GOT A SMART PHONE?

Available on iTunes

GET IT ON Google Play

Oregon State University OSU

Reduce Bee Poisoning from Pesticides

Quinolone insecticide/miticide, metabolic poison

Acetamiprid

Neonicotinoid insecticide (cyano group)

Common Product Names

Assail, Tristar, Transport

Toxicity information

N/A

Notes and Special Precautions

Length of residual toxicity to honey

HOME | KEY | HELP | ABOUT


HELLO
my name is
Andony

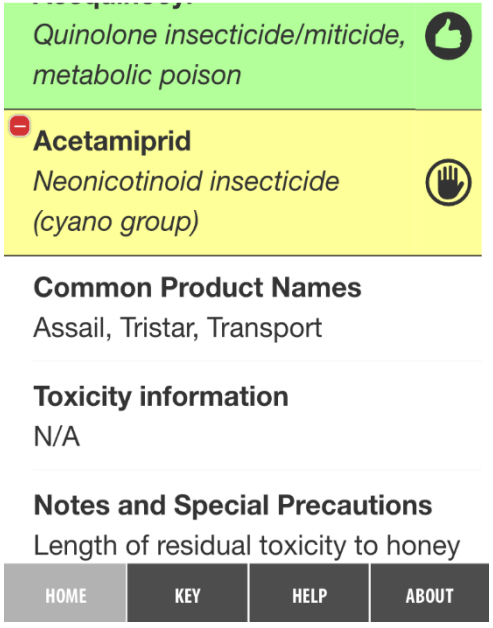
CLICKERS

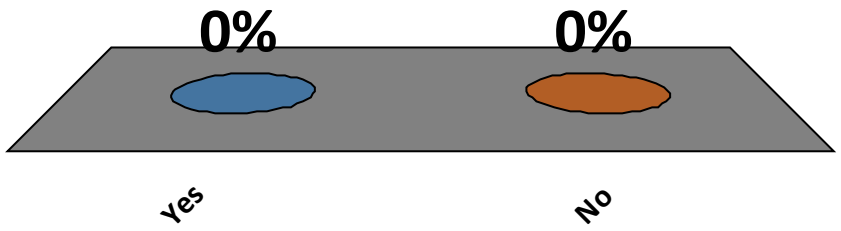
1. Press channel button
2. Type ’41’
3. Press channel button

Have you ever seen this publication or app?

A. Yes

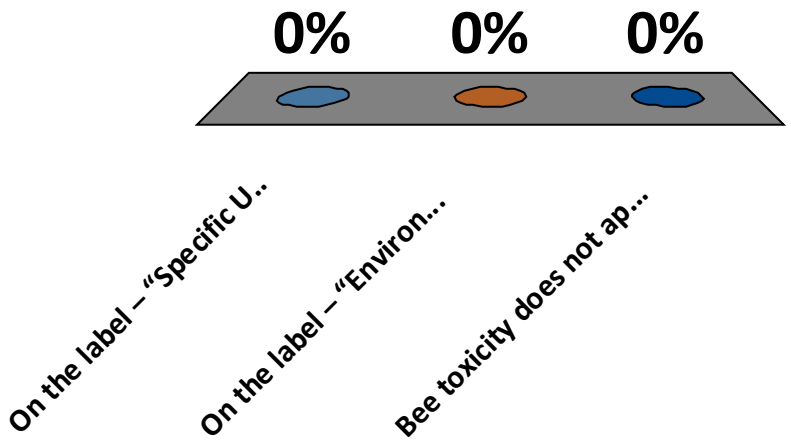
B. No





How can you find out if a pesticide is toxic to bees?

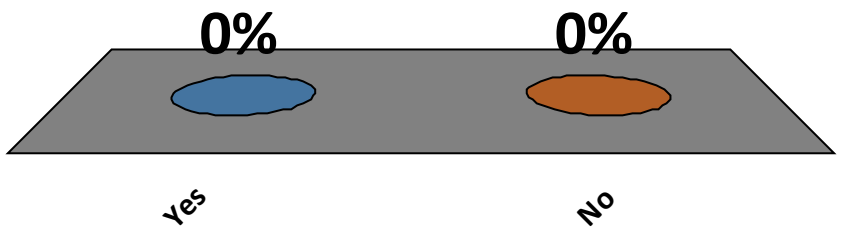
A. On the label – "Specific Use Directions"
B. On the label – "Environmental Hazards"
C. Bee toxicity does not appear on the label – you have to exercise judgement.



By law you can apply a pesticide when honey bees are in the area if the label indicates the product is toxic to bees?

A. Yes

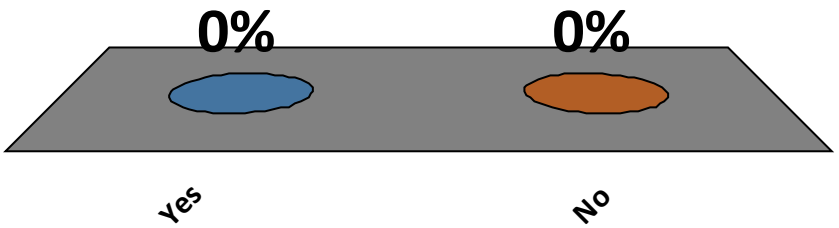
B. No



If a pesticide label says you cannot apply a pesticide when "bees are visiting the treated area" can you apply the product at night?

A. Yes

B. No



GETTING *MORE*

WILD BEE

POLLINATION OF CRANBERRY




Andony.Melathopoulos@oregonstate.edu

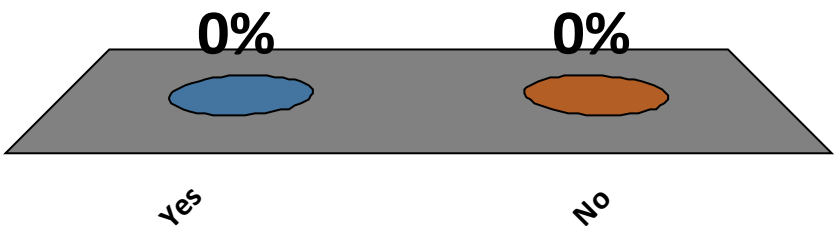
Cranberry School, Bandon, Oregon
3 February 2017

Oregon State University OSU

Do you rent honey bee colonies for pollination?

A. Yes

B. No



HONEY BEE POLLINATION IN OREGON

>75% of beekeeper income

FEBRUARY
almond

MARCH
peach

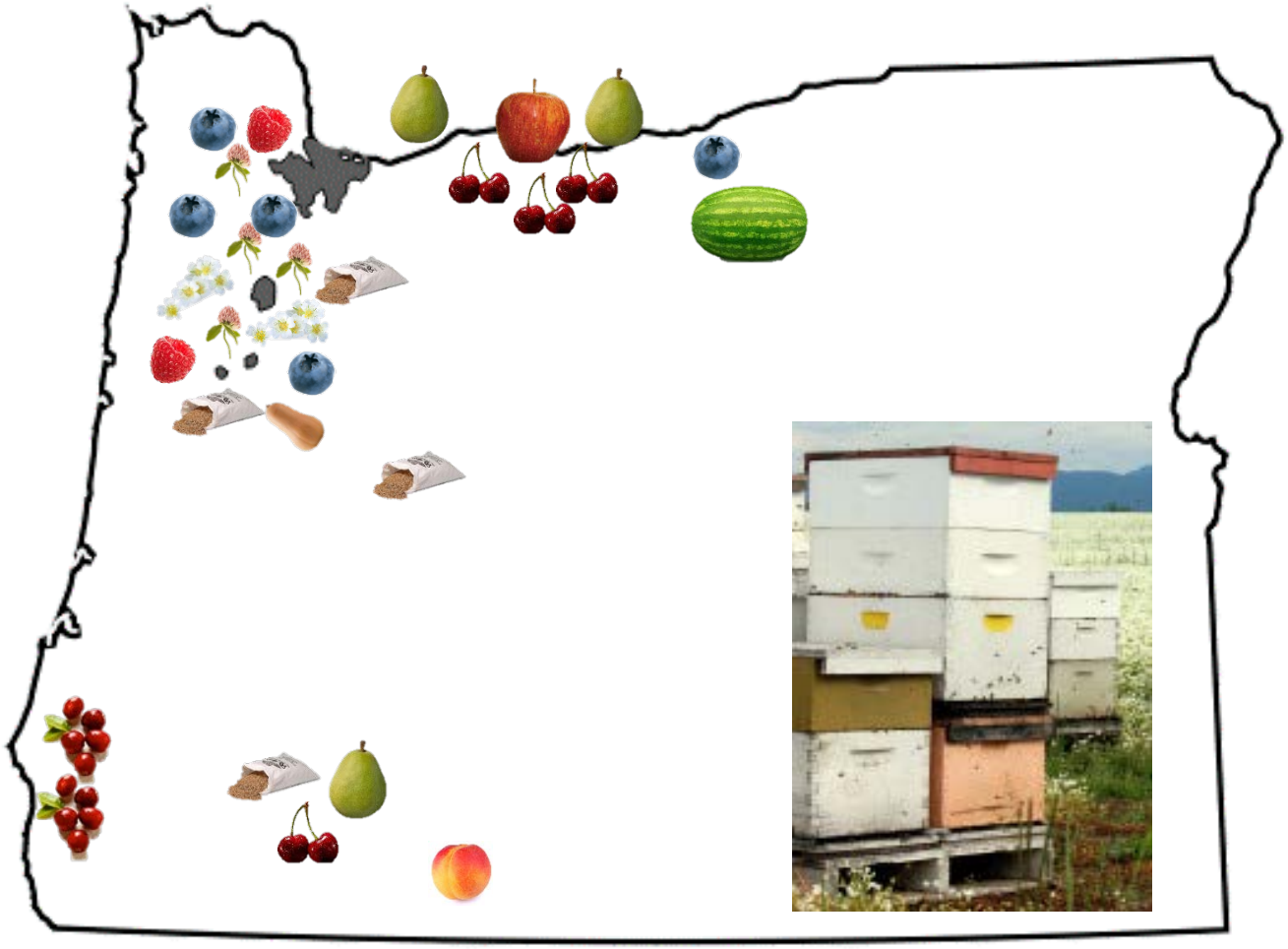
APRIL
orchard fruit
berries
seeds (onion, cabbage)

MAY
meadowfoam

JUNE
clover seed
cranberry
watermelons

JULY
seeds (carrots)
watermelons

AUGUST
watermelons
pumpkin and squash



WILD BEES

500 species in Oregon

Joseph Wilson

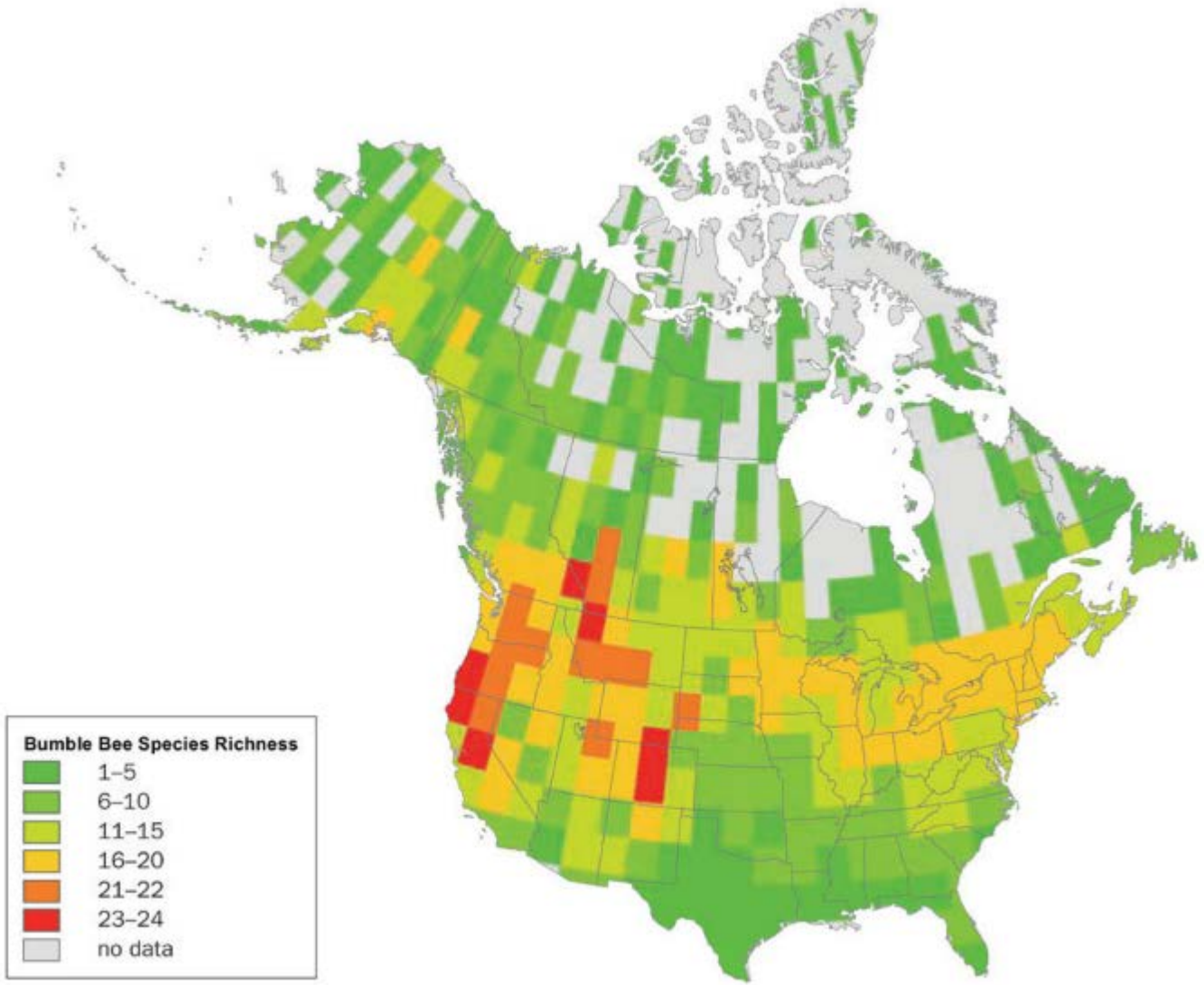
BUMBLE BEES

(~20 species)

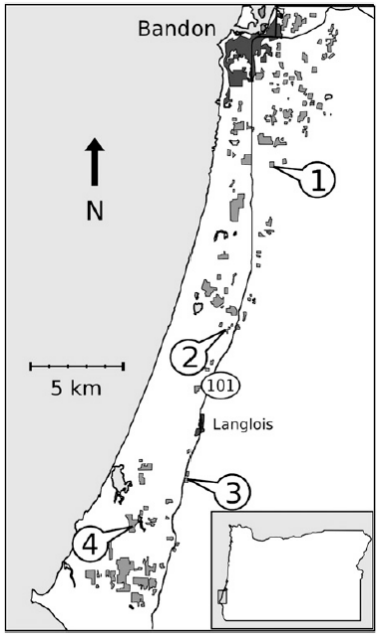
GROUND NESTING BEES

(~300 species)

OREGON SOUTH COAST BUMBLE BEE HOT SPOT



Williams et al. 2014



68%

Honey Bee

31%

Bombus vosnesenskii

Bombus mixtus

Bombus melanopygus

7 : 3 : 1

HortScience 46(6):885–888. 2011.

Native Bees, Honeybees, and Pollination in Oregon Cranberries

Melissa Broussard[1], Sujaya Rao, and William P. Stephen
Department of Crop and Soil Sciences, Oregon State University, 3017 ALS, Corvallis, OR 97331

Linda White
Department of Horticulture, Oregon State University Extension, 631 Alder Street, Myrtle Point, OR 97458

Joseph Wilson

11 tetrads/visit

51 tetrads/visit × 6.5 visits

Taxa	1	2	3	4	5	6	7	8
1. *A. mellifera*	1.0	—	—	—	—	—	—	—
2. *M. rotundata* (♂)	1.0	1.0	—	—	—	—	—	—
3. *M. rotundata* (♀N)	1.1	1.1	1.0	—	—	—	—	—
4. *M. rotundata* (♀P)	2.4	2.4	2.3	1.0	—	—	—	—
5. *Bombus* spp. (Q)	4.3	4.4	3.9	1.8	1.0	—	—	—
6. *Bombus* spp. (W)	2.9	3.0	2.7	1.2	0.7	1.0	—	—
7. *Andrena* spp.	4.0	4.0	3.6	1.7	0.9	1.3	1.0	—
8. *Halictus* spp.	2.2	2.2	2.0	0.9	0.5	0.7	0.6	1.0

Javorek et al. 2002

WILD BEES Require …

A suitable nesting substrate from which they can access adequate forage over the course of individual or colonial life spans.

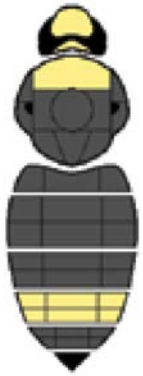
The Bees Perspective …

How are foraging resources distributed both spatially and temporally?

FORAGING RESOURCES

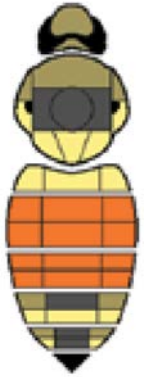
TAXA	APR		MAY		JUNE		JULY		AUG		SEP		OCT	
Andrena														
Melissodes														
Bombus														

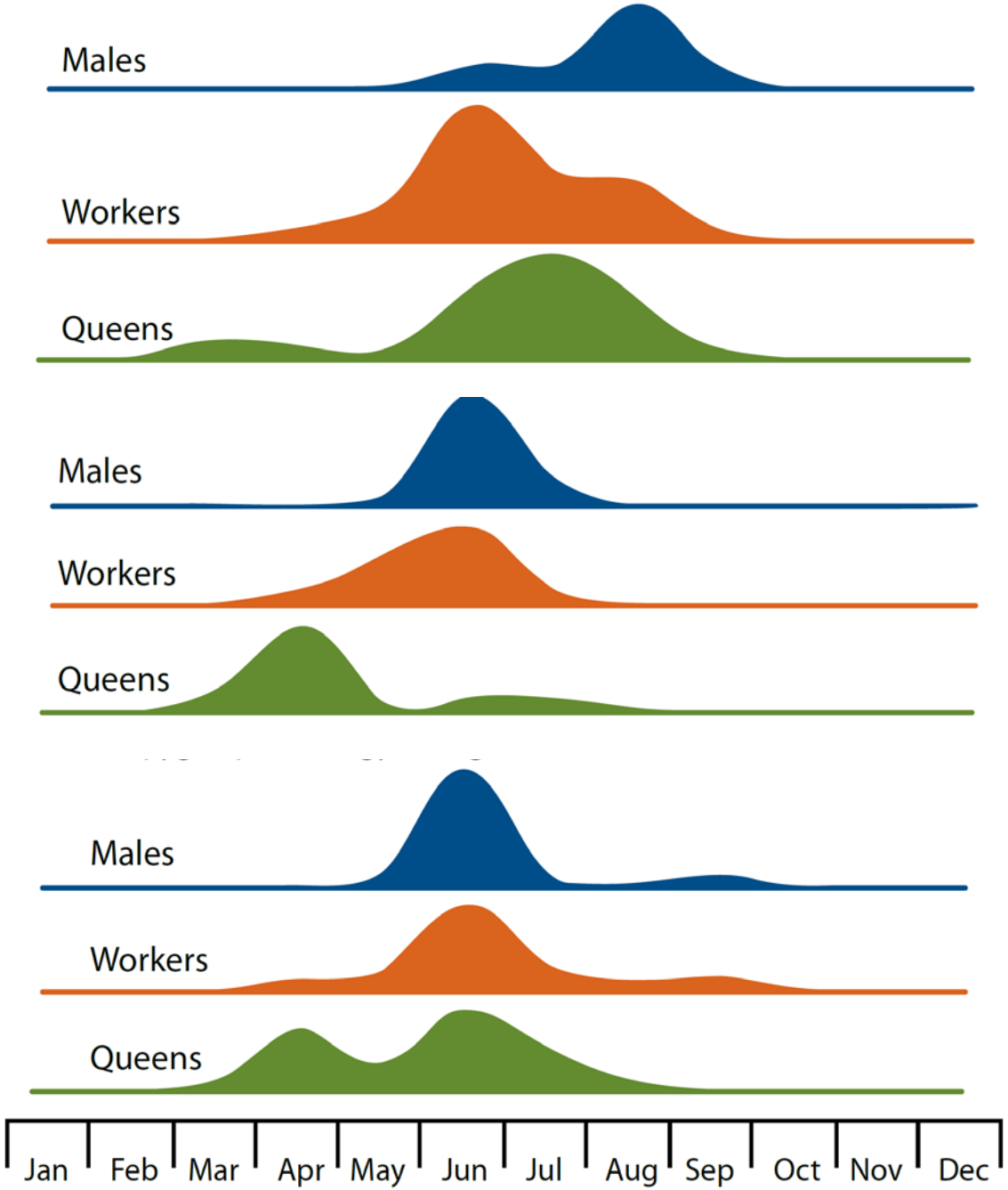
Yellow Headed
B. vosnesenskii



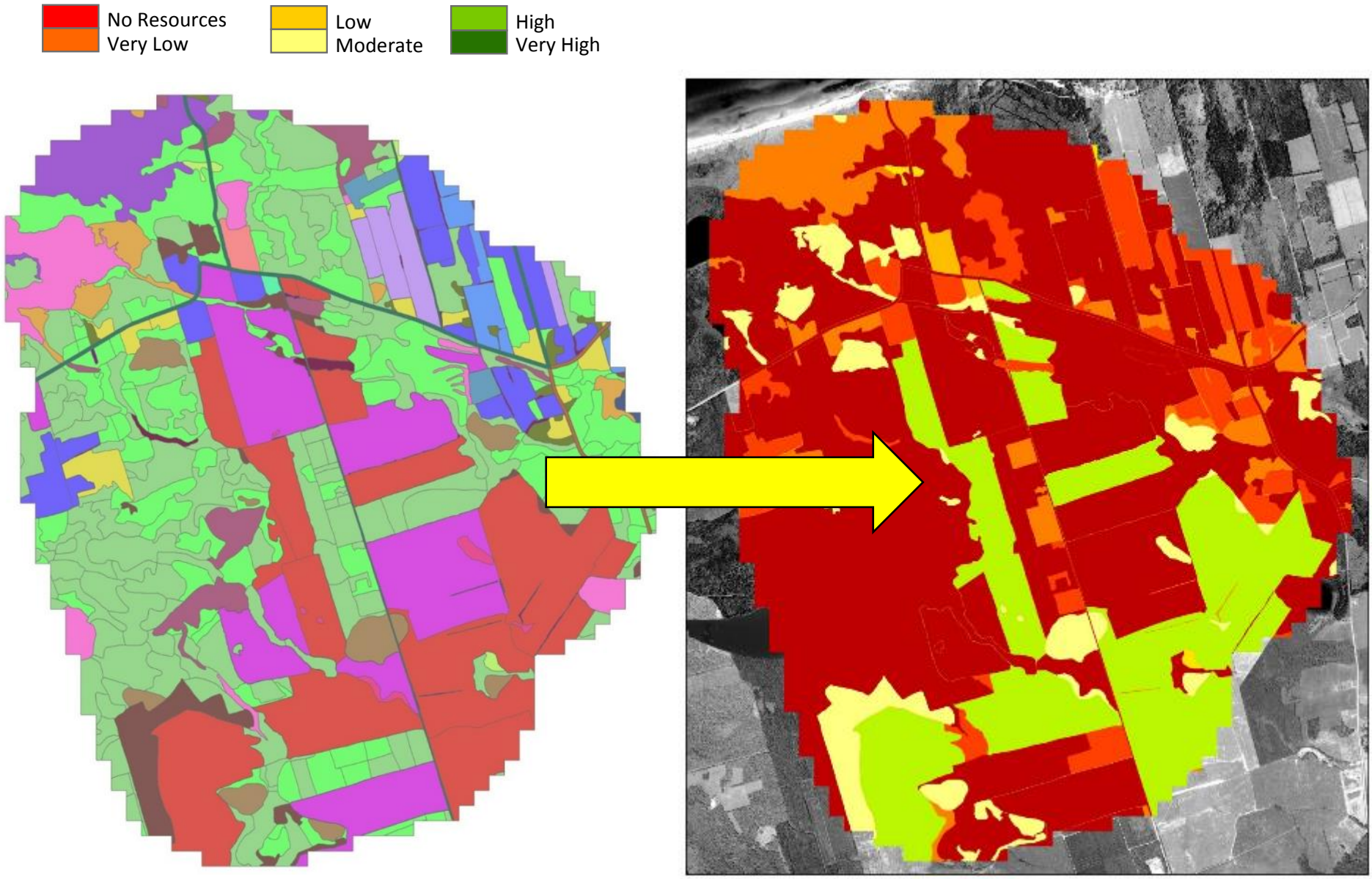
Fuzzy-Horned
B. mixtus

Yellow Headed
B. melanopygus



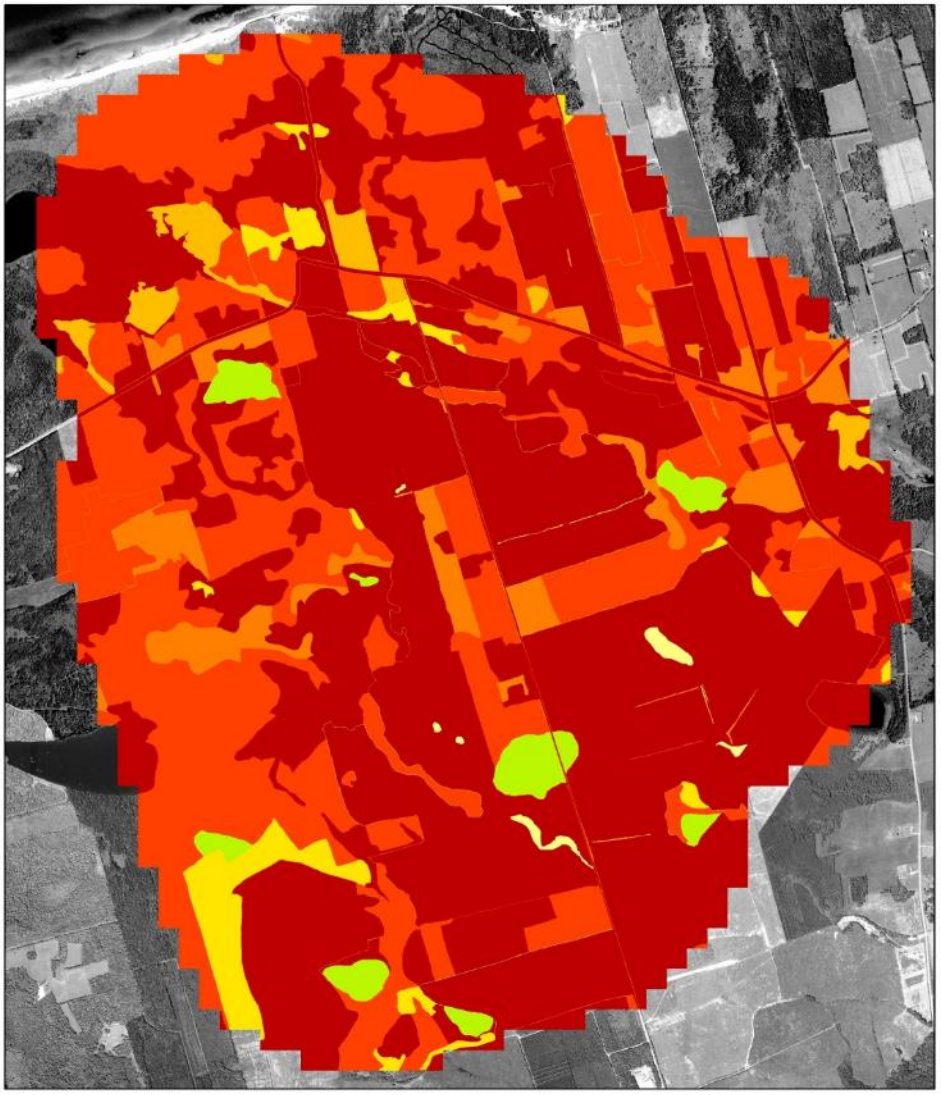


POLLINATOR'S PERSPECTIVE

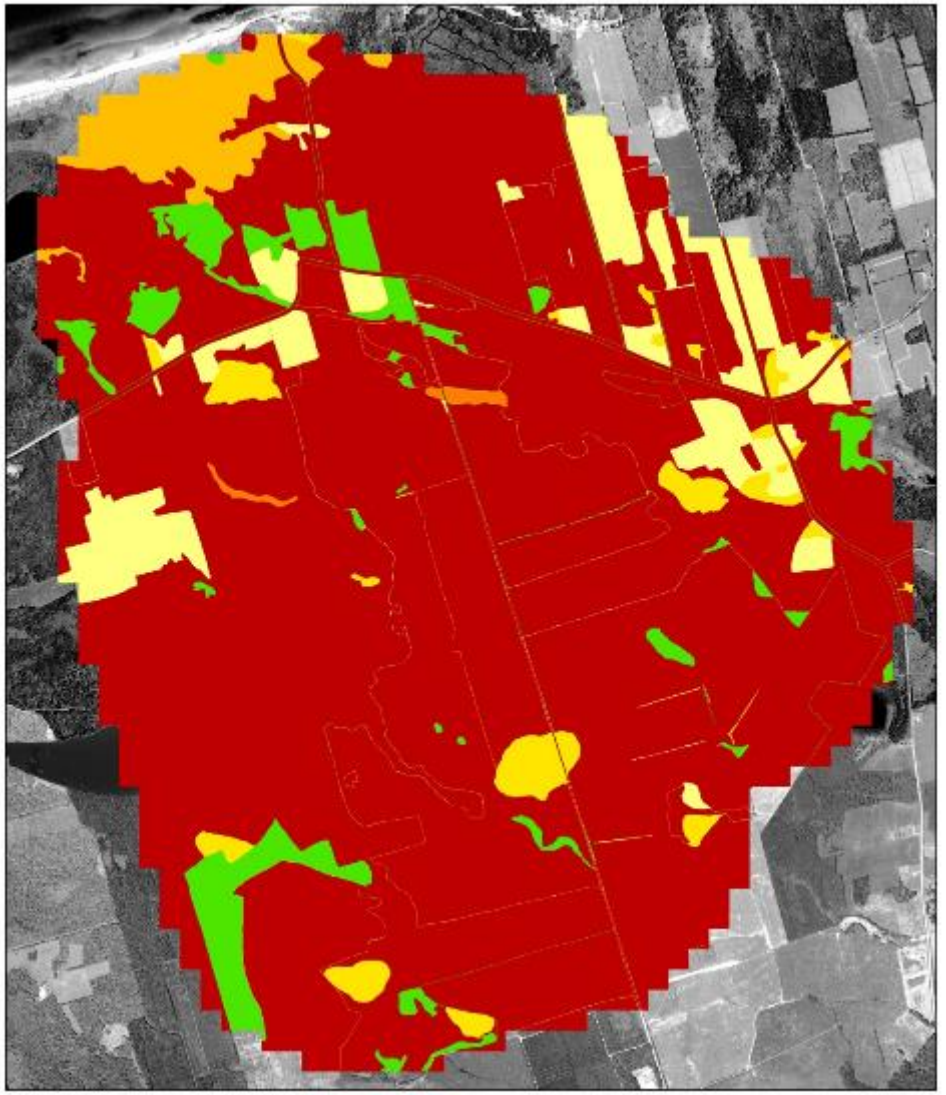


POLLINATOR'S PERSPECTIVE

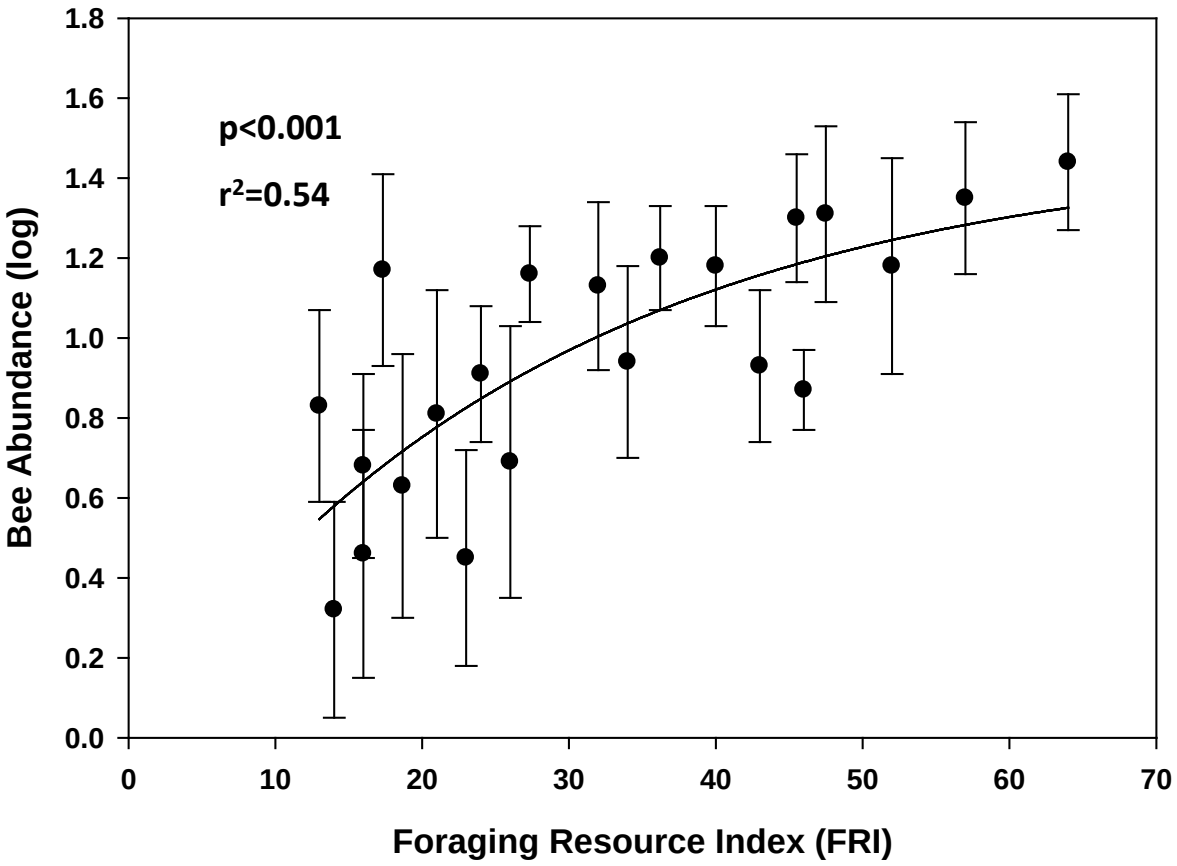
April

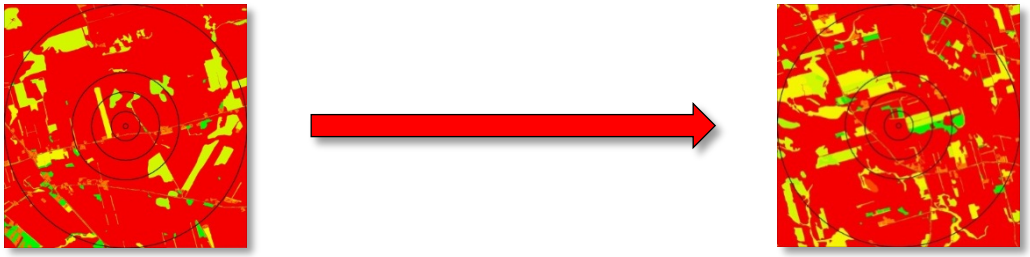


August



Foraging Resource Index





Key Factors

- Floral abundance × continuity × distribution
- Foraging resources beyond 300 m do not contribute significantly to the model
- Connectivity of blueberry land (crop/sprout ratio)

Pollinator Habitat Restoration

Land taken out of production for foraging habitat (meadows)

Expand Buffer (Bog/Field)

Shelterbelt (Greenlane)

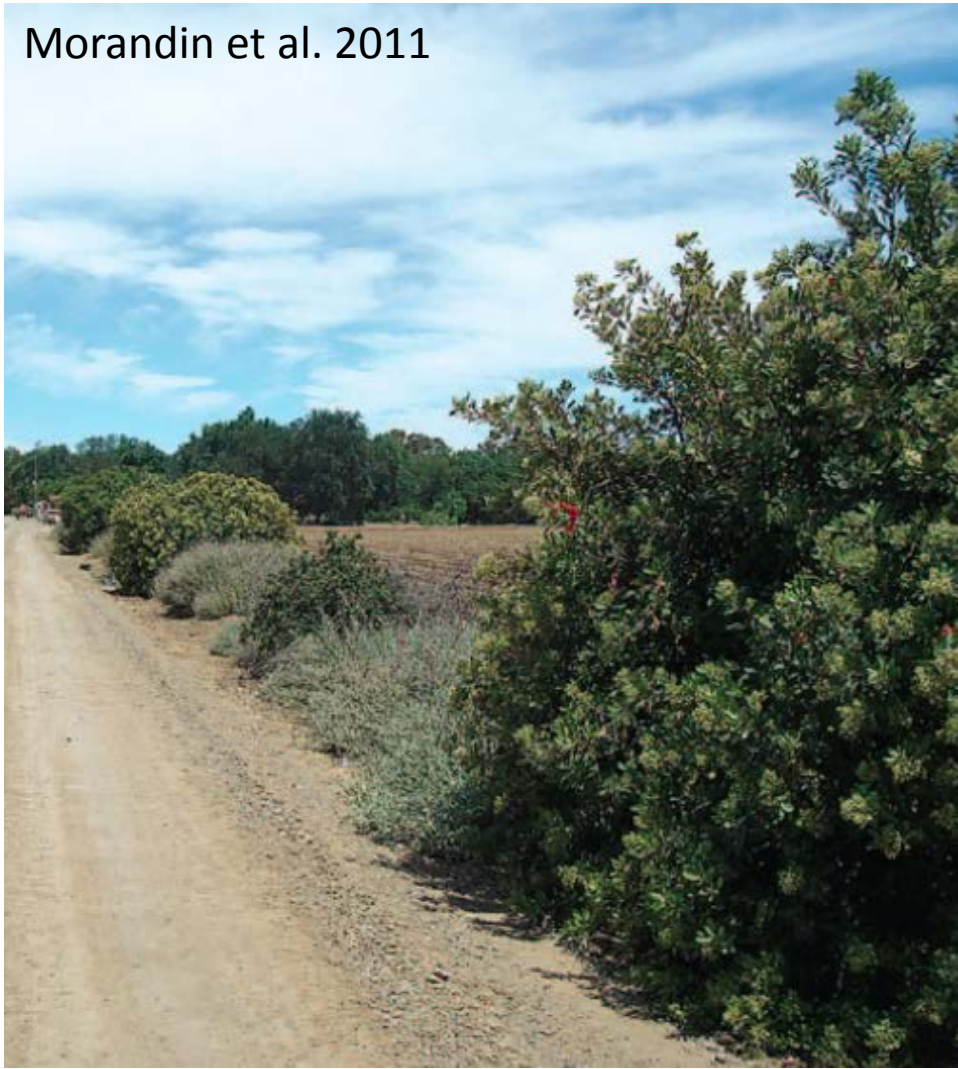
Forest Clearing (maintain early successional plant community)


Steve Javorek

PLANTING FLORAL RESOURCES

Floral Seed Mixtures

Hedgerows

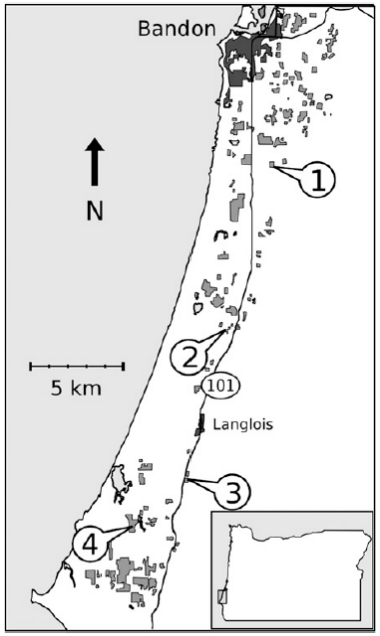


How to Estimate Bee Abundance in Maine Blueberries

Frank Drummond, University of Maine

https://youtu.be/rgVav2byI8o?t=7m28s

Andony – 541 452 3038



68%

Honey Bee

31%

Bombus vosnesenskii

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Linda White
Department of Horticulture, Oregon State University Extension, 631 Alder Street, Myrtle Point, OR 97458

LESSON OBJECTIVES:

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

2. Tell *how risky* a pesticide treatment is to bees from information on the label in conjunction with PNW 591

POLLINATORS, PESTICIDES & RISK

RISK =

1. Toxicity +

2. Residual Time +

3. Bloom +

4. Application/ Formulation

POLLINATORS, PESTICIDES & RISK

RISK =

1. Toxicity

2. Residual Time +

3. Bloom +

4. Application/ Formulation

PESTICIDE TOXICITY

Acute toxicity

LETHAL TOXICITY

Death within a few hours

GROUP 4A INSECTICIDE

TriStar® 8.5 SL

Insecticide

ACTIVE INGREDIENT:

Acetamiprid	8.5% by wt.
INERT INGREDIENTS:	91.5% by wt.
TOTAL:	100.0% by wt.

Contains 0.76 pounds of acetamiprid per gallon

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.

"...highly toxic to bees..."

"...toxic to bees..."

ACUTE TOXICITY & THE LABEL

"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

– LD50 is *greater than* 11 µg/bee

Nothing on the label

Table 4 (p. 16-27)

Table 4. Active ingredients of commonly used pesticides and their effect on bees in California, Idaho, Oregon, and Washington

Active Ingredient	Highly Toxic to Bees (RT)	Toxic to Bees (RT)	No Bee Precautionary Statement (PS) on Label	Common Product Names	Notes and Special Precautions
Abamectin (Avermectin) *Fermentation products derived from soil bacterium, affects nerve and muscle action of insects and mites*	X 0.025 lb ai/acre 1-3 days ERT, ≤ 0.025 lb ai/acre 8 hours RT [1] *Can vary with formulation and application rate*			Abacide, Abacus, Abba, Agmectin, Agri-Mek, Ardent, Avert, Avicta, Avid, Epi-Mek, Reaper, Solera, Solero, Temprano, Timectin, Zoro	ERT to bumble bees [2], short RT to alfalfa leafcutting bees and alkali bees at 0.025 lb ai/acre [1].
Acephate *Organophosphate insecticide*	X >3 days ERT [1] *Can vary with formulation and application rate*			Bracket, Orthene, Orthonex	Incompatible with bumble bees [2], ERT to alfalfa leafcutting bees and alkali bees [1].
Acequinocyl *Quinolone insecticide/miticide, metabolic*			X	Kanemite, Shuttle	
Acetamiprid *Neonicotinoid insecticide (cyano group)*		X Yes		Assail, Tristar, Transport	Length of residual toxicity to honey bees is unknown. ERT to alfalfa leafcutting bees and alkali bees [3]. 2 day ERT to bumble bees [2]. Cyano group neonicotinoids exhibit lower toxicity to bees than nitro group neonicotinoids [4].
Aldicarb *Systemic carbamate insecticide and nematicide*	X			Temik Only available as granular formulation [5]	Not hazardous to bees when applied at least 4 weeks prior to bloom [1]. May be a persistent contaminant of beeswax [6].
Alpha-cypermethrin *Pyrethroid insecticide*	X Yes			Fastac	Length of residual toxicity to bees unknown.
Aluminum tris O-ethyl phosphonate *Systemic organophosphate fungicide*			X	Aliette, Fosetyl-Al, Chipco, Flanker, Linebacker, Legion	
Azadirachtin *Insecticidal extract of neem oil Ecdysone antagonist*		X <2 hours RT [1] *Can vary with formulation and application rate*		Neemix, Amazin, Azera, Aza, Ecozin, Ornazin	Must be ingested to be toxic [7].
Azinphos-methyl *Organophosphate insecticide*	X 4 days ERT [1] 5 days ERT [8] *Can vary with formulation and application rate*			Guthion *is being phased out*	ERT to alfalfa leafcutting bees and alkali bees [1].
Azoxystrobin *ß-methoxyacrylate fungicide*			X	Abound, Dynasty, Heritage, Quadris	
Bacillus subtilis *Fungicide derived from naturally occurring soil bacterium*			X	Kodiak, Rhapsody, Serenade, Optiva, Companion, Cease	Laboratory tests suggest potential effects on bumble bees [9].

Quinolone insecticide/miticide, metabolic poison

Acetamiprid

Neonicotinoid insecticide (cyano group)

Common Product Names

Assail, Tristar, Transport

Toxicity information

N/A

Notes and Special Precautions

Length of residual toxicity to honey

Leafminer - *Liriomyza trifolii*

defesavegetal.net

LEAST ACUTELY TOXIC TO BEES?

Tame 2.4 EC SPRAY INSECTICIDE-MITICIDE

TriStar

Avid 0.15EC Miticide/insecticide

Surround Agricultural Crop Protectant

Radiant SC INSECTICIDE

A B C D E

A 0%

B 0%

C 0%

D 0%

E 0%

ACUTE TOXICITY & THE LABEL

ENVIRONMENTAL HAZARDS

"…highly toxic to bees…"

"…toxic to bees…"

New EPA Advisory Box

<u>Nitro-group neonicotinoids:</u>

- imidacloprid,
- dinotefuran,
- clothianidin, and
- thiamethoxam

applied outdoor to foliage.

DuPont™ Exirel® insecticide

GROUP 4A INSECTICIDE

VALENT PROFESSIONAL PRODUCTS

Safari®

20 SG INSECTICIDE

FOR FOLIAR AND SYSTEMIC INSECT CONTROL IN ORNAMENTAL PLANTS AND VEGETABLE TRANSPLANTS IN ENCLOSED STRUCTURES.

FOR GREENHOUSE, NURSERY, INTERIOR PLANTSCAPE AND OUTDOOR LANDSCAPE USE ONLY

Active Ingredient: nitro-group neonicotinoid

Dinotefuran, [N-methyl-N'-nitro-N"-((tetrahydro-3-furanyl)methyl)guanidine]	20%
Other Ingredients	80%
Total:	100%

ENVIRONMENTAL HAZARDS

This product is toxic to honey bees. The persistence of residues and potential residual toxicity of dinotefuran in nectar and pollen suggests the possibility of

PROTECTION OF POLLINATORS

APPLICATION RESTRICTIONS EXIST FOR THIS PRODUCT BECAUSE OF RISK TO BEES AND OTHER INSECT POLLINATORS. FOLLOW APPLICATION RESTRICTIONS FOUND IN THE DIRECTIONS FOR USE TO PROTECT POLLINATORS.

Look for the bee hazard icon in the Directions for Use for each application site for specific use restrictions and instructions to protect bees and other insect pollinators.

This product can kill bees and other insect pollinators.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ ENTIRE LABEL. USE STRICTLY IN ACCORDANCE WITH PRECAUTIONARY STATEMENTS AND DIRECTIONS, AND WITH APPLICABLE STATE AND FEDERAL REGULATIONS.

FOR COMMERCIALLY GROWN ORNAMENTALS NOT UNDER CONTRACT FOR POLLINATION SERVICES BUT ARE ATTRACTIVE TO POLLINATORS

- **Do not apply this product while bees are foraging.**
- **This product is toxic to bees exposed to residue for more than 38 hours following treatment.**

PESTICIDE TOXICITY

Acute toxicity

LETHAL TOXICITY

Death within a few hours

Chronic toxicity

"a lot little nicks" - repeated

Lingering effects

(e.g., impaired foraging,

↑ disease susceptibility, etc.)

CHRONIC TOXICITY

GROUP 11 | 3 FUNGICIDES

Briskway™

Fungicide

A broad-spectrum fungicide for prevention and control of listed diseases in golf course turfgrasses only

Active Ingredients:	
Azoxystrobin*	18.2%
Difenoconazole**	11.4%
Other Ingredients:	70.4%
Total:	100.0%

Environmental Hazards: Difenoconazole is toxic to fish, mammals and aquatic invertebrates. Drift and runoff may be hazardous to **estuarine/marine** organisms in water adjacent to treated area.

Difenoconazole

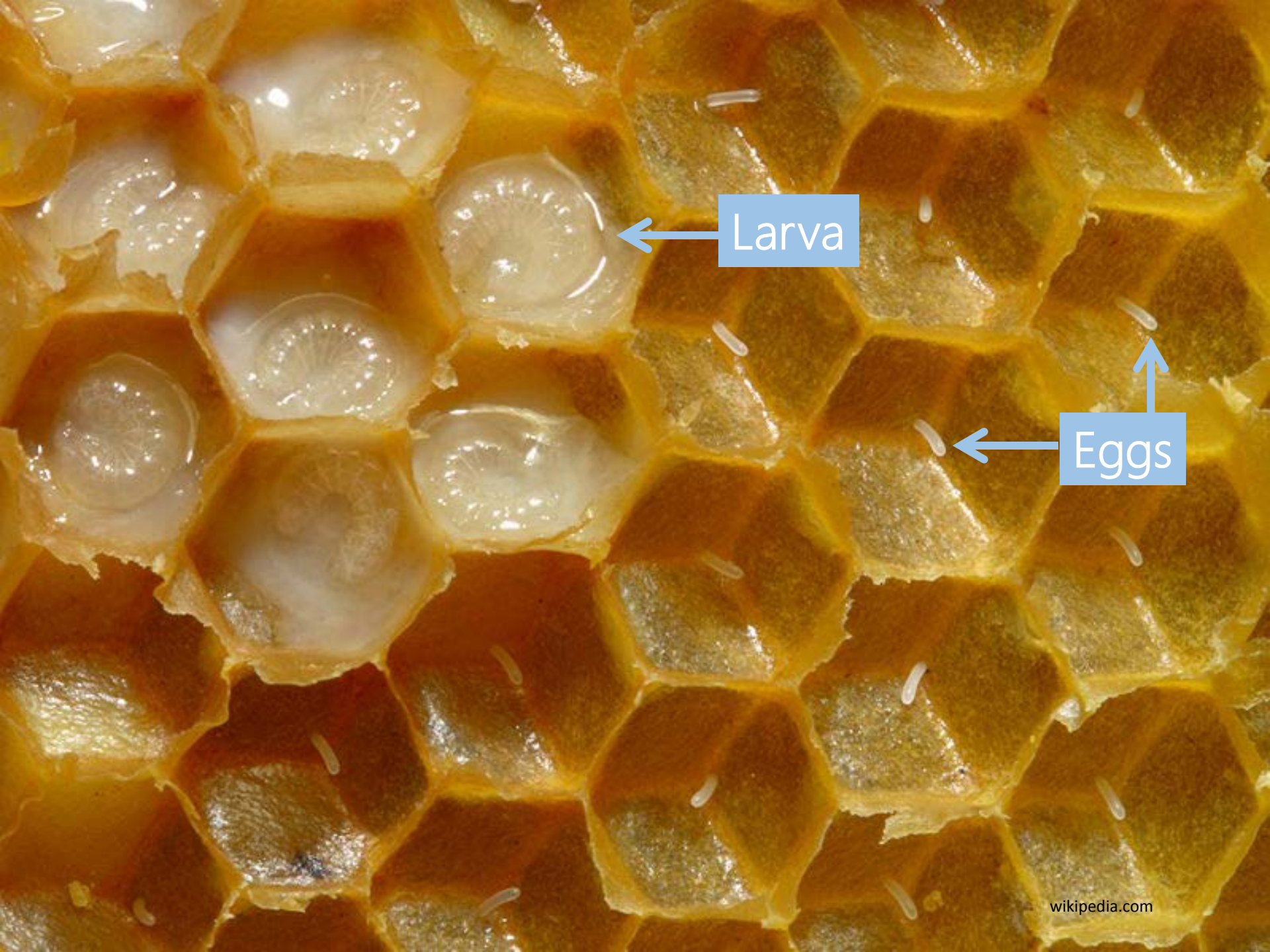
Triazole fungicide

p. 19

Notes and Special Precautions

Potential effects on learning in honey bees [19]

FOOD RESERVOIR


Larva
Eggs
wikipedia.com

The Great Sunflower Project

POLLINATORS, PESTICIDES & RISK

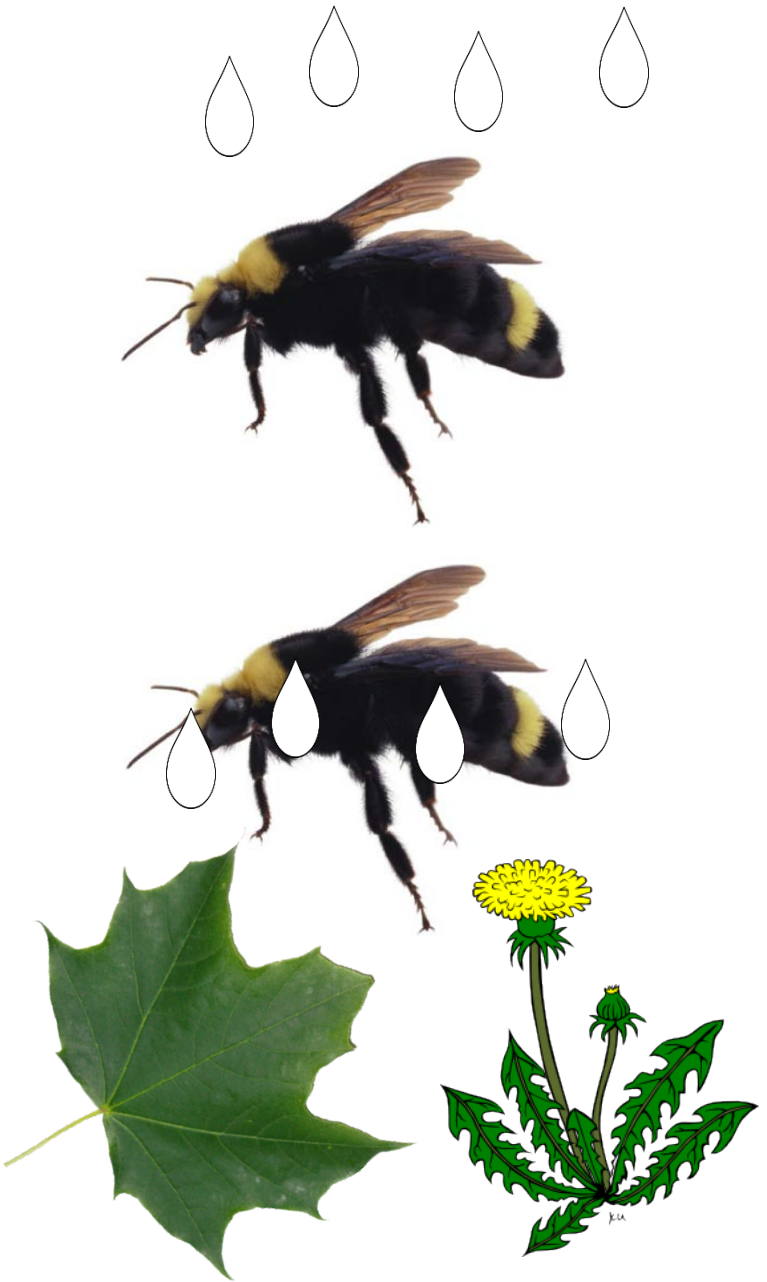
RISK =

1. Toxicity +
2. Residual Time
3. Bloom
4. Application/ Formulation

RESIDUAL TOXICITY

Direct Toxicity

Residual Toxicity
(*Residual Time*)

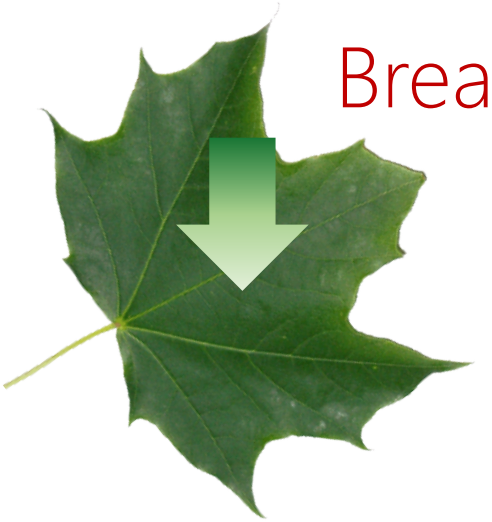


RESIDUAL TIME (RT)

↑ residual time with ↓ temperature

Volatilization

Breakdown



Absorption

RESIDUAL TIME (RT)

Dow AgroSciences

Conserve®

SC Turf and Ornamental

INSECT CONTROL

®Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow

For control of listed pests such as thrips, lepidopterous larvae, foliage feeding worms, fire ants and other listed pests infesting apple and other pome fruits, artichoke, asparagus, banana, *Brassica* (cole) leafy vegetables, bulb vegetables, bushberries, caneberries, citrus, commercial aquatic plants, cucurbits, dates, fruiting vegetables, grape, herbs, leafy vegetables, leaves of legume vegetables, leaves of root and tuber vegetables, okra, ornamentals (herbaceous and woody) growing outdoors, in nurseries or in greenhouses, peppermint, pistachio, plantain, pomegranate, popcorn, root and tuber vegetables, spearmint, spices, stone fruits, strawberry, sweet corn, tree nuts, tropical tree fruits, tree farms or plantations and turfgrass

Group	5	INSECTICIDE

Active Ingredient:
spinosad (including Spinosyn A and Spinosyn D) 11.6%
Other Ingredients 88.4%
Total 100.0%

*...toxic to bees exposed to treatment during the **3 hours** following treatment...*

p. 27

Notes and Special Precautions

> 1 day ERT for alfalfa leafcutting bees, short RT for alkali bees [1].

EXTENDED RESIDUAL TOXICITY (ERT)

Pesticide remains toxic to bees for an **extended** period (8 hours +) following foliar application

ERT pesticides cannot be applied to blooming crops or weeds

EXTENDED RESIDUAL TOXICITY (ERT)

What would you see on the label?

If NO ERT:

"…**actively** visiting the treatment area…"

→ bees seen on plants

If ERT:

"visiting" replaced with "foraging" on newer labels

"…visiting the treatment area…"

→ *could* visit plants later

DIAZINON CAN BE APPLIED TO BEES WHEN A CROP IS IN BLOOM?

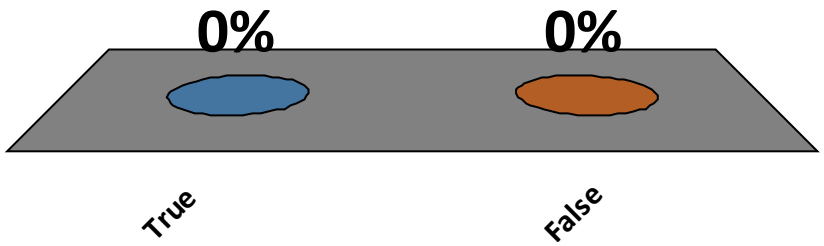
A. True

B. False

PEST	RATE
Blackheaded Fireworm *(Rhopobota naevana)*	2 qts. per acre
Cranberry Fruitworm	2 to 3 qts. per acre
Cranberry Tipworm	2 qts. per acre

Diazinon AG500

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



"…actively visiting the treatment area…"

Assume:

"…actively visiting the treated area…" ?

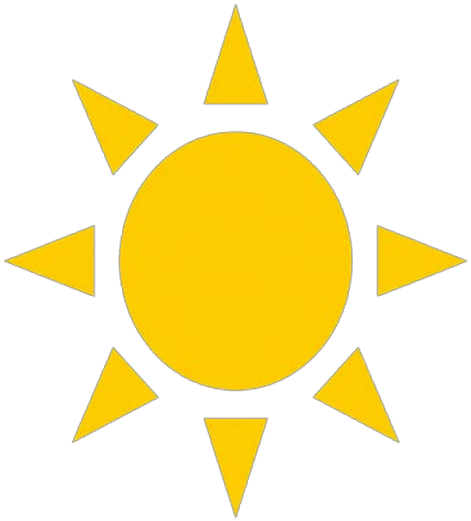
"…actively visiting the treated area…" ?

"…~~actively~~ visiting the treatment area…"

Assume:

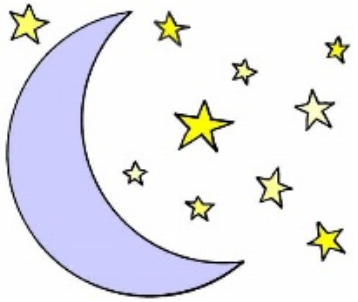
=

+



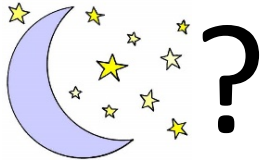
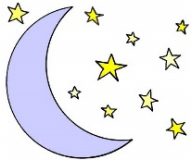
ERT

+



"...~~actively~~ visiting the treated area..." ?

WHICH PRODUCT CAN YOU APPLY TO A BLOOMING PLANT?

NO  **?** **NO** **YES** 

Tame 2.4 EC SPRAY INSECTICIDE-MITICIDE

TriStar

Avid 0.15EC Miticide/insecticide

Surround Agricultural Crop Protectant

Radiant SC INSECTICIDE

A	B	C	D	E
	actively?		no warning	*actively*

A 0%

B 0%

C 0%

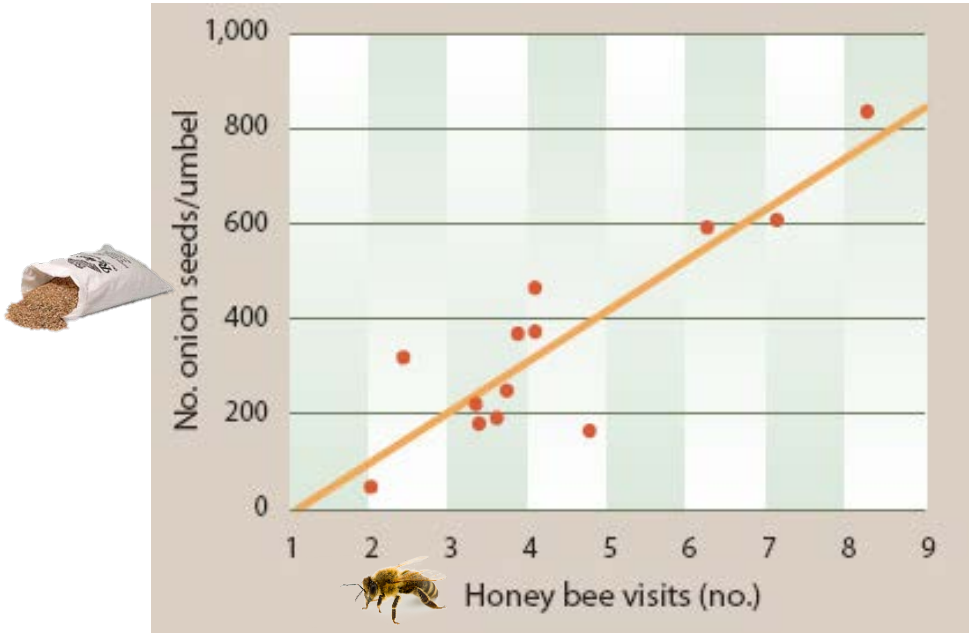
D 0%

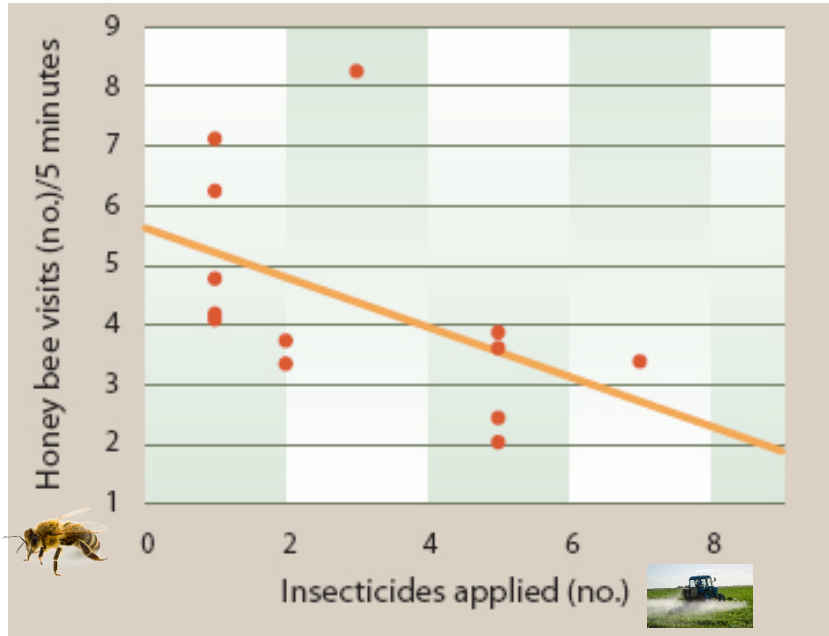
E 0%

AVOID SPRAYING AT BLOOM - ANYWAY

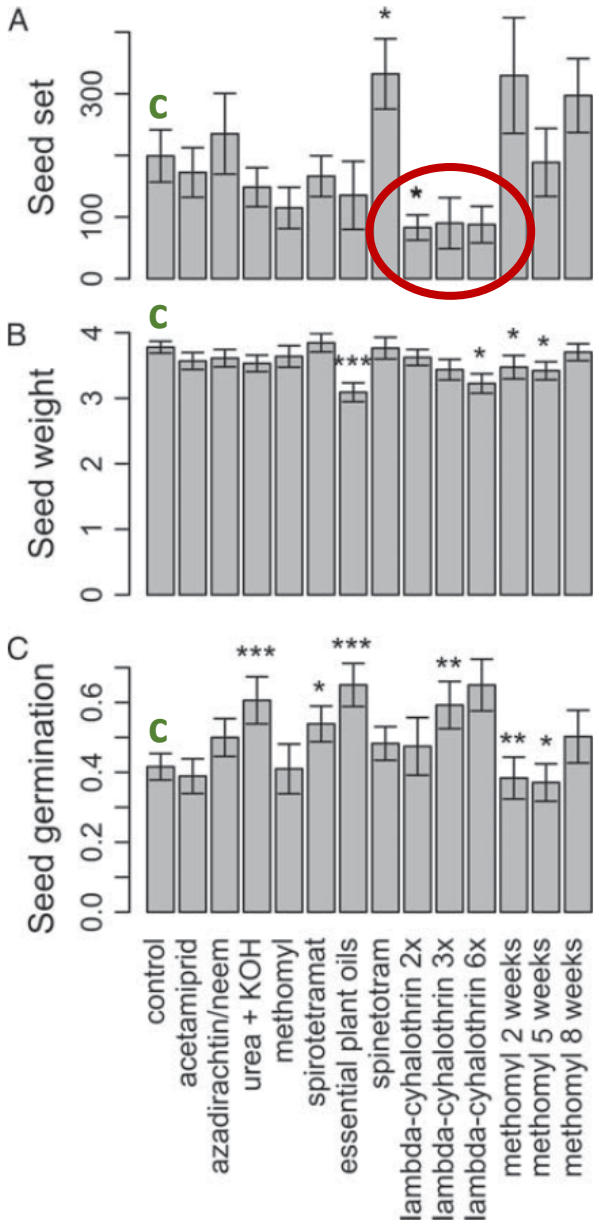
Onion thrip
(*Thrips tabaci*)
Iris yellow spot virus

Long and Morandin 2011, Cal. Agric., 65: 155-159





AVOID SPRAYING AT BLOOM - ANYWAY



Gillespie et al. 2014, J. Econ. Entomol., 107: 29-37

SOMETIMES NOT SPRAYING IS EASIER SAID THAN DONE…

Black *vine weevil*
Otiorhynchus sulcatus

Blackheaded Fireworm
Rhopobota naevana

Greedy scale
Acrobasus vaccinii

YOU HAVE A HIGH RISK SITUATION – WHAT NEXT?

1. Cannot use ERT pesticide – against the law

~~ERT~~

2. Select the least toxic product with short residual toxicity

3. Contact beekeeper


Harry Vanderpool

Honey Tree Apiaries

541-207-2155

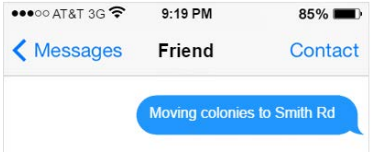
Harry Vanderpool

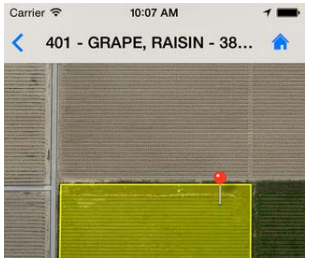
Harry Vanderpool

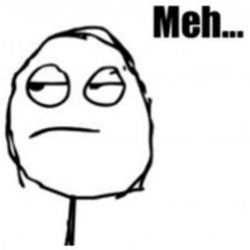

We are all working very hard.....
.....and trying to make a living at the same time

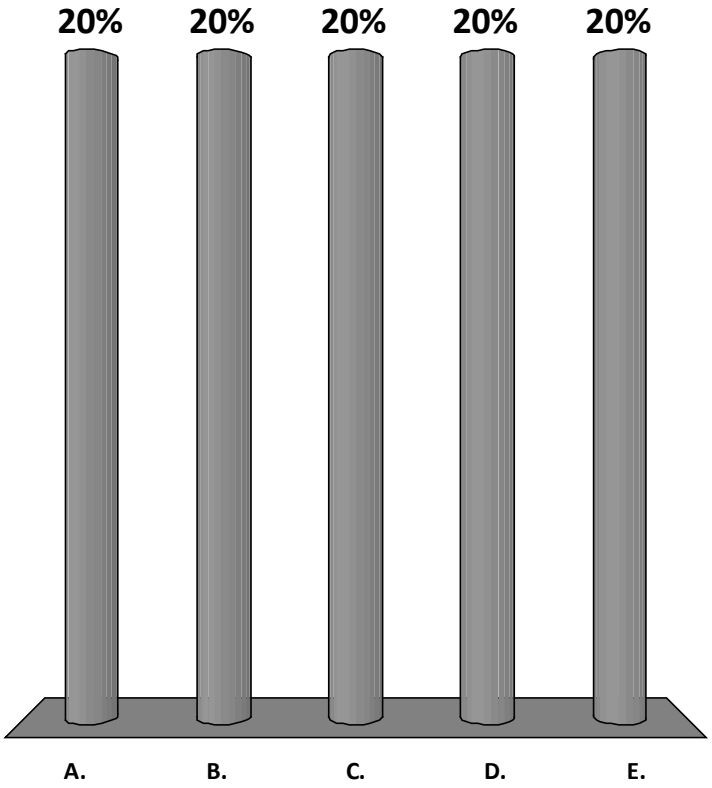
I would use the following tool to locate honey bees in a high risk situation:

A. Text msg system beekeeper
B. A phone app that pins colonies?
C. Web app that pins colonies?
D. Flag system?
E. Waste of time – wouldn't use it – too much work.









POLLINATORS, PESTICIDES & RISK

RISK =

1. Toxicity +
2. Residual Time

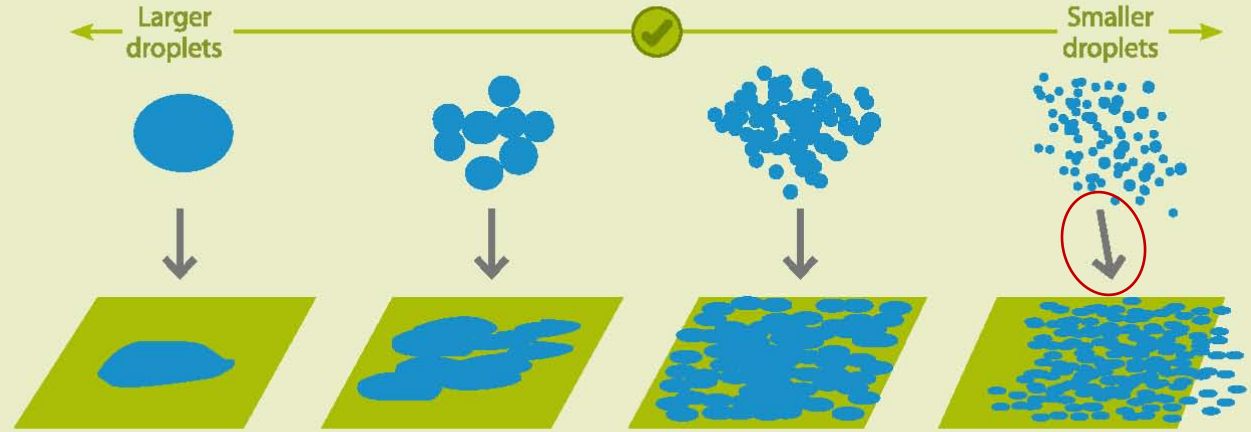
3. Bloom
4. Application/ Formulation


wildflowers next to tomatoes, Solano County, CA
Kimiora Ward

APPLICATION/FORMULATION

A delicate balance - coverage versus drift

Smaller droplets will achieve better coverage, but can increase the risk of spray drift.



farmguide.com.au

TANK MIXES/PRE-PACKS

More uncertainty around toxicity of tank mixes

No Bee Precautionary Statement (PS) on Label	**Dicofol**	**Triflumizole**
X	*Organochlorine miticide* Mixing with insecticides increases hazard to bees [1].	*Imidazole fungicide* May increase toxicity of certain neonicotinoids [32].

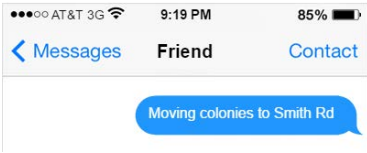
WHAT DID WE LEARN?

1. Use integrated pest management (pesticide only when needed)
2. Pay attention to bloom (target + non-target)


3. No bee toxic pesticides during bloom, but if necessary in evening

4. **No ERT** toxic pesticides during bloom

5. Communicate with your beekeepers



6. Least hazardous formulation – drop size, avoid tank mixes