GETTING ***TOUGH*** WITH PESTS

AND

GOING ***SOFT*** ON POLLINATORS

Brooke Decker, VAAFM Pollinator Health Specialist and State Apiculturist

Laura Johnson, UVM Extension Pollinator Support Specialist

Virtual Training
Spring 2022

CERTIFIED CROP ADVISER

Special thanks to:
MP3 Working Group

Sections of this presentation have been borrowed and adapted from work supported by MDARD and the USDA National Institute of Food and Agriculture, Crop Protection and Pest Management Program through the North Central IPM Center (2018-70006-28883).

<u>POLL QUESTION #1</u>

Where do you primarily use your pesticide applicator license?

- Agriculture
- Forestry
- Right of Way
- Schools, Colleges, Universities
- Other public uses
- Other private uses

<u>POLL QUESTION #2</u>

Have you taken this training before?

- Yes
- No
- I have taken other training on pollinators and pesticides

LESSON OBJECTIVES:

1. Recognize the role of pollinators in the environment and learn the lifecycles of common bee pollinators.

2. Explain the difference between a pesticide's *toxicity* and *risk* to bees.

3. Judge pesticide application risk to bees from the *Environmental Hazards* section of the label.

4. Take steps to reduce poisoning of bees in exposure scenarios.

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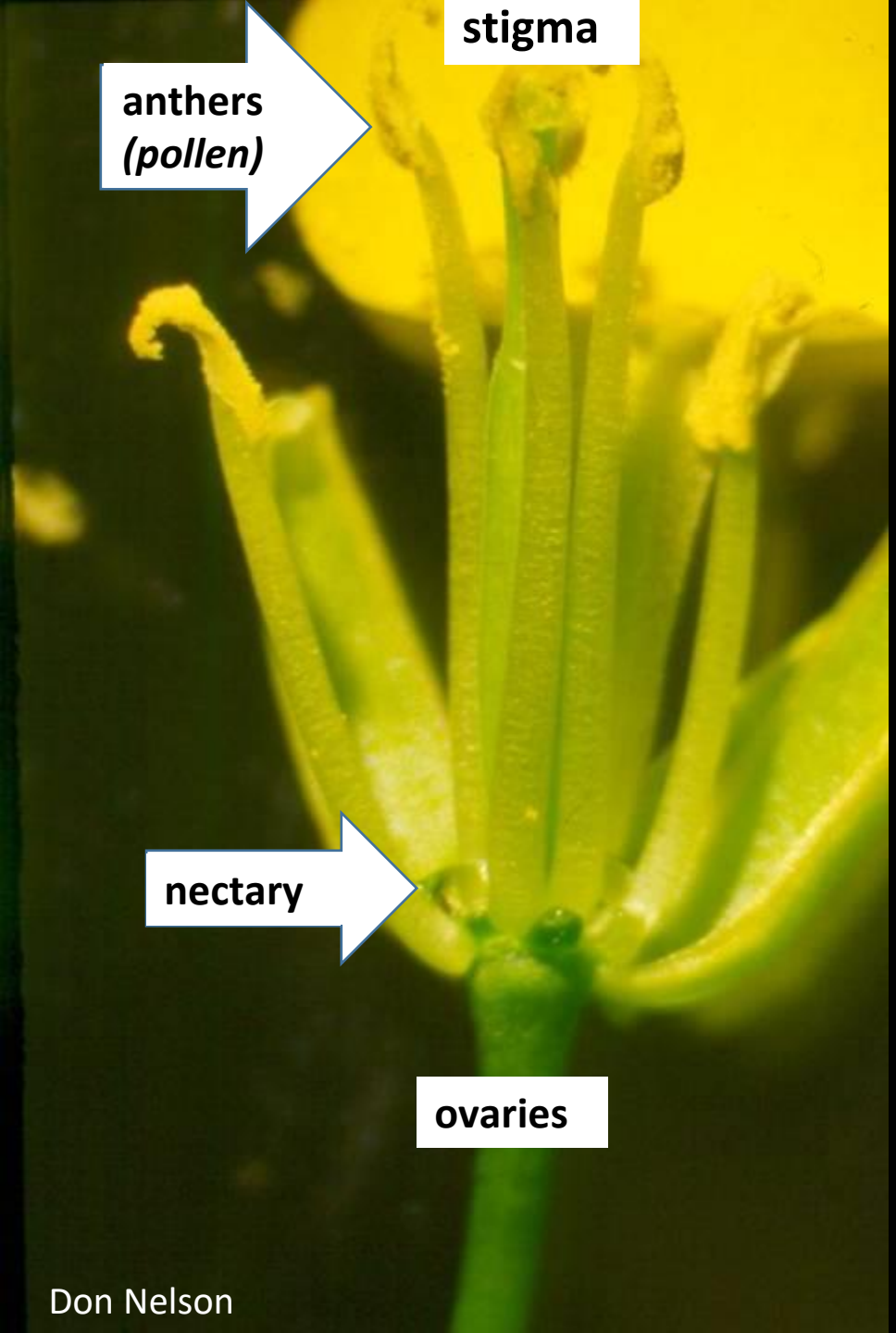


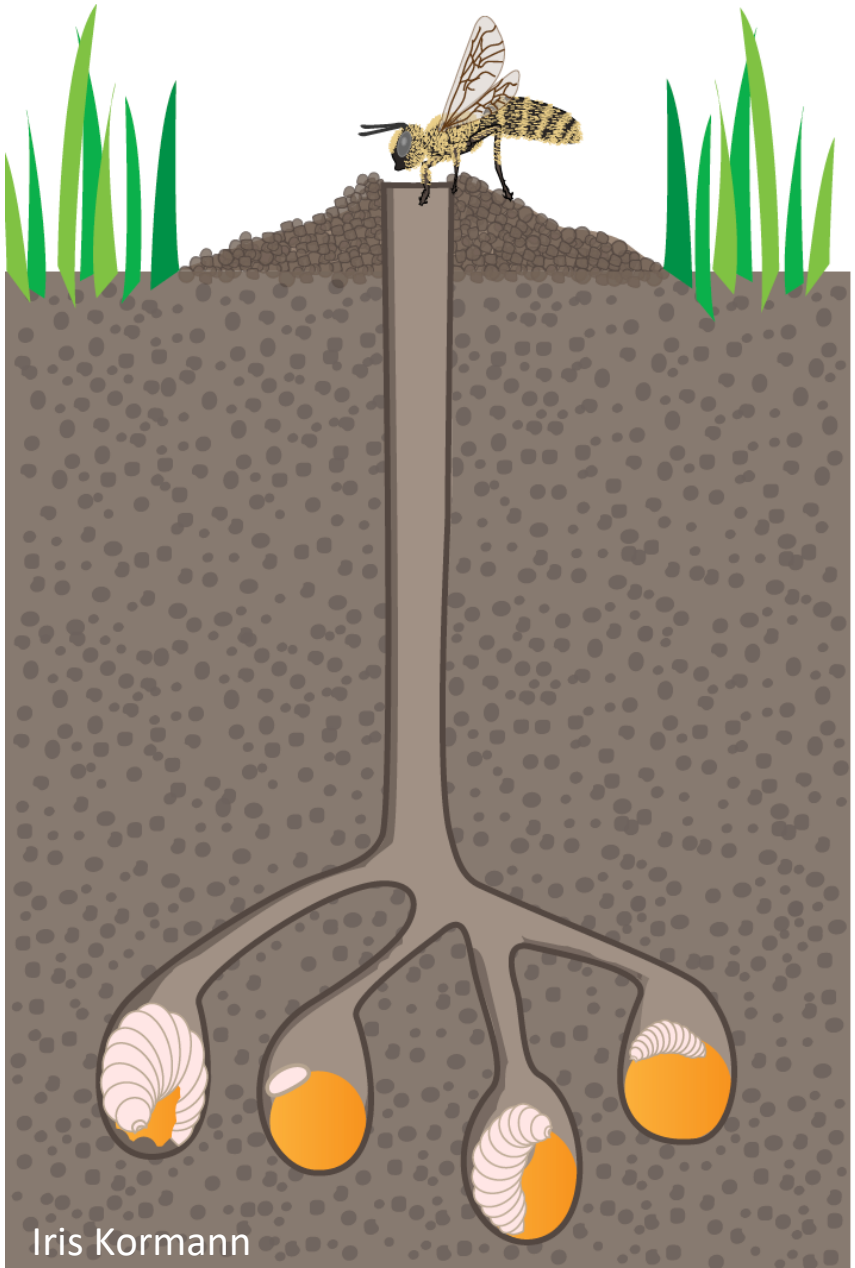
If it's carrying pollen, it’s a bee.
But not all bees carry pollen.

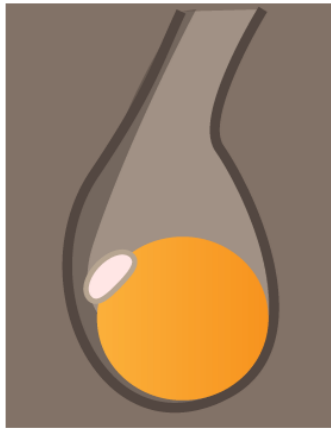
Bees vary greatly:

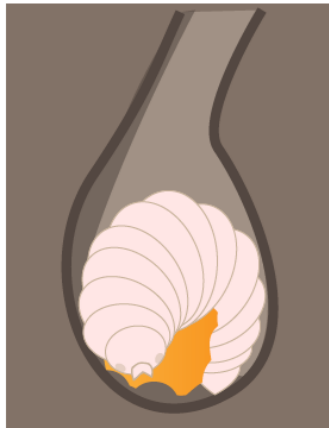
- Size
- Appearance
- Behavior
- Effectiveness as pollinators
- Floral choices
- Nesting locations

Photos: Oregon Department of Agriculture

WHERE DO BEES LIVE?








A. Melathopoulos

Orchard Mason Bee

Osmia lignaria

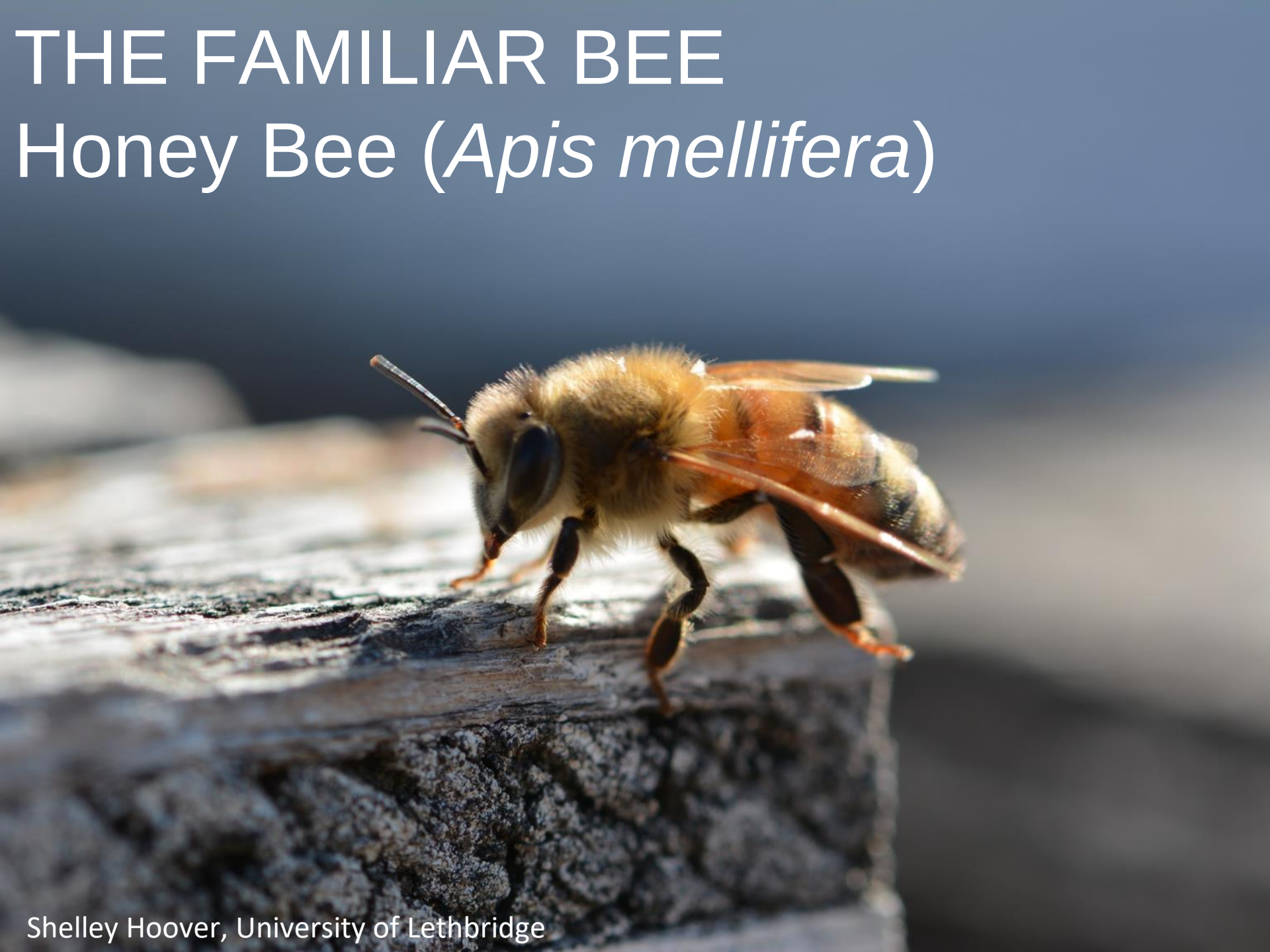
FAMILY: MEGACHILLIDAE

- A spring bee.
- Flies for 3-4 weeks.
- Excellent fruit tree pollinator.

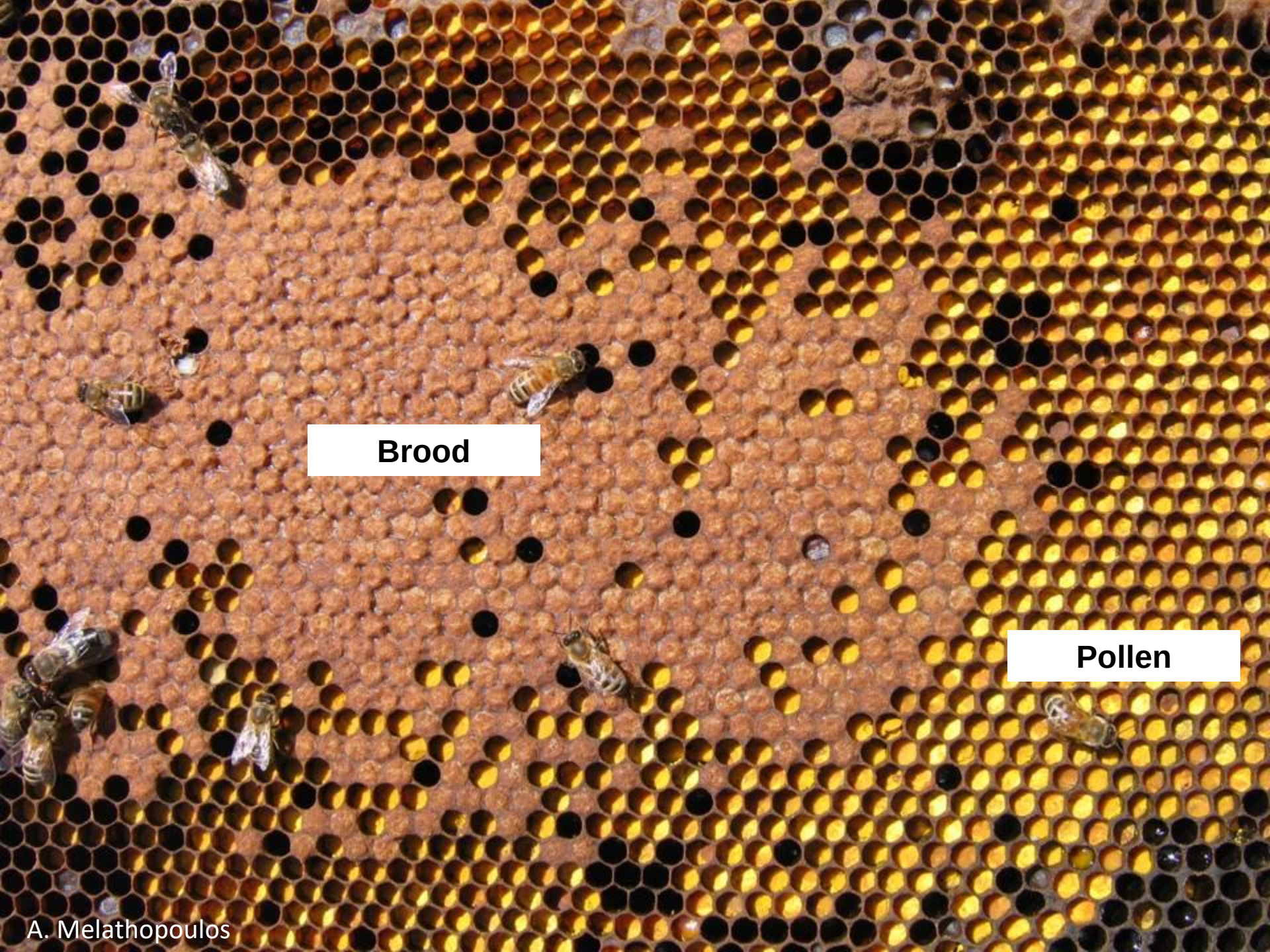
Lincoln Best

A. Melathopoulos

THE FAMILIAR BEE
Honey Bee (*Apis mellifera*)



Shelley Hoover, University of Lethbridge



A. Melathopoulos

Shelley Hoover, University of Lethbridge

HONEY BEE POLLINATION

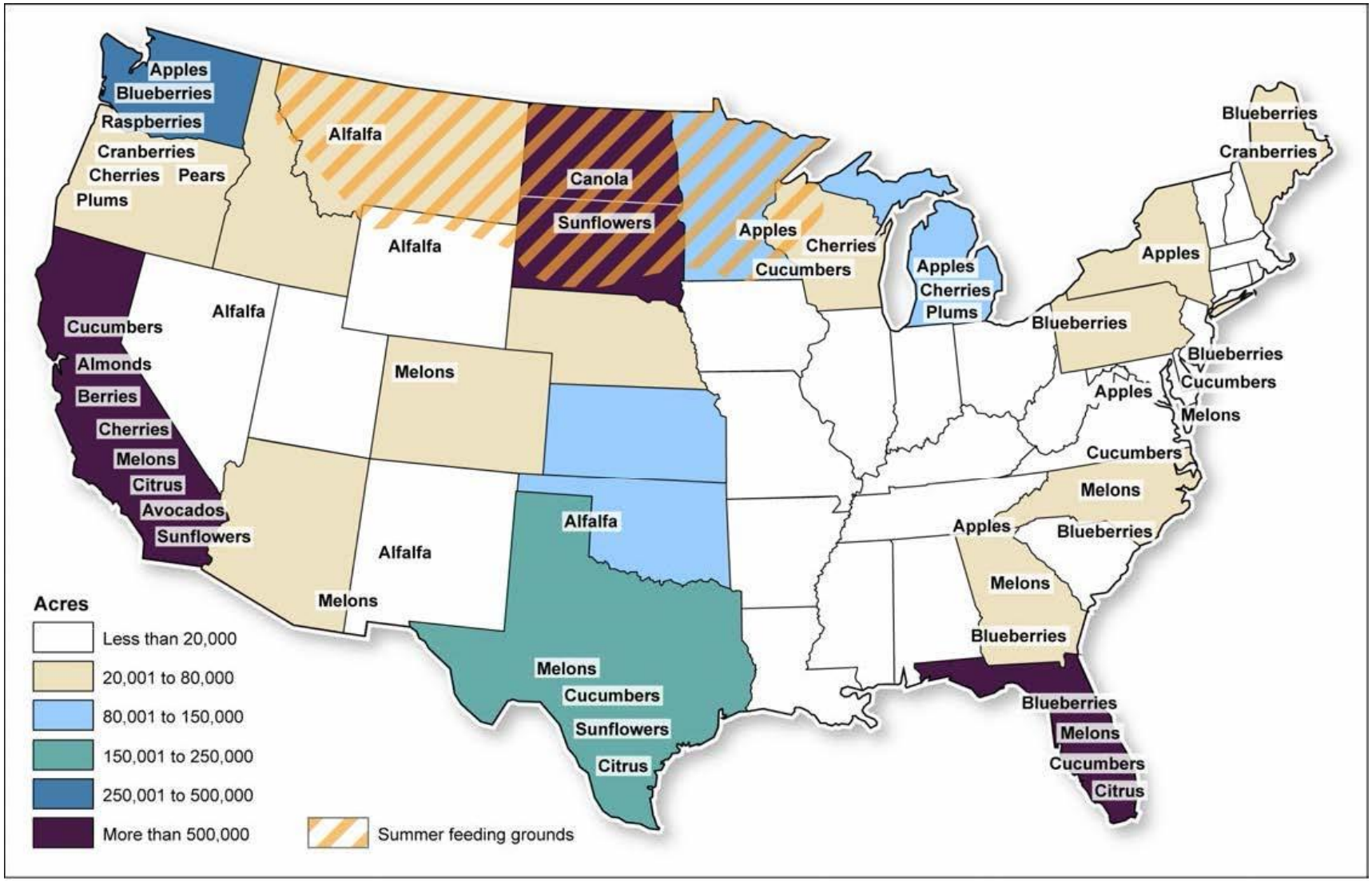
Orchard Fruit

Berries

Vegetable Seed

Hybrid Oilseeds

US COLONY MOVEMENT



Sources: Adapted by U.S. Department of Agriculture (USDA), Economic Research Service from Kautzmann (2011), with input from commercial beekeepers and agriculture experts, including Dr. Jeff Pettis and Dr. David Epstein, an entomologist and authority on pollinators with the USDA's Office of Pest Management Policy; crop production acres are from USDA, National Agricultural Statistics Service, 2012 Agricultural Census, 2014; Map Resources (map). | GAO-16-220


A. Melathopoulos
1
4
12
HOW MANY HIVES?

HOW MANY HIVES?

1

4

12

Bee Hive Tour

Shelley Hoover, University of Lethbridge

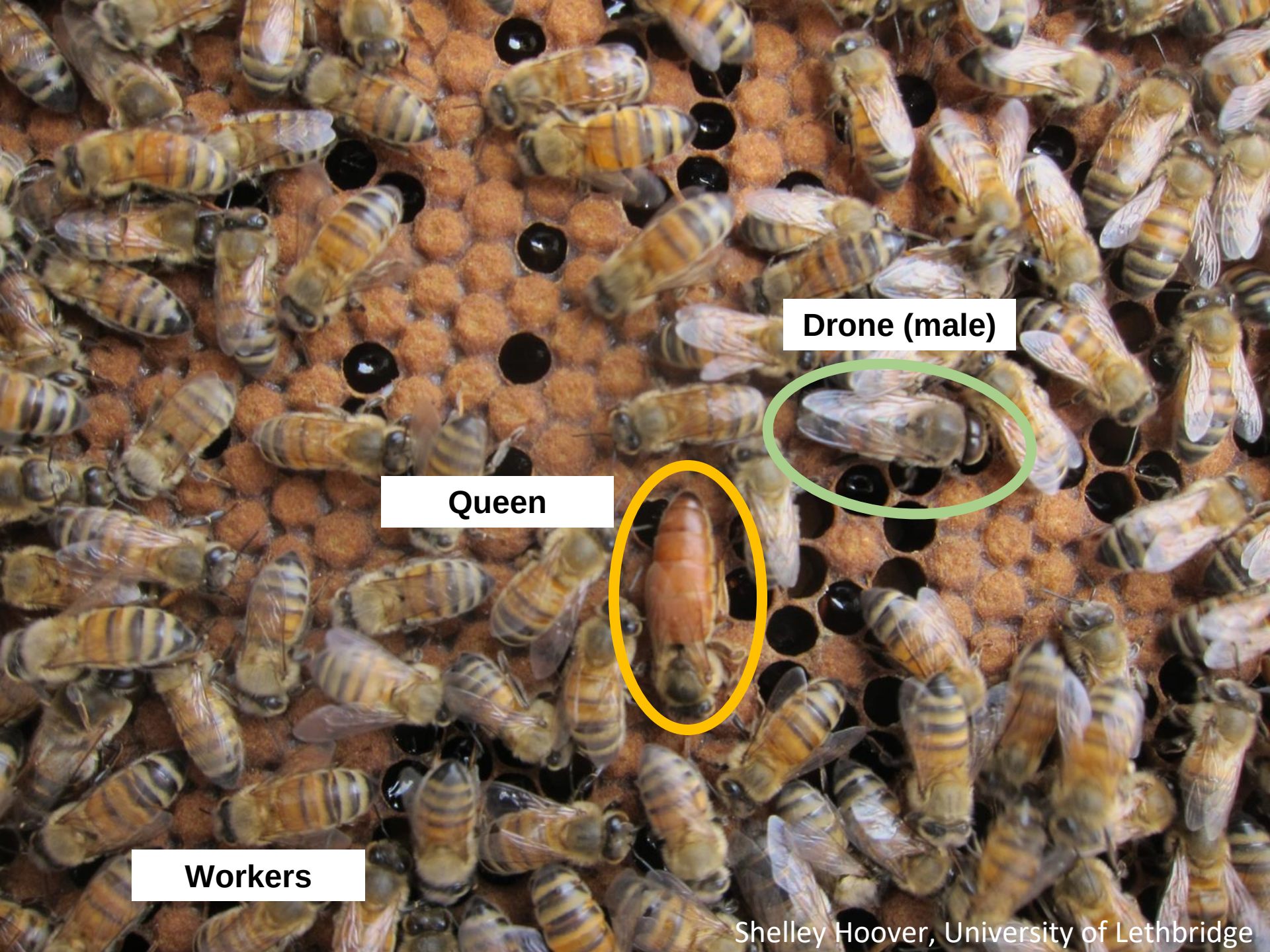
Lid

Honey Super

Bottom Board

Pallet

Shelley Hoover, University of Lethbridge



Shelley Hoover, University of Lethbridge

LESSON OBJECTIVES:

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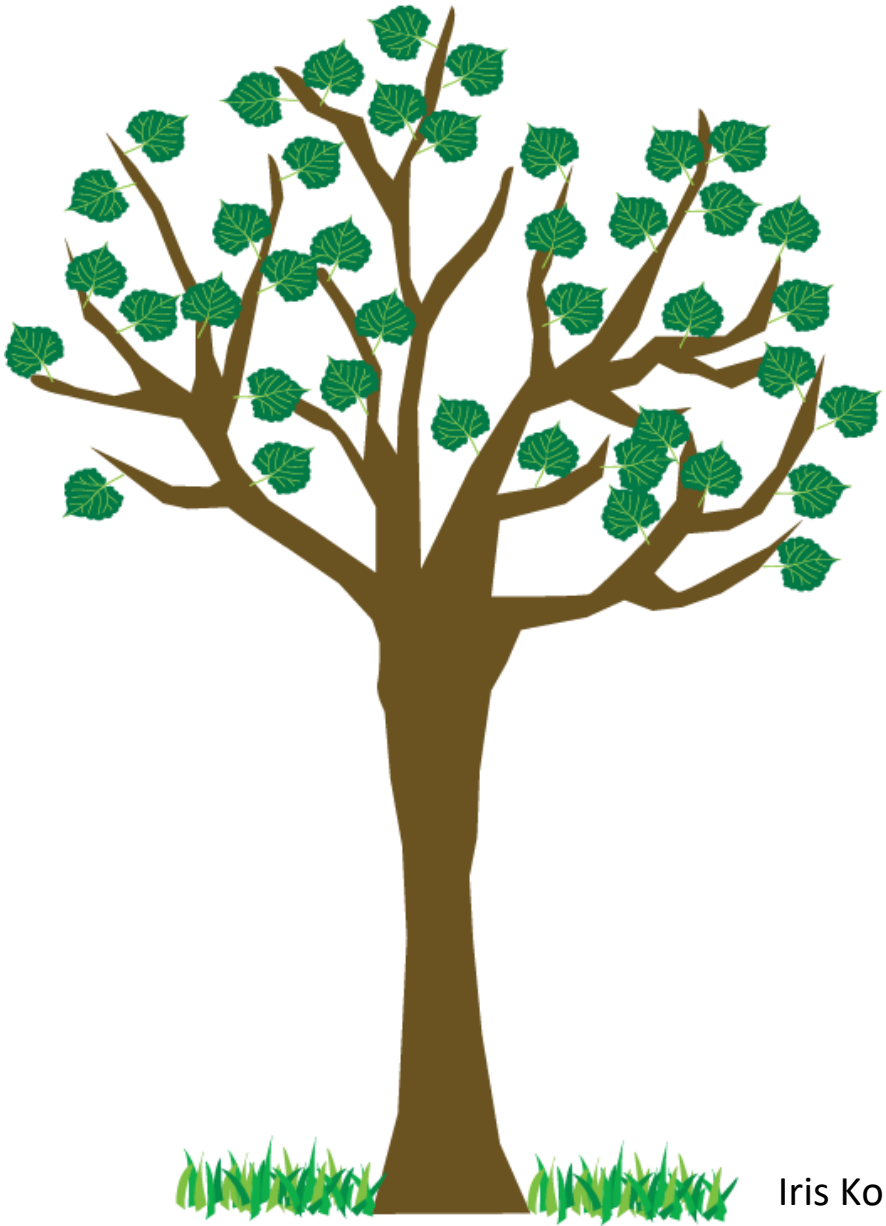
BEES, PESTICIDES & RISK

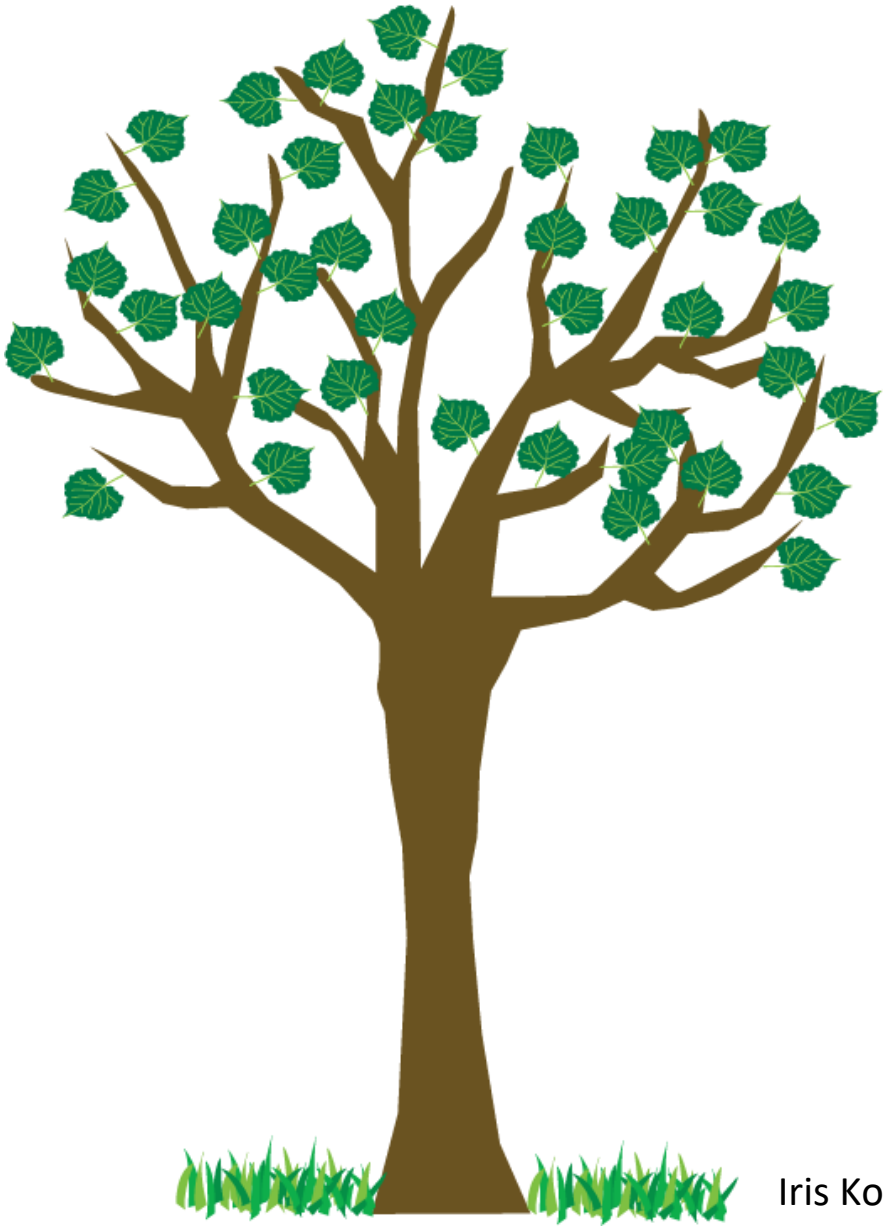


RISK =

*…the **likelihood** and **magnitude** of an adverse effect to bees as a result of exposure to a pesticide treatment.*

Iris Kormann

BEES, PESTICIDES & RISK

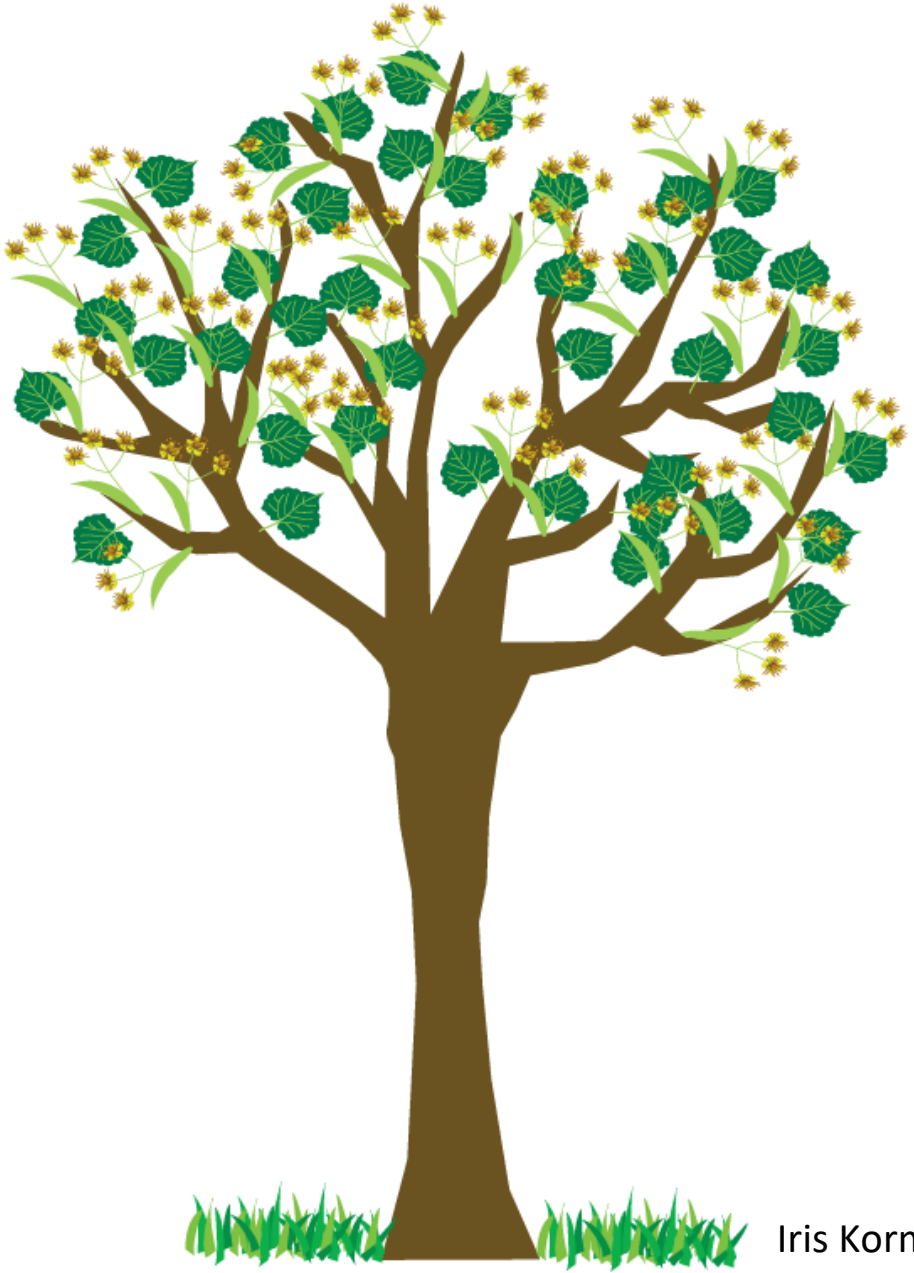


RISK =

Toxicity

Iris Kormann

BEES, PESTICIDES & RISK



RISK =

Toxicity

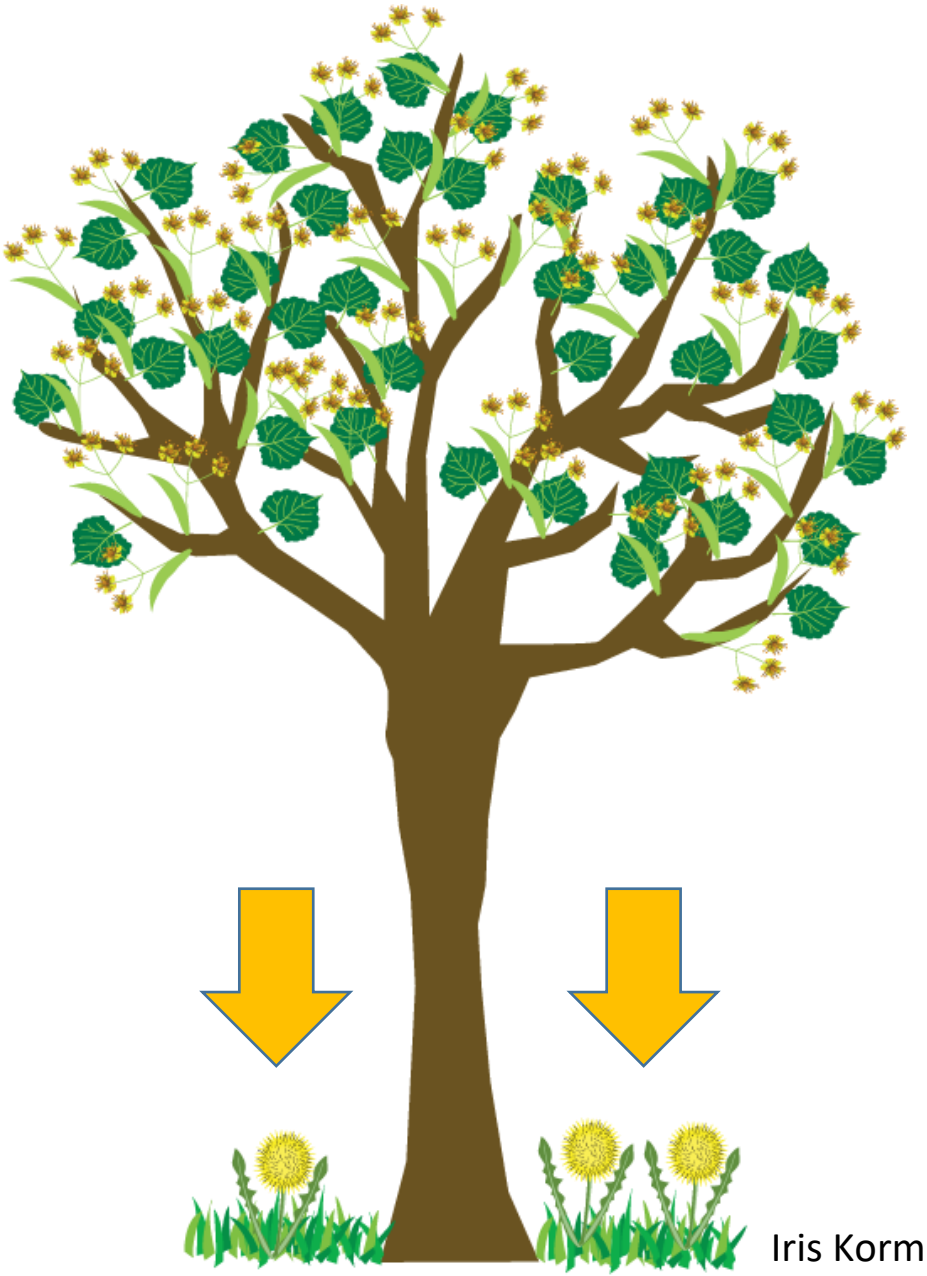
x

Exposure

Bee attractive bloom

Iris Kormann

BEES, PESTICIDES & RISK



RISK =

Toxicity

x

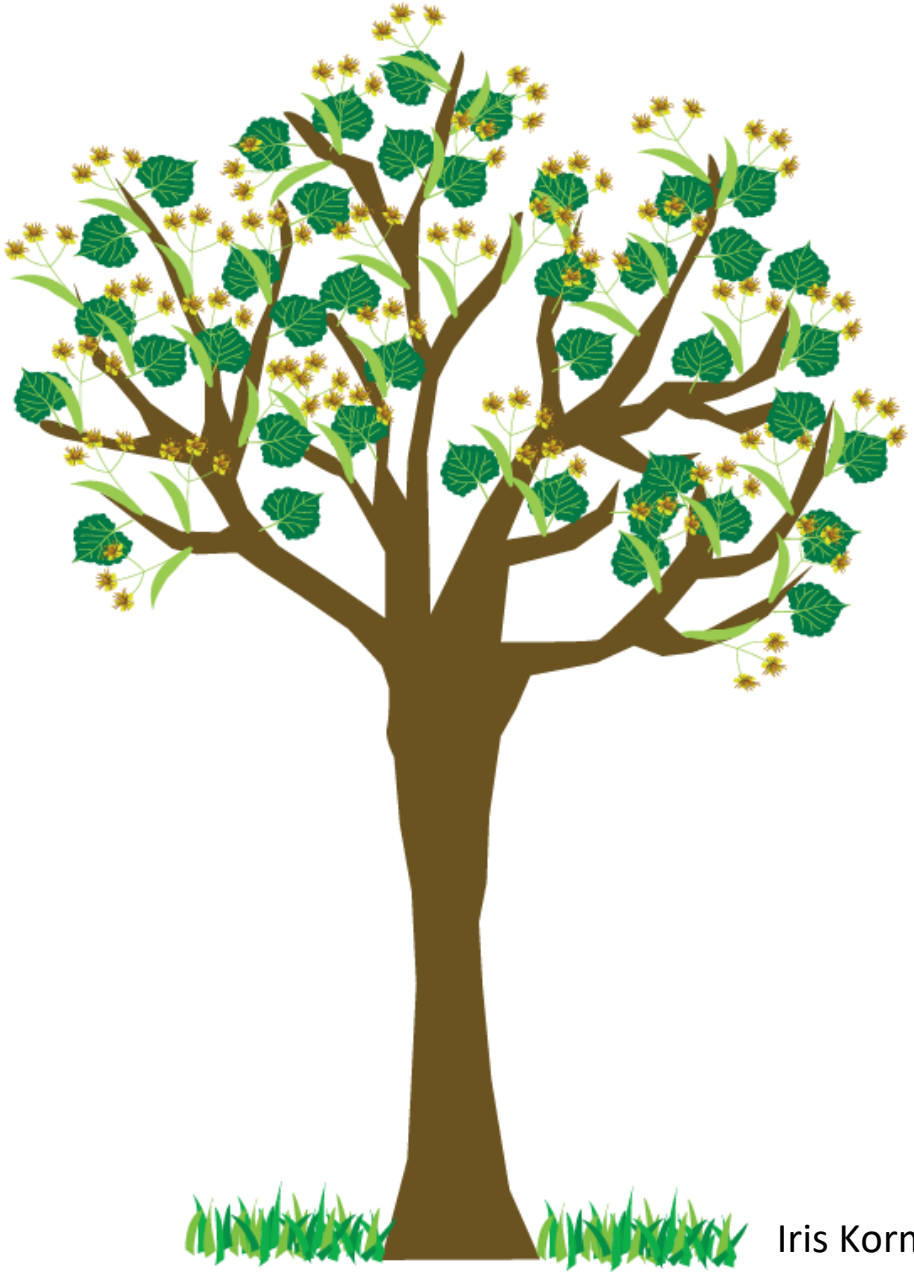
Exposure

Bee attractive bloom

Iris Kormann


A. Melathopoulos

BEES, PESTICIDES & RISK



RISK =

Toxicity

x

Exposure

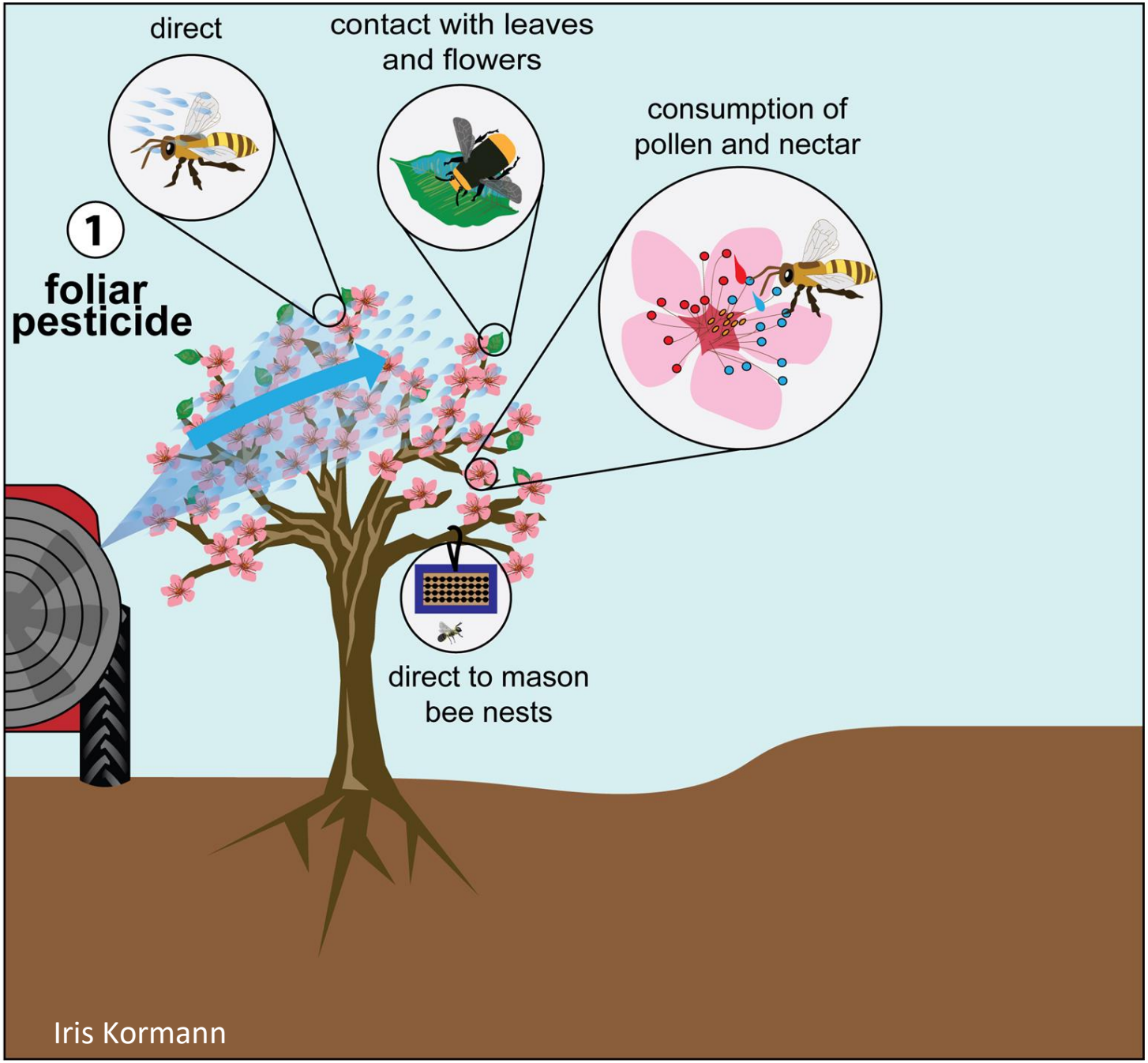
Bee attractive bloom

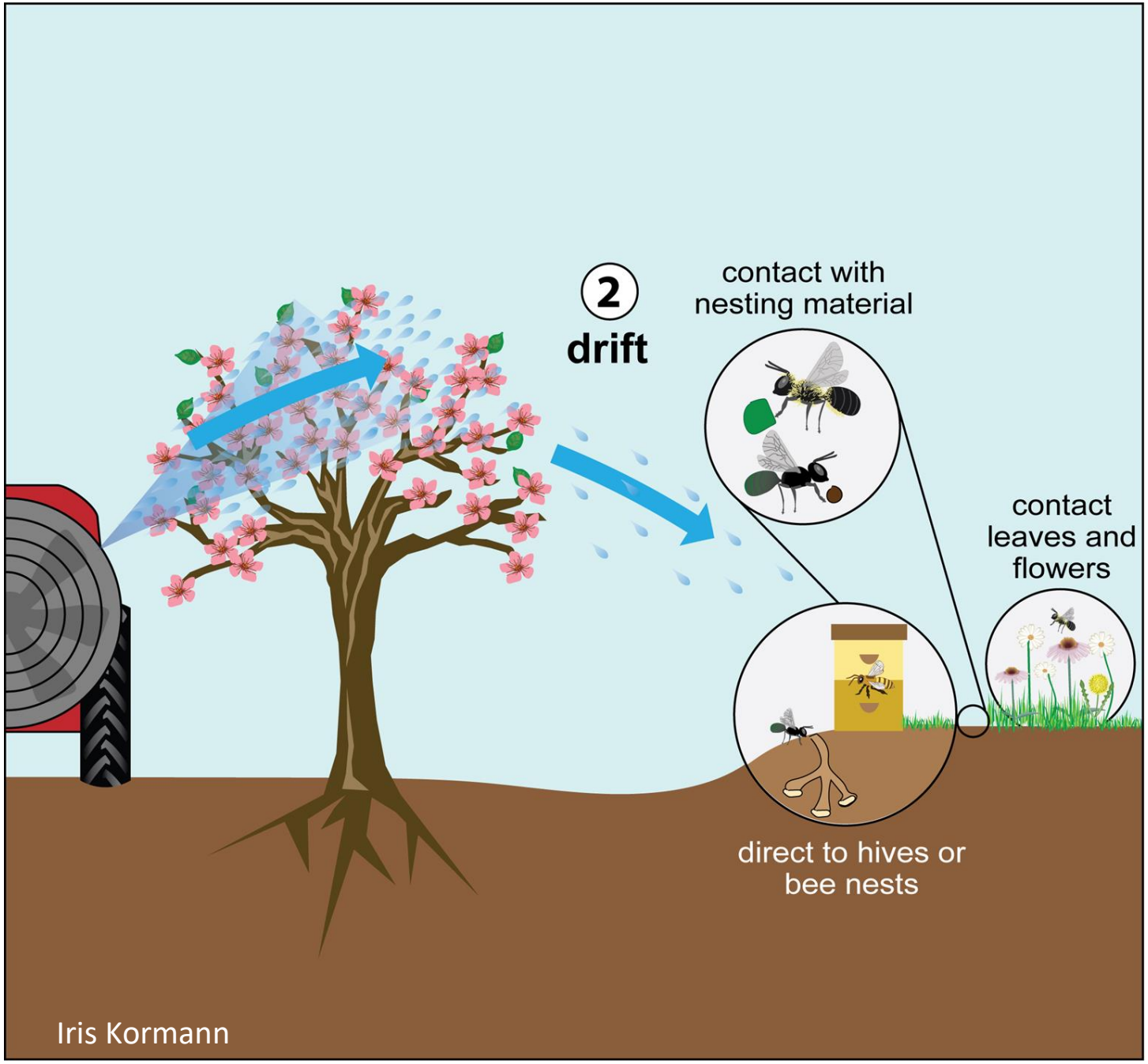
Nesting material

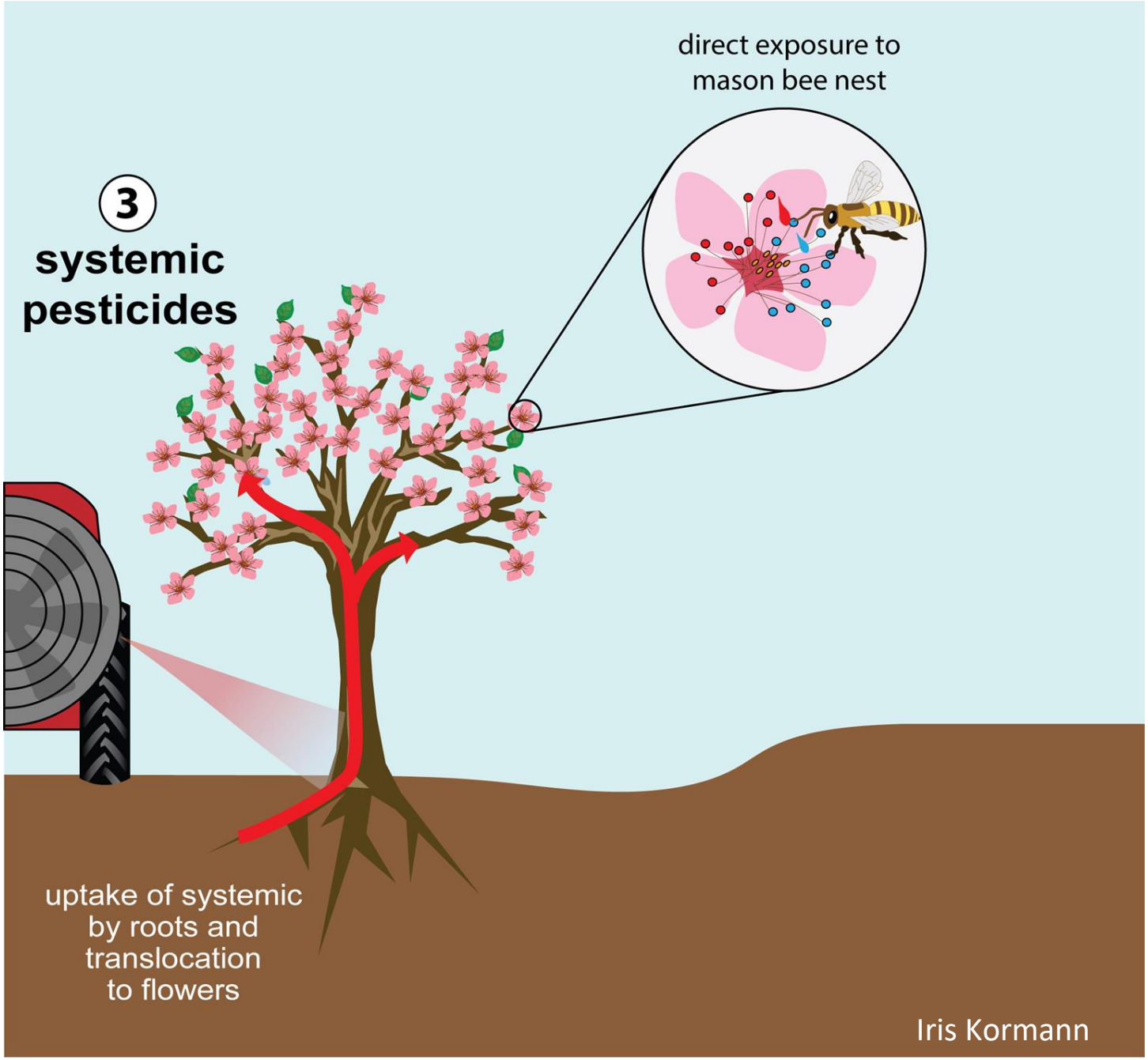
Nests

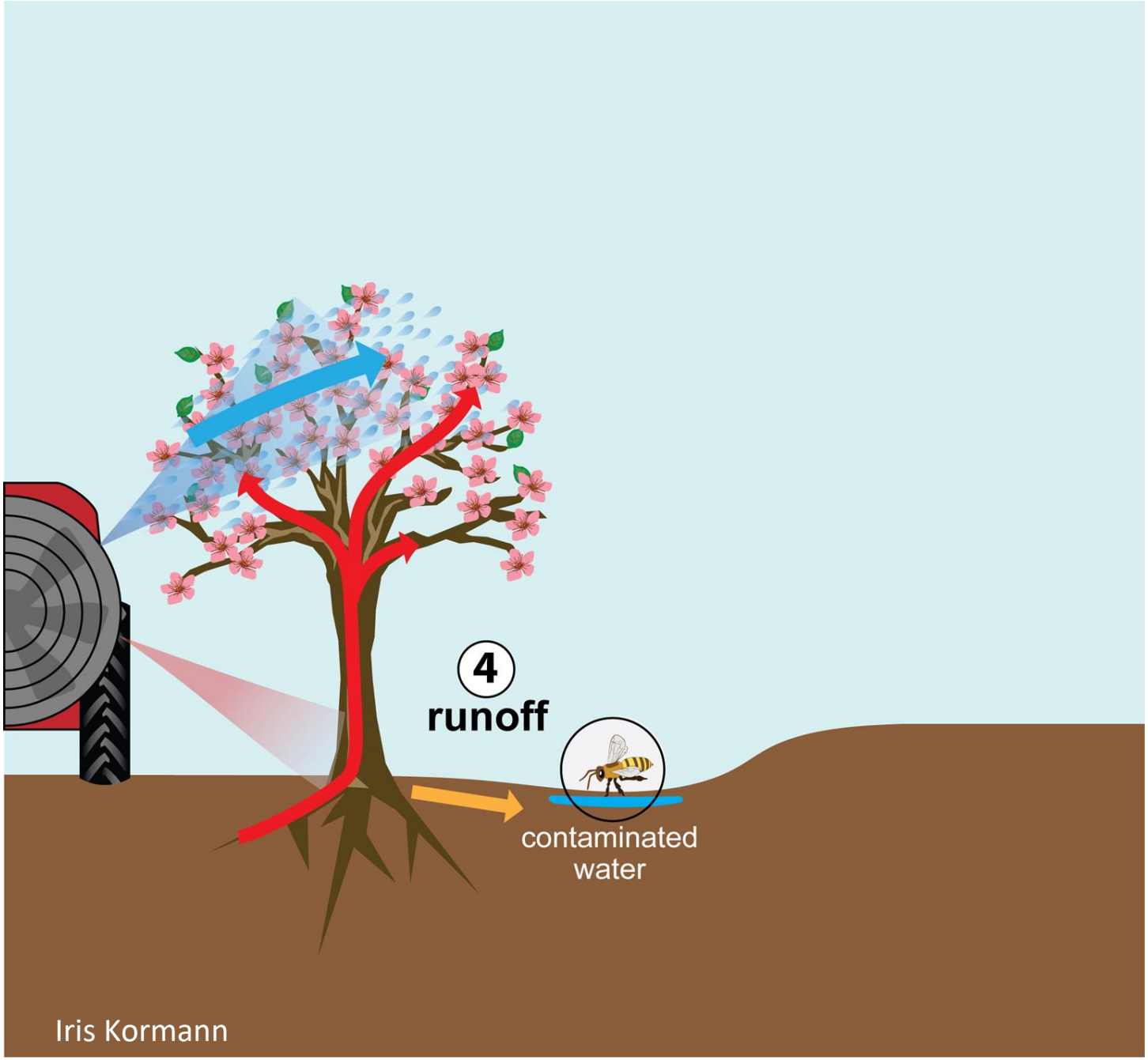
Water

Iris Kormann


direct
contact with leaves and flowers
consumption of pollen and nectar
1
foliar pesticide
direct to mason bee nests
Iris Kormann


2
drift
contact with
nesting material
contact
leaves and
flowers
direct to hives or
bee nests
Iris Kormann

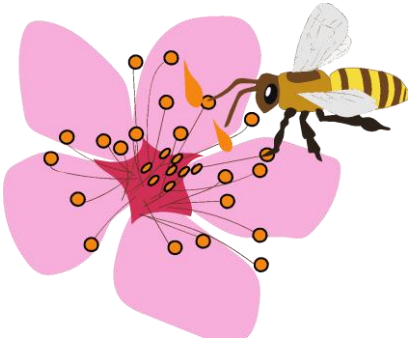

direct exposure to
mason bee nest
3
systemic
pesticides
uptake of systemic
by roots and
translocation
to flowers
Iris Kormann


4
runoff
contaminated
water
Iris Kormann

BEE EXPOSURE TO PESTICIDES

Contact

contaminated leaves or flowers



Consumption

contaminated pollen or nectar

Contact

gathering contaminated nesting material

Iris Kormann

Nest Exposure

contaminated cell material and food

LESSON OBJECTIVES:

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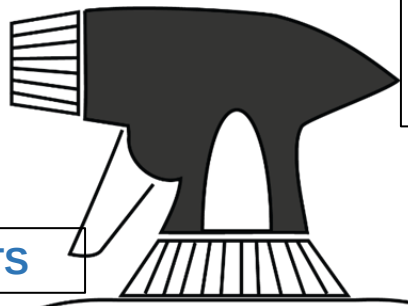
PESTICIDE LABELS AND POLLINATORS

THE UNIVERSITY OF VERMONT EXTENSION

Thanks to the MP3 Working Group and North Central IPM Center



PRECAUTIONARY STATEMENTS

ENVIRONMENTAL HAZARDS

This pesticide is toxic to _____

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are activly foraging the treatment area.

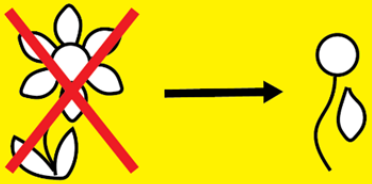
PROTECTION OF POLLINATORS

DIRECTIONS OF USE

Do not apply more than _____ outlined in the table below.

Plant	Pest	Directions
Fruit and Vegetables	Leafrollers	repeat every 14 days if neccessary
Roses	Aphids, Japanese beetle	use not less than 2 weeks apart

1. ENVIRONMENTAL HAZARDS



don't spray when in bloom → wait until full petal fall

2. Residual toxicity

Look out for the words:

1. **foraging** = toxic for longer than 8 hours

2. **actively foraging** or visiting = toxic for less than 8 hours

3. Check for more precautions

Some products have a more comprehensive label with a bee advisory box and icon containing information on routes of exposure and spray drift precautions.

Iris Kormann

ZETA-CYPERMETHRIN | GROUP 3A INSECTICIDE

THE UNIVERSITY OF VERMONT EXTENSION

Thanks to the MP3 Working Group and North Central IPM Center

MUSTANG® MAXX INSECTICIDE

EPA Reg. No. 279-3426 **EPA Est. 279-NY-1**

Active Ingredient: **By Wt.**
Zeta-cypermethrin*S-Cyano (3-phenoxy-phenyl) methyl (+) cis/trans 3-(2,2-dichloro-ethenyl)-2,2 dimethylcyclopropane carboxylate.....9.15%
Other Ingredients**.....90.85%
100.00%

Contains 0.8 pounds active ingredient per gallon.
*Cis/trans ratio: Max. 75% (±) cis and min. 25% (±) trans
**Contains Petroleum Distillates

ENVIRONMENTAL HAZARDS

This product is toxic to wildlife. This product is toxic to bees and other pollinating insects exposed to direct treatment. Do not apply this product while bees or other pollinating insects are actively visiting the treated area. Risk to managed bees and native pollinators from contact with pesticide spray or residues can be minimized when applications are made at dawn or dusk or when temperature is below 55°F at the site of application. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwater or rinsate. Do not contaminate water used for irrigation or domestic purposes.

"…toxic to bees…"

ACTUTE TOXICITY & THE LABEL

Thanks to the MP3 Working Group and North Central IPM Center

LD_{50} (lethal dose 50%): the amount of pesticide applied in a single dose that on average kills one-half of the exposed bees during the length of the study, usually 48 hours. One microgram (µg) equals one millionth (0.000001) of a gram.

"Highly Toxic to Bees"

– LD50 is *less than or equal* to 2 µg/bee

"Toxic to Bees"

– LD50 is *less than* 11 µg/bee but *greater than* 2 µg/bee

Relatively Nontoxic *-Nothing on the label*

– LD50 is *greater than* 11 µg/bee

- Risk assessment considers single products and not synergistic effects of mixes
- Assumes honey bee responses are relatable to other bees,……but……..

Acute toxicity

Thanks to the MP3 Working Group and North Central IPM Center


Harry Vanderpool

Death within a few hours


Photo by Ellen Topitzhofer

TARGET

June 2013, Wilsonville, OR

THE UNIVERSITY OF VERMONT EXTENSION

Thanks to the MP3 Working Group and North Central IPM Center

Aphid treatment

Thanks to the
MP3 Working Group
and North Central
IPM Center

POLL QUESTION

Where on a pesticide label can you find out if a pesticide is considered toxic to bees?

PESTICIDE TOXICITY

THE UNIVERSITY OF VERMONT EXTENSION

Thanks to the MP3 Working Group and North Central IPM Center

Acute toxicity

Death within a few hours

Iris Kormann

Chronic toxicity

<u>SUBLETHAL</u> TOXICITY

"a lot of little nicks" –

Research shows lingering effects from exposure. (e.g. neurological effects like impaired foraging. Other increased vulnerabilities, like disease susceptibility, delayed larval development, etc.)

Thanks to the
MP3 Working Group
and North Central
IPM Center

CHRONIC TOXICITY NOT CONSIDERED FOR MOST LABELS.

Toxicity from herbicides?

Thanks to the MP3 Working Group and North Central IPM Center

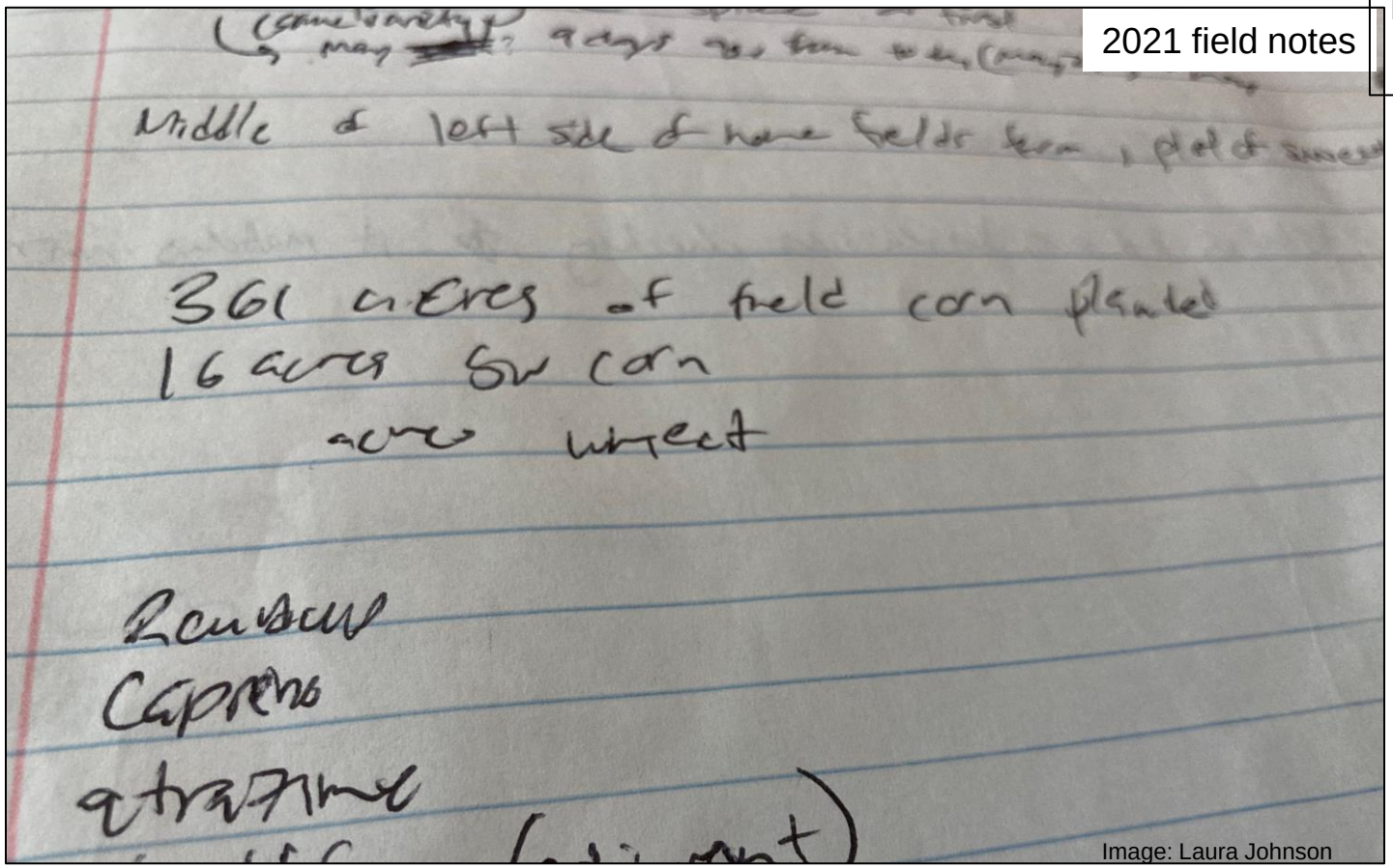
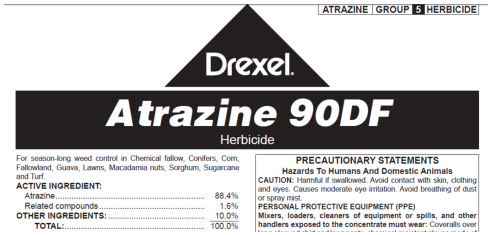


Image: Laura Johnson



ATRAZINE | GROUP 5 | HERBICIDE

Thanks to the MP3 Working Group and North Central IPM Center

Drexel

Atrazine 90DF

Herbicide

For season-long weed control in Chemical fallow, Conifers, Corn, Fallowland, Guava, Lawns, Macadamia nuts, Sorghum, Sugarcane and Turf.

ACTIVE INGREDIENT:

Atrazine	88.4%
Related compounds	1.6%
OTHER INGREDIENTS:	10.0%
TOTAL:	100.0%

ENVIRONMENTAL HAZARDS

Atrazine can travel (seep or leach) through soil and can enter groundwater which may be used as drinking water. Atrazine has been found in groundwater. Users are advised not to apply Atrazine to *Sand* and *Loamy sand soils* where the water table (groundwater) is close to the surface and where these soils are very permeable, i.e., well-drained. Your local agricultural agencies can provide further information on the type of soil in your area and the location of groundwater.

This product must not be mixed or loaded within 50 feet of intermittent streams and rivers, natural or impounded lakes and reservoirs. This product must not be applied aerially or by ground within 66 feet of the points where field surface water runoff enters perennial or intermittent streams and rivers or within 200 feet around natural or impounded lakes and reservoirs. If this product is applied to highly erodible land, the 66 foot buffer or setback from runoff points must be planted to crop or seeded with Grass or other suitable crop.

Do not contaminate water when disposing of equipment washwaters. This product must not be mixed/loaded or used within 50 feet of all wells including abandoned wells, drainage wells and sinkholes. Operations that involve mixing, loading, rinsing or washing of this product into or from pesticide handling or application equipment or containers within 50 feet of any well are prohibited, unless conducted

63027R6-10

GROUP 9 HERBICIDE

CROPSHIELD
Specially formulated for Roundup Ready® crops

Roundup POWER MAX® HERBICIDE

Complete Directions for Use
Herbicide for Roundup Ready® Crops

THE UNIVERSITY OF VERMONT EXTENSION
VERMONT VEGETABLE & BERRY GROWERS ASSOC.

Thanks to the MP3 Working Group and North Central IPM Center

1.0 INGREDIENTS

ACTIVE INGREDIENT:
*Glyphosate, N-(phosphonomethyl)glycine, in the form of its potassium salt 48.7%
OTHER INGREDIENTS: 51.3%
100.0%

3.2 Environmental Hazards

Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high-water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash waters and rinsate.

Thanks to the
MP3 Working Group
and North Central
IPM Center

Herbicides

- **Impact food sources**: stunt plant growth, reduce or delay flowering of plants around the site of application, reduce forage quality
- **Expose bees to surfactants**: products often used in agricultural settings can contain surfactants that incapacitate the gas exchange system of bees, causing death.



Images: Laura Johnson

Systemic pesticides

Pesticide products applied via a seed treatment or to a plant's roots can pose risk to bees.

Advisory: This pesticide product contains the active ingredients mefenoxam and ch are known to leach through soil into groundwater under certain conditions (where le and/or the water table is shallow) as a result of agricultural use. Azoxystrobin also for several months or longer.

ains thiamethoxam and fludioxonil, which have properties and characteristics associ- als detected in groundwater. Use of this product in areas where soils are permeable, the water table is shallow, may result in groundwater contamination.

Pollinator Precautions: Thiamethoxam is highly toxic to bees, and effects are possible as a result of exposure to translocated residues in blooming crops.

Bag tag information is provided AS IS AND WITHOUT WARRANTY OF ANY KIN OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTY C AND FITNESS FOR A PARTICULAR PURPOSE. Syngenta shall not be liable for ing but not limited to incidental or consequential damages or loss of profit.

For Emergencies or questions related to this treated seed or the seed treatr seed, please call 1-800-888-8372.


Image: Laura Johnson

95% of US field corn has thiamethoxam or clothianidin seed treatment.

"Highly Toxic to Bees"

– LD50 is *less than or equal* to 2 µg/bee

Thanks to the MP3 Working Group and North Central IPM Center

Poll question

Can pesticide products applied via a seed treatment or to plant roots pose risk to bees?

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Calibrate your sprayer

Thanks to the MP3 Working Group and North Central IPM Center

Pesticide efficacy = the right product, right rate, right time, and right place.

- **Ensures Targeted and Uniform Application**
- **Less injury to crop and non-target organisms**
- **Application of the Proper Amount of Pesticide**
- **Save Money $$$$$$$**

  Cost of Re-treatment (Under Application)

  Cost of Over Application-Sprayer problems can cost big money. "One grower over-applied by 12%, which cost him an extra $2,938 in pesticides." (pre-2022 costs) George Hamilton, UNH Extension

To avoid legal implications associated with poor pesticide application, calibrate.

Slide content adapted from George Hamilton

Thanks to the MP3 Working Group and North Central IPM Center

Calibration help: ~6-minute videos

- UNH Extension **Boom** Sprayer Calibration
- https://youtu.be/f05LW5nKDIQ
- UNH and Penn State Extension **Air Blast** Sprayer Pre-calibration Instructions and Calibration Process
- https://youtu.be/4LnOM-J7ApA
- https://youtu.be/fF3TPvH0cHk
- UNH Extension **Backpack** Sprayer Calibration
- https://youtu.be/AIRs4WL9t9E

Nozzles: Target application, Spray Drift Reduction

Thanks to the MP3 Working Group and North Central IPM Center

- Replace worn or loose-fitting nozzles
- Clean nozzles (Do not clean sprayer nozzles with metal implement or try to blow out dirt or residue with your mouth!)
- Make sure all nozzles are the same type and size
- Consider use of air induction nozzles and/or drift reducing adjuvant

Image: Laura Johnson

Nozzles: Target application, Spray Drift Reduction

Thanks to the MP3 Working Group and North Central IPM Center

6. **SPRAY DRIFT MANAGEMENT**
   a. To reduce the potential of spray drift to non-target areas, apply this product using nozzles which deliver medium to **coarse spray droplets** as defined by ASAE standard S-572 and as shown in nozzle manufacturer's catalogs. Flat fan nozzles of 80° or 110° are recommended for optimum post emergence broadcast coverage. Nozzles that deliver COARSE spray droplets may be used to reduce spray drift provided spray volume per acre (GPA) is increased to maintain coverage of weeds. **DO NOT** use nozzles that produce FINE (e.g. - Cone) or EXTRA COARSE (e.g., Flood jet) spray droplets.

Image credit: George Hamilton

Reduce Spray Drift Potential to Non-Target areas

Thanks to the MP3 Working Group and North Central IPM Center

ZETA-CYPERMETHRIN GROUP 3A INSECTICIDE

MUSTANG MAXX INSECTICIDE

EPA Reg. No. 279-3426 EPA Est. 279-NY-1

Active Ingredient: By Wt.
Zeta-cypermethrin*S-Cyano (3-phenoxy-phenyl) methyl (+) cis/trans 3-(2,2-dichloro-ethenyl)-2,2 dimethylcyclopropane carboxylate.....9.15%
Other Ingredients**.....90.85%
100.00%

Contains 0.8 pounds active ingredient per gallon.
*Cis/trans ratio: Max. 75% (+) cis and min. 25% (±) trans
**Contains Petroleum Distillates

Don't spray in wind

Spray Drift Requirements

Wind Direction and Speed

Only apply this product if the wind direction favors on-target deposition. Do not apply when the wind velocity exceeds 15 mph.

Other labels limit spray at 10mph or less

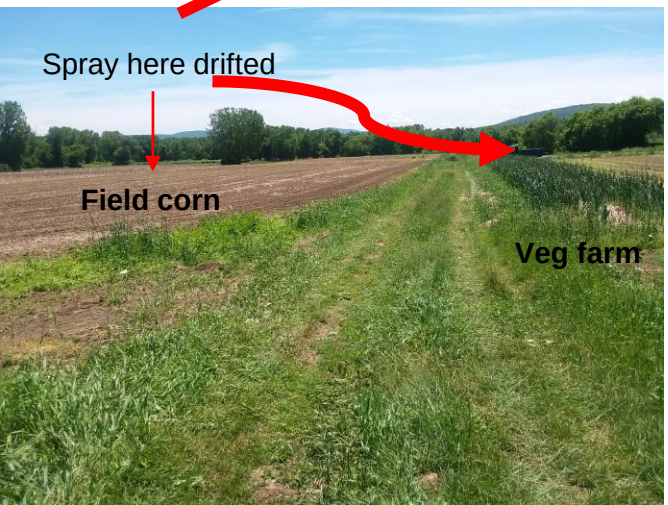
Temperature Inversion

Do not make aerial or ground applications into temperature inversions. Inversions are characterized by stable air and increasing temperatures with height above the ground. Mist or fog may indicate the presence of an inversion in humid areas. The applicator may detect the presence of an inversion by producing smoke and observing a smoke layer near the ground surface. Smoke that layers and moves laterally indicates an inversion.

Drift example in Vermont

Thanks to the MP3 Working Group and North Central IPM Center

*legal implications
*loss of efficacy to target organism
*loss of $$$$ for both farms
*yield losses for both farms



All photos here courtesy of Becky Maden, UVM Extension

BUFFER HABITAT

Image: Laura Johnson

Images: Laura Johnson

Thanks to the MP3 Working Group and North Central IPM Center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THE UNIVERSITY OF VERMONT
EXTENSION
Thanks to the
MP3 Working Group
and North Central
IPM Center
A. Melathopoulos

Drift and Buffer Habitat

Thanks to the MP3 Working Group and North Central IPM Center

Pesticides can also drift into flowering buffers via:

- Wind erosion and contaminated soil particle movement to non-target locations
- Surface and subsurface flow of contaminated water to non-target locations

Image: Laura Johnson

Thanks to the
MP3 Working Group
and North Central
IPM Center

Avoid spraying blooms
Mow before spray

Broadleaf weed flowers provide pollen and nectar to bees.

Image: Laura Johnson

THE UNIVERSITY OF VERMONT EXTENSION

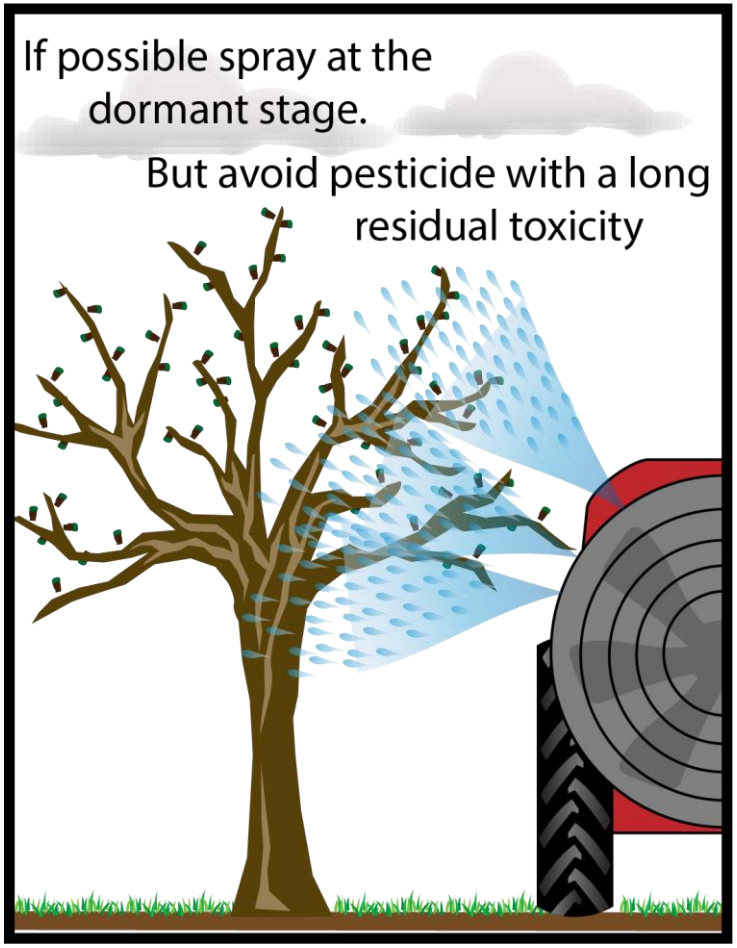
Thanks to the MP3 Working Group and North Central IPM Center

TREATMENT TIMING

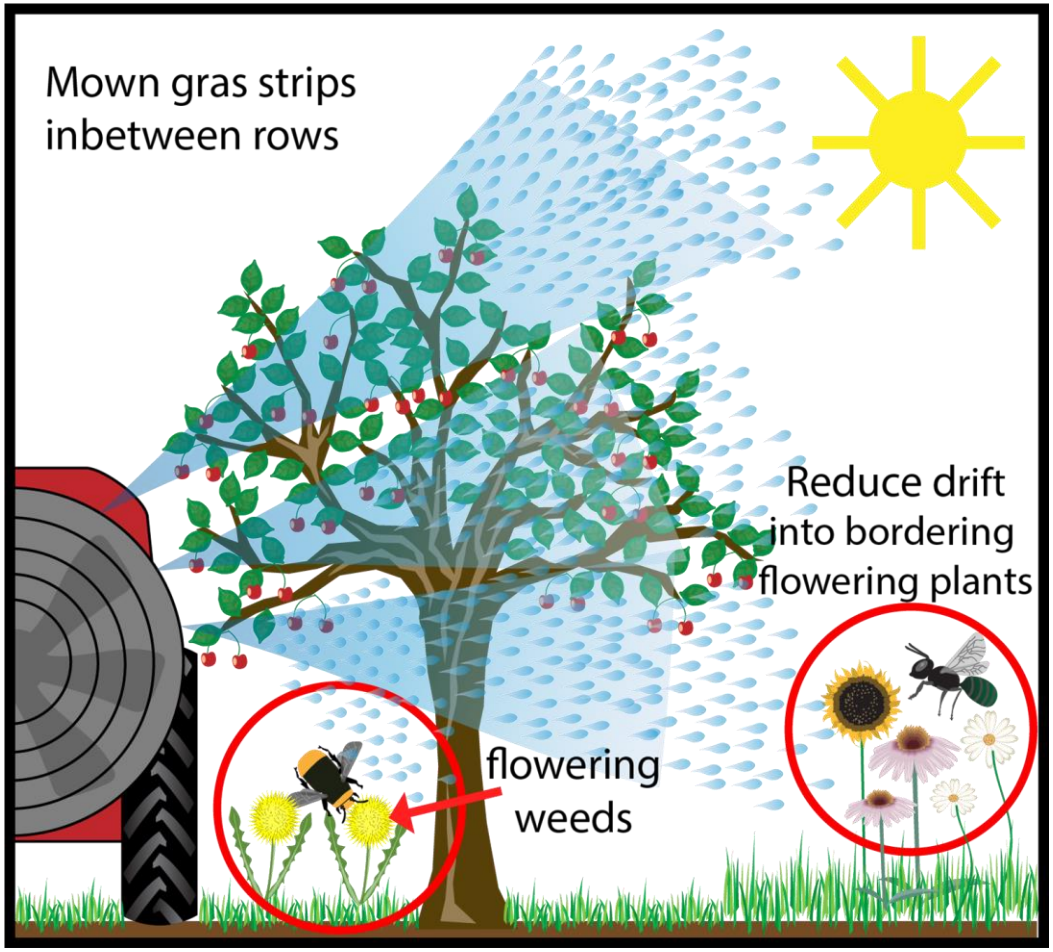
THE UNIVERSITY OF VERMONT EXTENSION

Thanks to the MP3 Working Group and North Central IPM Center

BEFORE BLOOM



AFTER BLOOM

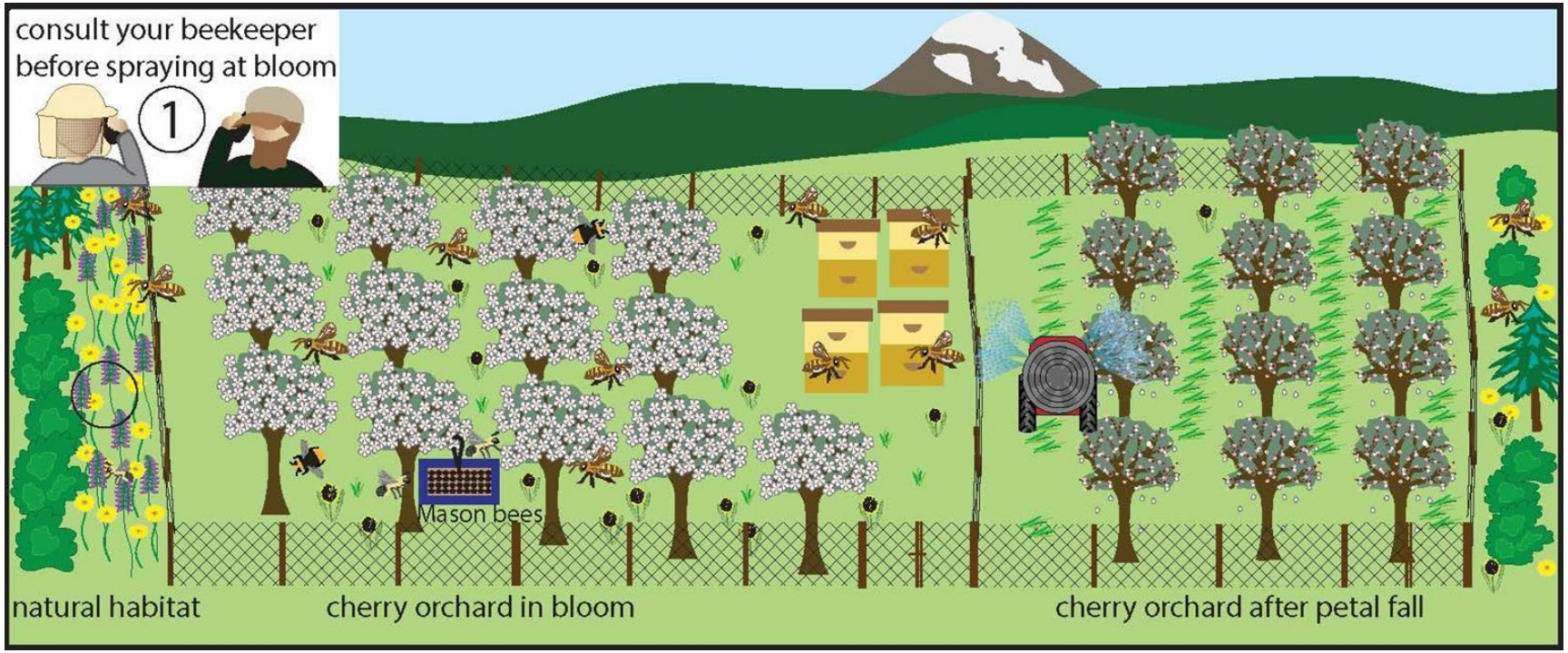


Iris Kormann

COMMUNICATE WITH YOUR BEEKEEPER

THE UNIVERSITY OF VERMONT EXTENSION

Thanks to the MP3 Working Group and North Central IPM Center



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SUMMARIZING STEPS YOU CAN TAKE TO MITIGATE EXPOSURE

Thanks to the MP3 Working Group and North Central IPM Center

1. Calibrate sprayer
2. Use correct, clean nozzles and replace old nozzles
3. Do not spray in wind
4. Avoid bloom spray, mow flowering weeds before spraying
5. Plant buffer strips
6. Communicated with your beekeeper.

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THANK YOU!

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