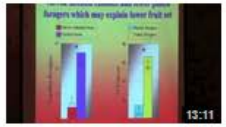

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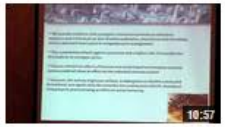

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