# Protecting Pollinators from Pesticides

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# Don’t make your pollinator habitat an ecological trap

An ecological trap is a habitat that is attractive to an organism, but is detrimental to fitness.  An attractive pollinator habitat contaminated with pesticides harmful to the pollinators is an ecological trap!


Ellen Bulger

# Insecticides, Fungicides, Herbicides

- Insecticides are the pesticides most likely to be directly acutely toxic to insect pollinators.
- Many insecticides have sublethal, chronic, or larval effects on insect pollinators.
- Fungicides: some fungicide groups synergize toxicity of certain insecticides. Others are being studied for long-term effects on honey bee colony health.
- Herbicides: Most of their effect on pollinators will be the result of effects on plants – removing blooming plants, or sublethal effects on plants that reduce or delay flowering.

# Pesticide applications that could expose pollinators:

- For honey bees: acaricides and other pesticides inside the hive to control mites and other pests
- Control of human pests and disease vectors: against mosquitos, other biting flies, and ticks
- Control of nuisance pests
- Control of stinging insects: against yellow jackets, honey bees, other bees and wasps - sometimes justifiable, sometimes not
- Agricultural use: Field crops, fruit and vegetable crops, nurseries, greenhouses
- Ornamental Landscape use: including parks, golf courses, and commercial landscapes as well as residential landscapes

# *Varroa* mites are major pests of honey bee colonies

- Beekeepers have been changing their practices in recent years to use acaricides that are less persistent in the hive and less toxic to the honey bee colony

Scott Bauer,
USDA, ARS

# Mosquito Control

For adult mosquitoes:

- May use permethrin, pyrethrins, piperonyl butoxide
- Pyrethrin and permethrin are both highly toxic to bees.
  Piperonyl butoxide is a synergist to increase the toxicity of other insecticides.
- Large-scale public health programs can use naled or malathion, which are also highly toxic to bees.

Alternatives:

- Personal protection - avoid times of mosquito activity, cover up, use repellents
- Removal or management of habitat for mosquito larvae
- Conservation of natural enemies
- Microbial controls of larvae
- Surface oils and films – which affect other aquatic organisms
- Insect growth regulators – also affect other aquatic organisms

From EPA website: https://www.epa.gov/sites/production/files/2013-06/misting_system.jpg

# Tick Control

Permethrin and Pyrethrins, often combined with Piperonyl Butoxide, are also used for tick control, as are other insecticides highly toxic to bees. Their use can be minimized by making applications at the most effective time and just to the parts of the landscape most likely to harbor ticks.

Alternatives:

- Personal Protection: Avoid tick habitats, dress to deter ticks, wear repellents, perform tick checks
- Altering the landscape to make it less favorable to ticks
- Biological control using Met52 fungus

Scott Bauer, USDA, ARS

I have bees in my yard. How do I get rid of them?
*Colletes* – Solitary Bees
Nest in the ground in aggregations

# Bees and Wasps – Which Ones Sting?

- **Social** bees and wasps are more likely to sting
  - large nest to defend, including larvae
  - large number of workers that can be sacrificed to save the colony.
- **Most bee and wasp species are solitary**
- **Solitary** bees and wasps generally do **not** sting.
- Some **solitary** bees and wasps nest in aggregations. Each female has her own nest, but many females make their nests close together. This **does not** make them more likely to sting.
- Male bees and wasps **never** sting. A sting is a modified ovipositor. Males don't have them.

# Most Stings in US are from Yellow Jackets

Eastern Yellow Jacket, *Vespula maculifrons*
Biology.duke.edu

German Yellow Jacket, *Vespula germanica*
Wikipedia.org

European Paper Wasp, *Polistes dominula*
Alvesgaspar, Wikipedia.org

Bald Faced Hornet, *Dolichovespula maculata*
Beatriz Moisset

## Most Bee Stings are from Honey Bees

- Honey bees mainly sting to defend the colony
- Aside from beekeepers, most people stung by bees are walking barefoot on lawns or handling flowers
- Bumble bees are much less likely to sting than honey bees
- Solitary bees generally do not sting unless directly handled


How to
Reduce Bee Poisoning
from pesticides
L. Hooven
R. Sagili
E. Johansen
Photo: Ramesh Sagili
A PACIFIC NORTHWEST EXTENSION PUBLICATION • PNW 591
Oregon State University ■ University of Idaho ■ Washington State University

# Most agricultural bee poisoning incidents occur when:

- Insecticides are applied
  - when bees are foraging
  - **to bee-pollinated crops when in bloom**
  - **to blooming weeds in orchards or field margins**
  - **drifting onto blooming plants adjacent to the target crop**
- Bees collect insecticide-contaminated pollen or nectar from treated crops that do not require bee pollination
- Bees collect insecticide-contaminated nectar or pollen from plants treated with systemic insecticides
- Insecticides contaminate nesting materials (soil for ground-nesting bees, leaves collected by leaf-cutting bees)
- Bees collect insecticide-contaminated water (drip tape, chemigation, drift into water sources)
- Beekeepers and growers do not adequately communicate

- List adapted from “How to Reduce Bee Poisoning from Pesticides”

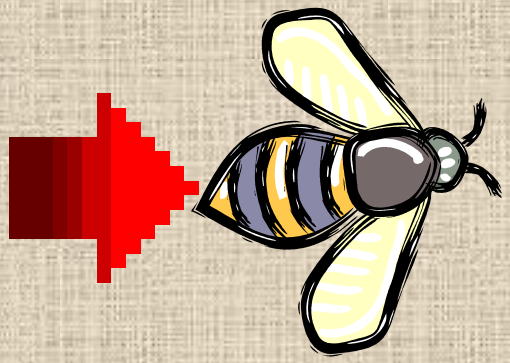
# Pollinator Habitat Too Close to the Crop (if you are using pesticides) !

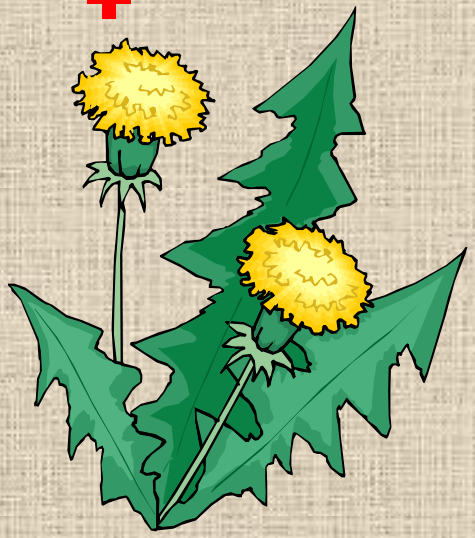
Photo by Ramesh Sagili – from How to Reduce Bee Poisoning from Pesticides

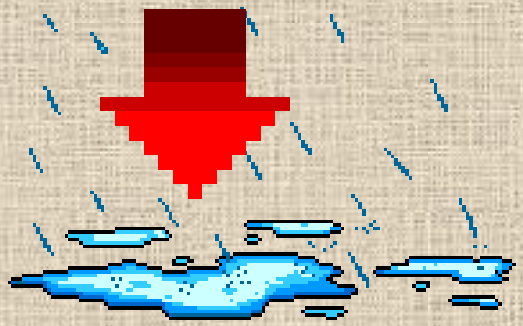
# Squash Bees Nesting in the Crop

Photos from Kristen Brochu – Cornell University

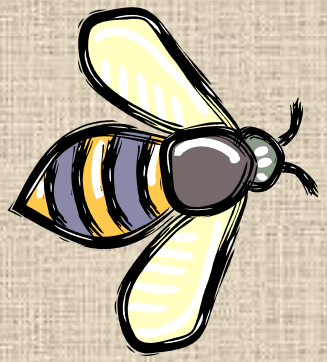
# Routes of Bee Exposure to Pesticides

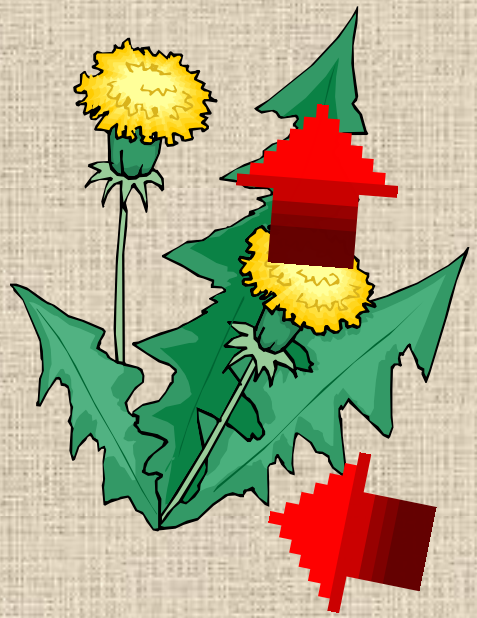






# Systemic Pesticides






# How Neonicotinoids Can Kill Bees
# Xerces Report

http://www.xerces.org/neonic-report-exec-summary/

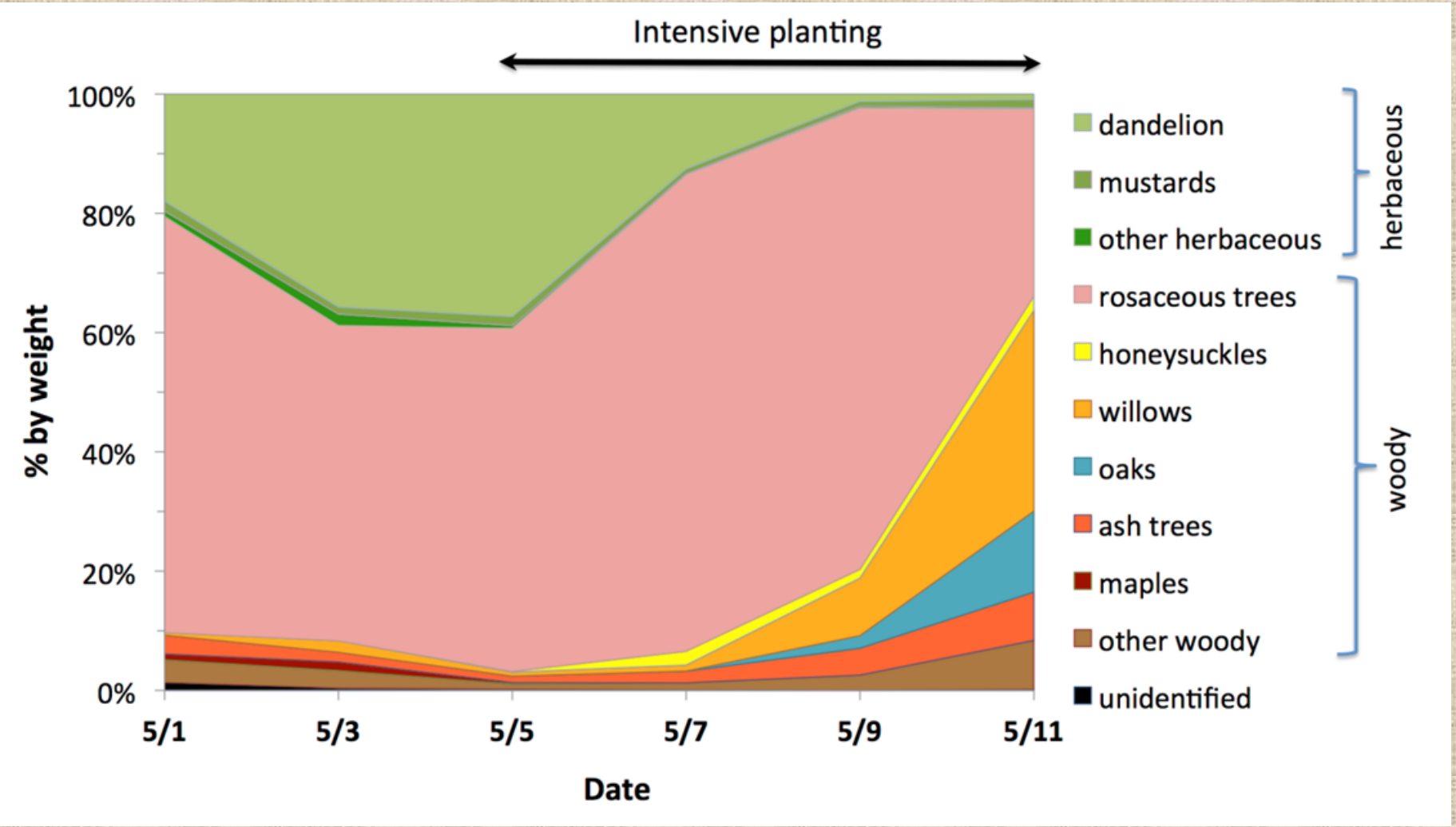
Summarizes current knowledge, identifies data gaps

# Drifting dust at planting from corn seeds treated with systemic insecticides

Corn planting – Note dust

Source: http://www.producer.com/2013/05/no-yield-benefit-from-neonicotinoids-scientist/

# Honey bee pollen collected from hives near corn fields at the time of planting

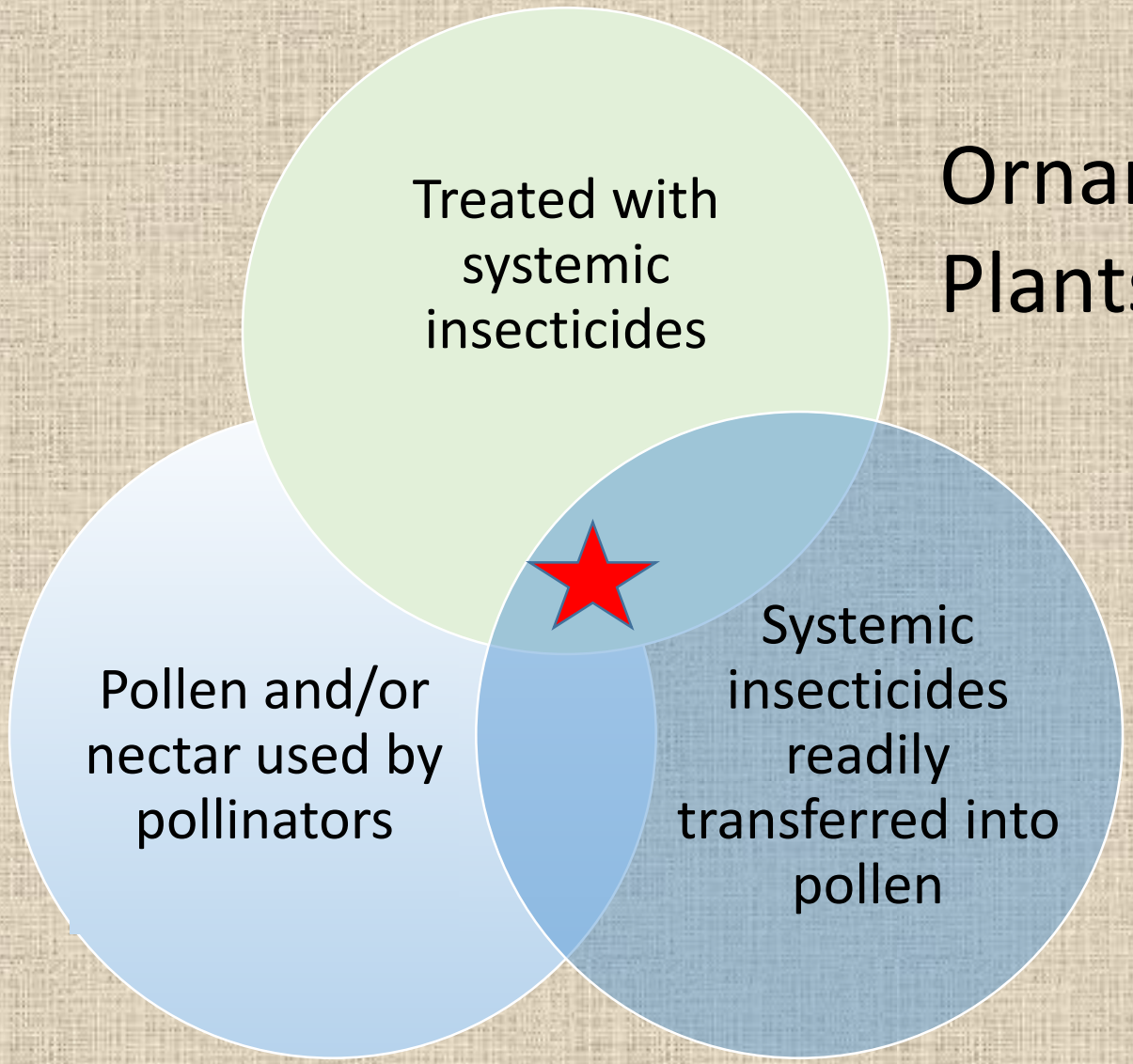



From the report of the Corn Dust Research Cooperative – OSU – July 2015

# How much risk is there from ornamental pesticide use?

- Based on our studies testing trapped honey bee pollen in urban environments and in ornamental plant nurseries, highly toxic concentrations in pollen are unusual.
- Due to the high label rates of application and the long residual times, neonicotinoids can be present in high concentrations in nectar and pollen of certain plants, even when applied according to the label.
- Probably the greatest risks are from misapplication (to plants in bloom, for example) and drift

# Ornamental Plants



# Pesticide testing of pollen collected by honey bees living inside ornamental plant nurseries

| Site | No. of pollen samples | Samples below 5% of $LD_{50}$ | Samples 5 - 10% of $LD_{50}$ | Samples above 10% $LD_{50}$ |
|---|---|---|---|---|
| Nursery M | 35 | 35 | 0 | 0 |
| Nursery P | 31 | 31 | 0 | 0 |
| Nursery C | 38 | 33 | 2 | 3 |

# How far away is far enough to prevent drift into pollinator habitat?

- Xerces guidelines: 40 feet from ground-based pesticide applications, 60 feet from air blast sprayers
- To avoid dust from treated seeds: 125 feet
- Plant upwind from area where pesticide used (if there are steady prevailing winds)
- Vegetative buffers as windbreaks – evergreens not attractive to pollinators
- Grassed filter strips to catch field runoff

# How far do bees travel?

- Depends on availability of good forage close to home
- Depends on the size of the bee
- Also varies with species, even among similar sized-species (such as bumble bees)
- Honey bees are weird – they can recruit foragers for distances up to 4-6 miles away (to a great resource in a poor environment)
- Other pollinators may travel differently – migrating butterflies, for instance

# How far some bees travel

| Size | Example | Typical distance | Maximum distance |
|---|---|---|---|
| Small | Sweat bee | 100 yards | 200 – 300 yards |
| Medium | Mason bee | 500 yards | 900 – 1000 yards (about ½ mile) |
| Large | Bumble bee (forager) | Varies from 300-600 yards | Varies from 800 yards to 1.7 miles |
| Medium | Honey bee | Can sustainably go 4 miles for a good resource if necessary | Have been found to go 7 miles, but this is not sustainable |

# Recommendations to protect pollinator habitat

- Do not apply pesticides highly toxic to bees during bloom.
- Use Integrated Pest Management (IPM) to limit pesticide use to where it is most needed and most effective. Consider alternatives to pesticides.
- Don’t use pesticides where they are not needed or not effective against the target pest.
- Minimize drift and turn off application equipment near water sources.
- Evaluate the bee toxicity of pesticides and choose less toxic options.
- Consider less hazardous pesticide formulations and length of residual toxicity to reduce bee exposure.
- Remove blooming plants in or near the application area before spraying.
- Identify pollinator nesting as well as foraging habitats and protect them from pesticides.

# Resources for evalutating pesticides

- How to Reduce Bee Poisoning from Pesticides https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/pnw591.pdf
- University of California IPM Bee precaution ratings http://www2.ipm.ucanr.edu/beeprecaution/

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