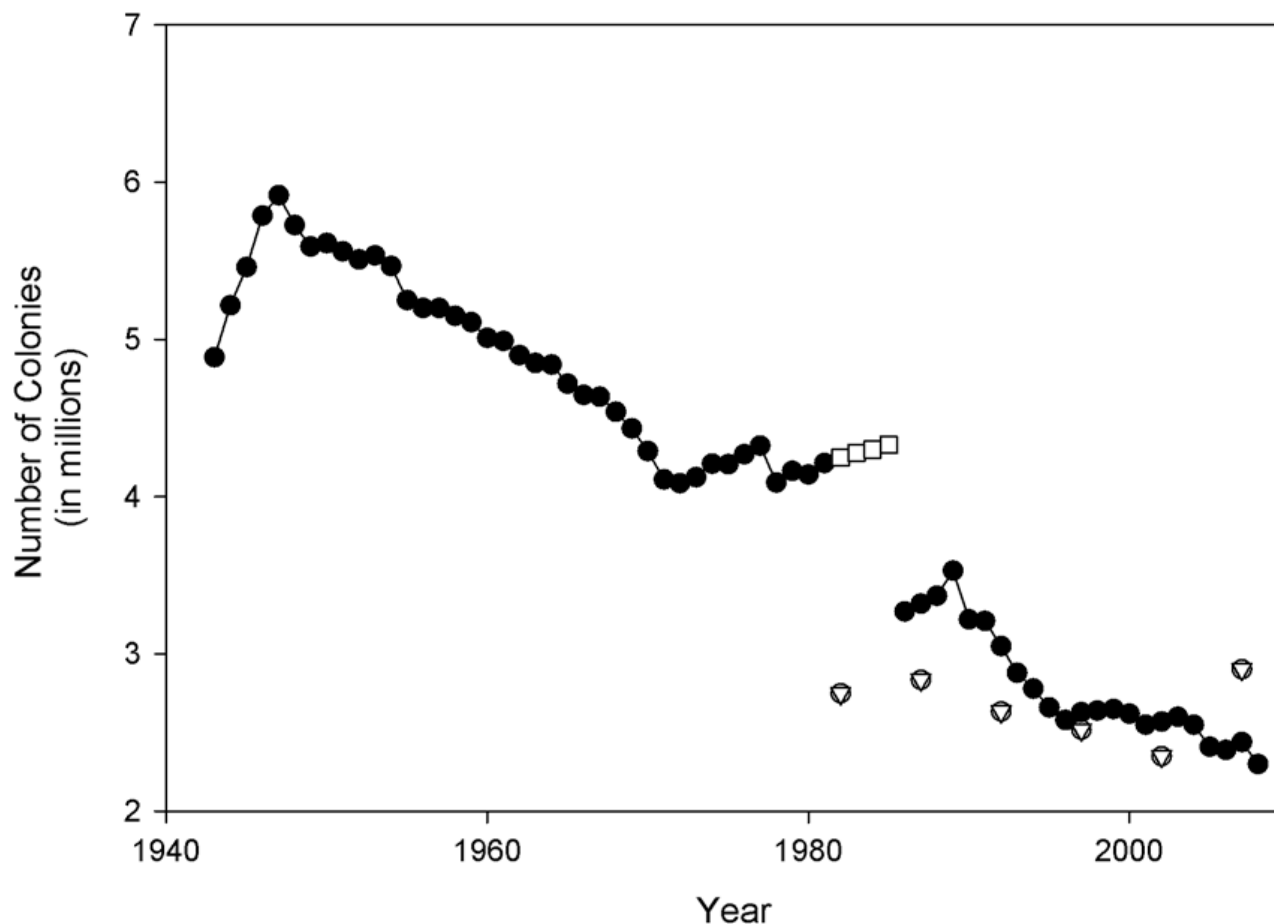


Honey Bees and Bumble Bees – Their Problems and What You Can Do to Help



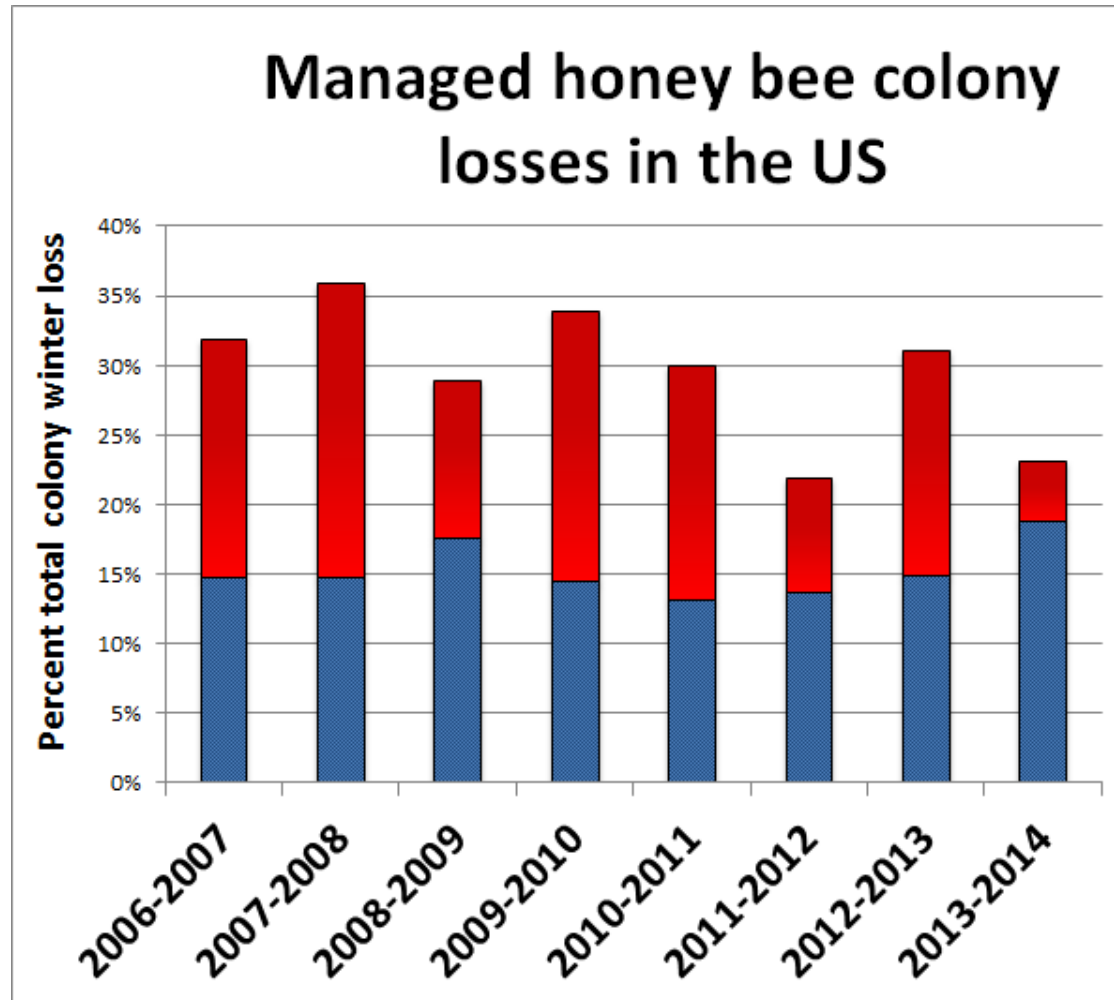
Kimberly Stoner
Department of Entomology
The Connecticut Agricultural Experiment Station

The Number of Honey Bee Colonies in the US Has Been Decreasing Since the 1940s



Source: vanEngelsdorp and Meixner (2010)

Honey Bees Are Still In Trouble



<http://beeinformed.org>

Honey Bees Are in Trouble in CT

- 52% Colony Loss in CT for winter 2012-2013
- 48% Colony Loss in CT for winter 2013-2014
- Source: Bee Informed Survey (www.beeinformed.org)

Bumble Bees Are Also Important Pollinators

66 % of bee visits to pumpkins and winter squash are by bumble bees, only 15% by honey bees



Mike Thomas

Bumble bees are declining in species diversity in the Northeast, across North America, and around the world

- Many studies in US and Canada have found some species declining drastically in abundance and geographic range, while others are increasing
- Similar pattern with different species in Europe – 24% of their bumble bee species are declining

Bumble Bee Species of Concern in CT and across the Northeast

Bumble Bee Species	Status throughout Northeast	First and Last Collection Records in CT	Conservation Status in CT
<i>Bombus ashtoni</i>	Declining	1905-1992	Likely extirpated
<i>Bombus affinis</i>	Declining	1904-1997	Species of Special Concern
<i>Bombus terricola</i>	Declining	1904-2009	Species of Special Concern
<i>Bombus pensylvanicus</i>	Declining	1902-2006	No official status in CT

Why the recent declines?

Possible causes

Honey Bees

- Spread of pests and diseases – *Varroa* mites, viruses, *Nosema ceranae*
- Poor nutrition – lack of diverse floral resources in monoculture sites
- Pesticides – used inside and outside the hive
- Interactions of above factors

Bumble Bees

- Spread of new diseases – “spillover” of multiple pathogens from commercial bumble bees and possibly also from honey bees to wild bumble bees
- Loss of habitat – floral resources and nesting sites
- Pesticides
- Interactions of above factors

Our Research: Comparing Flowers for Attractiveness to Bees



Tracy Zarrillo



Ellen Bulger

98 Species of Bees on 10 Vegetable Farms – here are a few



Plant Flowers for Bees



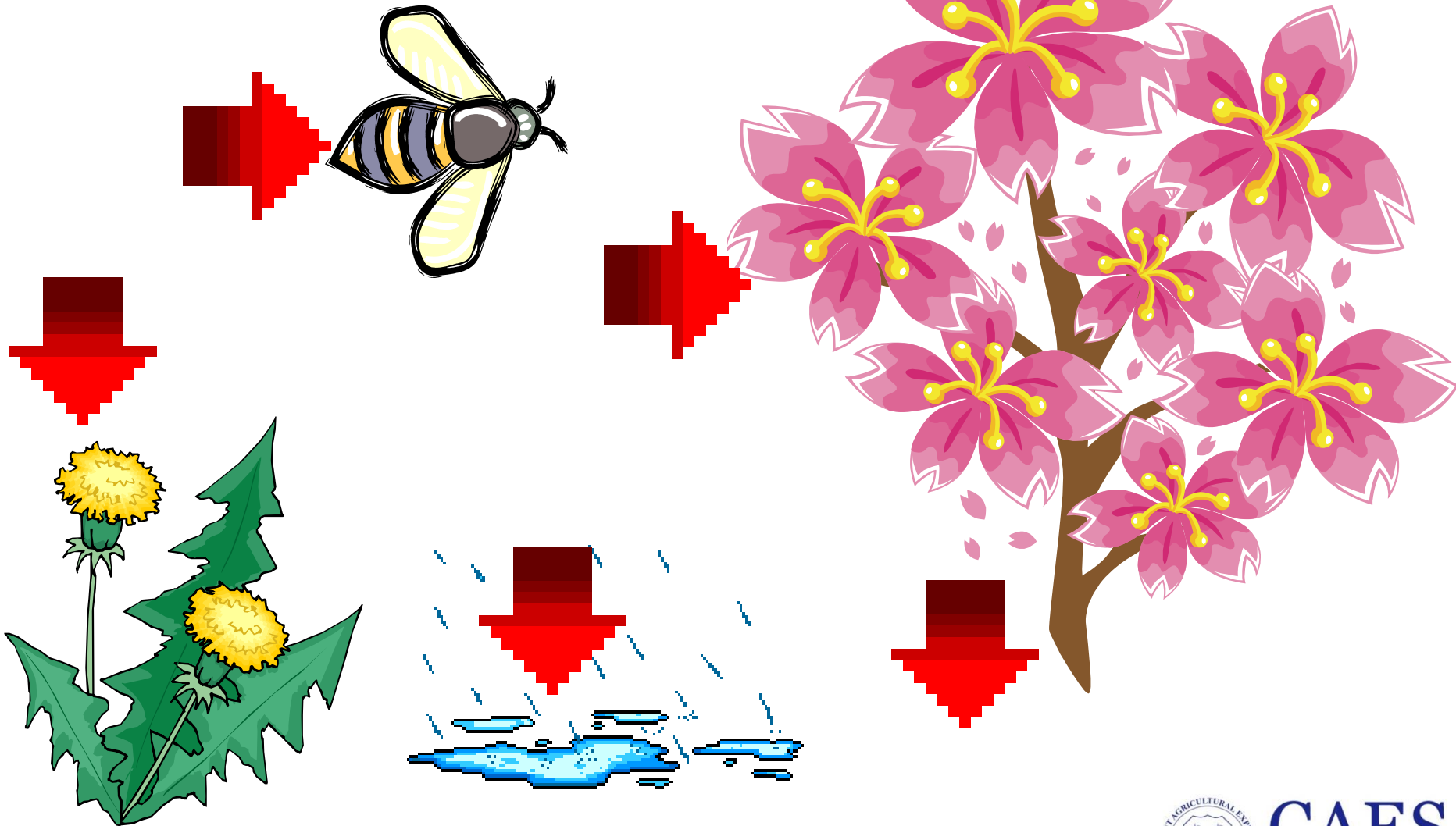
What You Can Do to Help Bees – Provide Resources for Them

- Economics: Buy local honey – support local beekeepers
- Food for Bees: Plant flowers attractive to bees, blooming throughout the growing season, protected from pesticides
- Nesting Habitat: Leave some natural habitat – bare ground, tunnels in soil, hollow stems, rotting wood

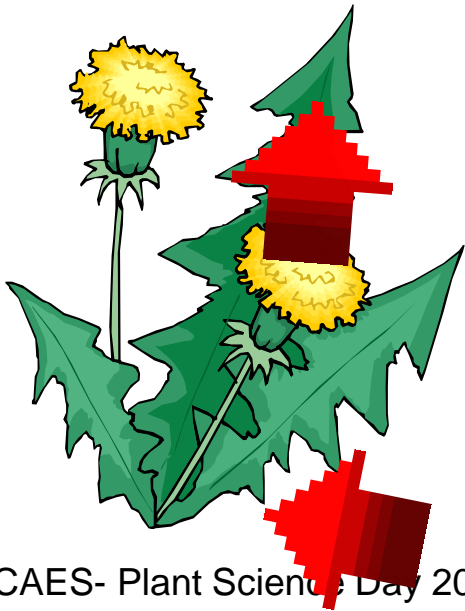
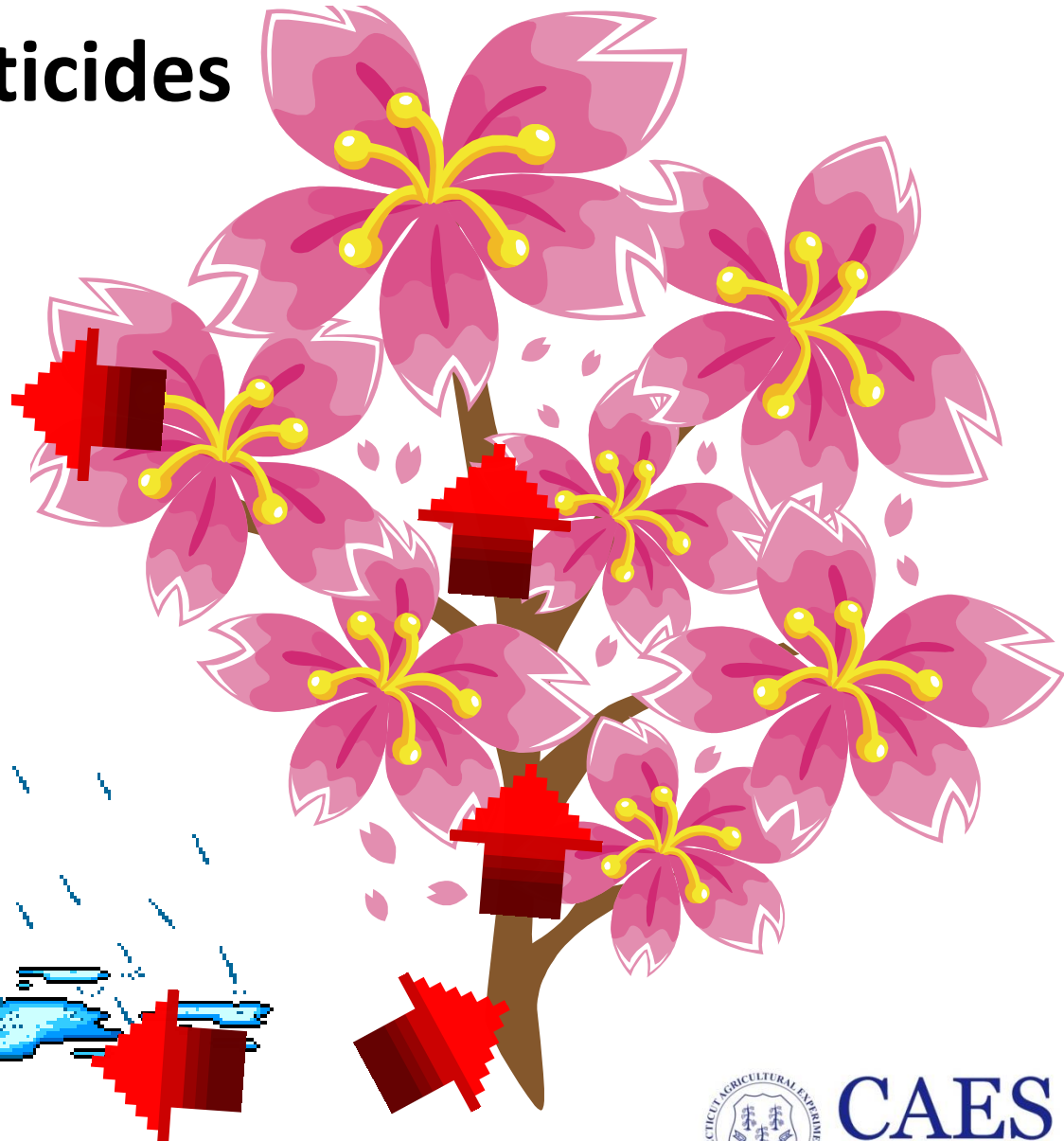
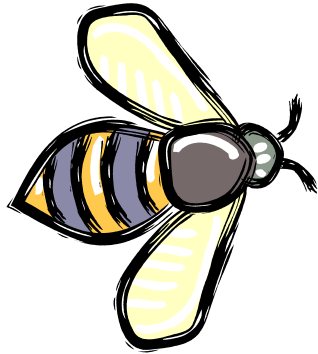
Pesticides in the News: Neonicotinoid Insecticides

- Neonicotinoid insecticides are chemical relatives of nicotine and act on the insect nervous system
- Neonicotinoids are systemic – which means they can travel through the veins of the plant
- Some neonicotinoids (imidacloprid, thiamethoxam, clothianidin, dinotefuran) are very highly toxic to bees and to many other insects

Non-Systemic Insecticides



Systemic Insecticides



Neonicotinoids Are Sold to Homeowners at Garden Centers







Look At the Fine Print to See Active Ingredients

- **Insect control**
 - **Disease control**
- One application protects up to 6 weeks**

Active Ingredients:
 Tebuconazole 0.80%
 Imidacloprid 0.15%
 Other Ingredients ... 99.05%
 Total 100.00%

KEEP OUT OF REACH OF CHILDREN
CAUTION See back panel booklet for additional precautionary statements

3595505d R.3



1 APPLICATION protects for 6 WEEKS

*(adults)

KEEP OUT OF REACH OF CHILDREN
CAUTION See back panel for additional precautionary statements

Active Ingredients:
 Tebuconazole 1.06%
 Imidacloprid 0.11%
 Clothianidin 0.05%
 Other Ingredients ... 98.78%
 Total 100.00%

- **Apply anytime Spring through late Summer**
- **Also kills mole crickets & European crane fly larvae**

Active Ingredient:
 Imidacloprid 1.47%
 Other Ingredients ... 98.53%
 Total 100.00%

KEEP OUT OF REACH OF CHILDREN
CAUTION See back panel for additional precautionary statements
 Not for sale, sale into, distribution and/or use in Nassau, Suffolk, Kings, and Queens counties of New York.



How Are Bees Exposed to Neonicotinoids and Other Pesticides?

Our Research

- Measuring the movement of neonicotinoids, applied to soil, into the pollen and nectar of squash
- Monitoring of pollen trapped from honey bee hives: 5 locations, 2007 – 2012

Measuring Neonicotinoids in Nectar and Pollen of Squash



Movement of Neonicotinoids into Nectar and Pollen of Squash

- Stoner & Eitzer 2012 – squash - Applied to soil just before planting or irrigation water just after planting –
 - imidacloprid at 10 ppb in nectar, 14 ppb in pollen
 - thiamethoxam at 11 ppb in nectar, 12 ppb in pollen
- No Observed Effect Level for honey bees = 20 ppb

Trapping Pollen from Honey Bees



Pesticides in Pollen

- Maximum bee toxicity in a single sample:
 - Phosmet (organophosphate)
 - Imidacloprid (neonicotinoid)
 - Indoxacarb (oxadiazine)
 - Chlorpyrifos (organophosphate)
 - Fipronil (phenylpyrazole)
 - Thiamethoxam (neonicotinoid)
 - Azinphos-methyl (organophosphate)

Pesticides in Pollen

- Number of samples (out of 313) with more than 5% of the lethal dose at maximum pollen consumption

Imidacloprid (neonicotinoid)	21
Phosmet	9
Indoxacarb	4
Chlorpyrifos	4
Thiamethoxam (neonicotinoid)	2
Fipronil	1
Azinphos-methyl	1

Conclusions About Neonicotinoids

- Neonicotinoids can travel from soil application into pollen and nectar of plants, where bees can collect and consume them. We need to know much more about how this is affected by application method, timing, rate, and plant species
- We have seen low levels of neonicotinoids in most samples of pollen collected by honey bees, with occasional higher spikes above 5% of a lethal dose

Big Question:

What do we do when faced with uncertainty about a possible hazard?

- European Union – put a temporary ban on most uses of the most toxic neonicotinoids to allow time for additional study
- U.S. – allows widespread use of neonicotinoids – even by homeowners in their yards – until the hazard is proven

What You Can Do to Help Bees – Limit Exposure to Insecticides

- Do not spray any highly toxic insecticide on flowering plants with any visiting bees
- Whenever you apply insecticides, avoid drift onto any nearby flowering plants
- Avoid using neonicotinoids (or other systemic insecticides) on flowering plants attractive to bees unless truly necessary
- If you do use neonicotinoids, use the minimum effective amount, as long a time from flowering as possible, and protect non-target plants from exposure

CAES Fact Sheets About Helping Bees

- Protecting Bees from Pesticides
- Planting Flowers for Bees in Connecticut
- Ground Nesting Bees
- Bees on Alternative Flowering Plants on Vegetable Farms in Connecticut



Kimberly Stoner
Department of Entomology
123 Huntington Street
P. O. Box 1106
New Haven, CT 06504



Phone: 203.974.8480
Email: Kimberly.Stoner@ct.gov
Website: www.ct.gov/caes