AmericanHort IS PROUD TO BRING YOU Cultivate'18

Protecting Pollinators in Environmental Horticulture

Cristi L Palmer, PhD
Environmental Horticulture Program Manager
IR-4 Project

- Acknowledgements
- Team Members
- Backdrop & Objectives for Research Project
- Risk and why assessing risk is important
- Snippets of results so far

Acknowledgements

- NIFA SCRI Grant 2016-51181-25399 “Protecting Pollinators with Economically Feasible and Environmentally Sound Ornamental Horticulture”
- NIFA IR-4 Grant 2015-34383-23710
- USDA-ARS
- State Agricultural Experiment Stations

Research Team

- James Bethke (University of California-ANR)
  - Lea Corkidi, Leah Taylor
- Christine Casey (University of California-Davis)
- JC Chong (Clemson University)
- Rich Cowles (Connecticut Agricultural Experiment Station)
- Brian Eitzer (Connecticut Agricultural Experiment Station)
- Dan Gilrein (Cornell Cooperative Extension of Suffolk County)
- Christina Grozinger (Penn State University)
  - Emily Erickson, Doug Sponsler
- Zachary Huang (Michigan State University)
- Hayk Khachatryan (University of Florida)
- Elena Nino (University of California-Davis)
- Andrea Nurse (University of Maine)
- Cristi Palmer (IR-4, Rutgers University)
  - Amy Abate, Dave Bodine, Tom Freiberger, Yu-Han Lan, Carolina Simao
- Harland Patch (Penn State University)
- Dan Potter (University of Kentucky)
  - Adam Baker, Bernadette Mach, Carl Redmond
- Dave Smitley (Michigan State University)
  - Erika Hotchkiss, Colin O'Neal
- Kimberly Stoner (Connecticut Agricultural Experiment Station)
- Nishanth Tharayil (Clemson University)

Stakeholder Advisory Group

- Jennifer Browning, BASF
- Joe Chamberlin, Valent Corporation
- Harvey Cotten, Horticulture Research Institute
- Stephanie Darnell, Bayer Environ. Science
- Dave Fischer, Bayer Environmental Science
- Rufus Isaacs, Michigan State University
- Gary Mangum, Owner, Bell Nurseries
- Dustin Meador, CfAHR
- Terril Nell, American Floral Endowment
- Randy Oliver, Scientific Beekeeping
- Ed Overdevest, Owner, Overdevest Nurseries
- Jay Overmyer, Syngenta Crop Protection
- Casey Sclar, American Public Gardens Association
- Becky Sisco, IR-4 Western Region
- Tim Tucker, Amer. Beekeeping Federation
- Mark Yelanich, Metrolina Greenhouses, Inc.
- Vickie Wojcik, Pollinator Partnership
- *Ex officio*: Thomas Harty, Tom Moriarty, Tom Steeger, EPA

Challenges

- Most regulatory data related to pollinators was generated on large row agriculture
  - concern about seed treatment and dust during application
  - concern about systemic treatments over large acreage
- Sublethal impacts published with high doses in artificial diets
- Highly publicized bumble bee mortalities after misapplications in Oregon landscapes
- Calls for bans of systemic neonicotinoid insecticides

Protecting Pollinators Requires a Multi-prong Approach

- **Pollinator Attractiveness of Ornamental Horticulture Crops**
- **Risk Assessment Data Gaps**
- Economic, Efficacy, and Toxicological Comparisons of Alternatives
- Public Perception of Management Practices & Point-of-Purchase Display Materials
- Development of New BMPs
- Outreach

National Research Council's Four Steps to Characterize Risk

- Step 1: Hazard Identification √
- Step 2: Dose Response Assessment √
- Step 3: Exposure Assessment
- Step 4: Risk Characterization

What is risk?

Toxicity x Exposure = Risk

Risk and minimizing risk contributes to how labels are written

Toxicity Regulatory Data Needed

- What is the Lowest Observed Adverse Effect Level?
- What is the No Observed Adverse Effect Level?
  - LD_{50}, LC_{50} – the lower the number the higher the toxicity
  - Laboratory feeding and contact studies

DONE!

Exposure Regulatory Data Needed

- What is the actual amount ingested under field rates and conditions?
  - Varies based on application methodology, rate used, timing of applications, reapplication interval(s)
  - Varies based on crop physiology, environmental conditions
  - Varies based on pollinator preferences in food sources

We're working on it

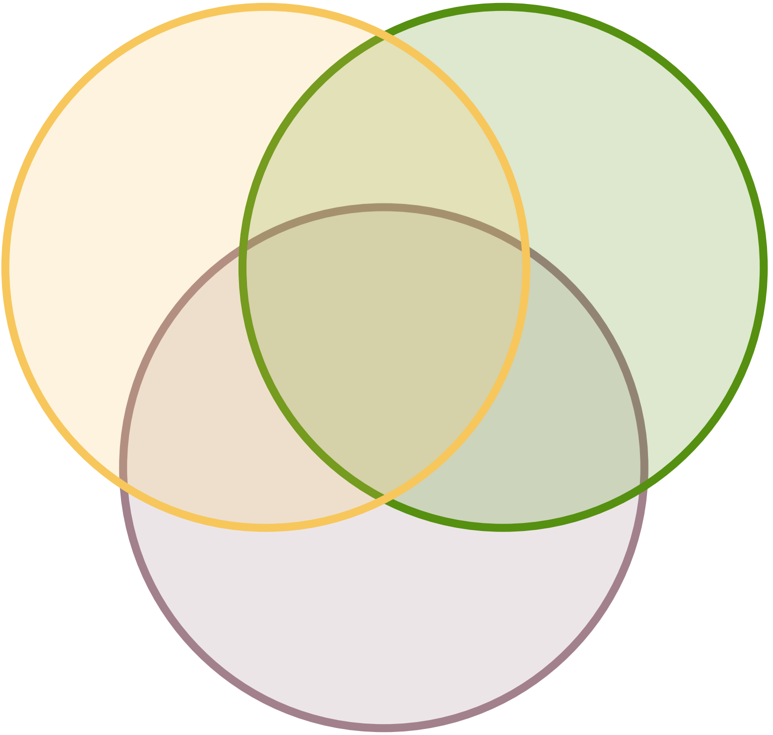
Systemic insecticides and pollinator risk

Pollinator

What and how much do insect (bee) pollinators eat?

What are pollinator foraging patterns?

Are they social or solitary?



Plant

Are plants good forage materials for insect (bee) pollinators?

How many are available in the landscape?

Are plants treated to manage pest insects?

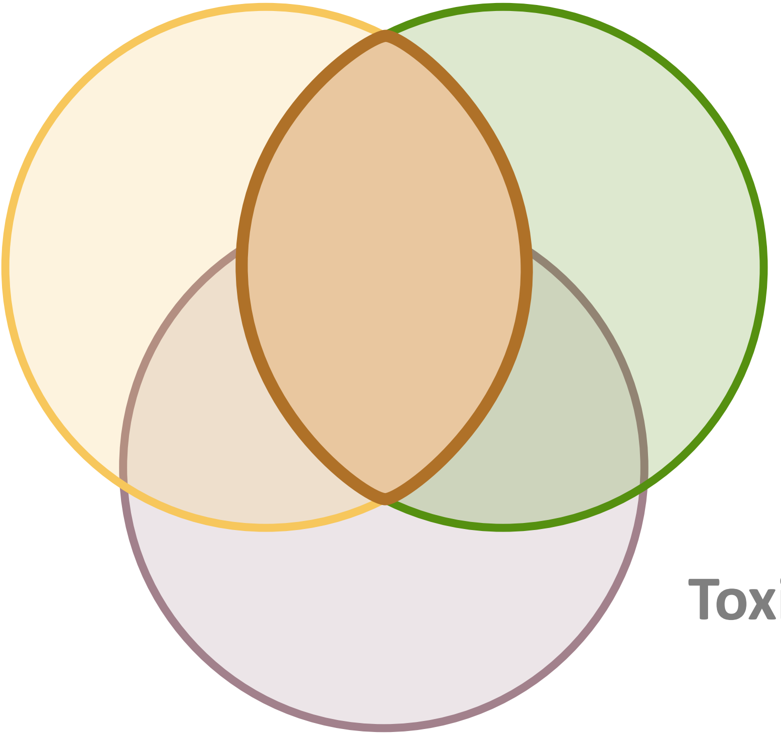
Insecticide

How impactful is the active to pollinator health?
When are applications needed to manage pests, protect pollinators?
How much is needed?

Systemic insecticides and pollinator risk

Pollinator

Plant



Are orn hort growers producing good sources of bee forage?

Toxicity X **Exposure** = Risk

Insecticide

Pollinator Attractiveness

2017 MSU Pollinator Attractiveness Plots for Annuals.

During 2017, scientists in six locations throughout the United States are studying the top 20 to 25 annuals and perennials grown in the US. They are counting the number of each pollinator group visiting of 3 to 5 cultivars of each plant species.

Researchers: Drs. Jim Bethke, Christine Casey, JC Chong, Christina Grozinger*, Harland Patch*, Dan Potter, Dave Smitley, Kim Stoner*

States: CA, CT, KY, MI, PA, SC

2016 PSU Pollinator Attractiveness Plots for Annuals. Photo by Nick Sloff.

Table of originally planned crops

CA (Casey)	CT (Stoner)	MI (Smitley)	PA (Grozinger/Patch)	SC (Chong)
Salvia (annual) *Verbena sp.* *Zinnia elegans*	*Celosia sp.* *Zinnia angustifolia* *Zinnia elegans* *Zinnia haagenana* *Zinnia sp.*	*Begonia sp.* *Impatiens hawkeri* *Impatiens walleriana* *Pelargonium sp.* *Petunia sp.* *Viola tricolor*	*Lobularia maritima* *Pentas sp.* Salvia (annual) *Tagetes sp.* *Zinnia elegans* *Zinnia sp.*	*Antirrhinum majus* *Calabrachoa sp.* *Catharanthus roseus* *Portulaca sp.* *Solenostemon sp.* *Verbena sp.*
Achillea millefolium *Echinacea sp.* *Lavandula sp.* *Penstemon sp.* *Perovskia atriplicifolia* Salvia (perennial)	*Echinacea purpurea* *Phlox sp.* *Sedum sp.*	*Chrysanthemum sp.* *Dianthus caryophyllus* *Dianthus chinensis* *Dianthus sp.* *Heuchera sanguinea* *Heuchera sp.*	*Echinaea sp.* *Rudbeckia sp.* Salvia (perennial)	*Astilbe sp.* *Coreopsis sp.* *Lavandula sp.* *Hibiscus sp.* *Iris sp.* *Veronica sp.*
Echinacea sp. *Nepeta sp.* *Tagetes erecta* *Zinnia x marylandica*	*Echinacea sp.* *Nepeta sp.* *Tagetes erecta* *Zinnia x marylandica*	*Echinacea sp.* *Nepeta sp.* *Tagetes erecta* *Zinnia x marylandica*	*Echinacea sp.* *Nepeta sp.* *Tagetes erecta* *Zinnia x marylandica*	*Echinacea sp.* *Nepeta sp.* *Tagetes erecta* *Zinnia x marylandica*

PROTECTING BEES

UC-ANR Plant Lists

Comparison of CA-Native to Non-Native

Natives

- *Bahiopsis laciniata*
- *Encelia californica*
- *Rhus integrifolia*
- *Sphaeralcea ambigua*
- *Salvia apiana*
- *Eriogonum fasciculatum*
- *Ceanothus* 'Concha'
- *Heteromeles arbutifolia*
- *Penstemon heterophyllus*
- *Verbena lilacina*

Non-Natives

- *Escallonia x exoniensis 'Fradesii'*
- *Lavandula stoechas*
- *Nepeta faassenii 'Walker's Low'*
- *Rosmarinus officinalis*
- *Salvia greggii*
- *Callistemon viminalis*
- *Ligustrum japonicum texanum*
- *Raphiolepis indica 'Pink Lady'*

Comparison of coastal and inland areas

- *Tagetes patula*
- *Zinnia marylandica*
- *Impatiens walleriana*
- *Begonia sp.*
- *Lobularia maritima*
- *Pelargonium x hortorum*
- *Salvia farinaceae*
- *Eschscholzia california*
- *Calibrachoa sp.*
- *Petunia hybrida*

USDA NASS Census of Horticulture 2014: Top Crops by Units Sold

Top 25 Annual & Seasonal Potted Crops

1. **Pelargonium**
2. **Viola (Pansy)**
3. **Petunia**
4. *Euphorbia (poinsettia)*
5. **Begonia**
6. **Impatiens**
7. **Tagetes**
8. *Phalaenopsis*
9. *Chrysanthemum/ Dendranthema*
10. **Catharanthus**
11. *Lilium*
12. *Rosa (miniature roses in pots)*
13. Gerbera
14. Kalanchoe
15. **Calibrachoa**
16. *Hibiscus*
17. **Solenostemon (Coleus)**
18. *Caladium*
19. *Tulipa*
20. *Rhododendron (greenhouse pots of azalea)*
21. *Hydrangea*
22. *Saintpaulia*
23. Cyclamen
24. **Zinnia**
25. **Salvia**

26. Pentas, 27. Verbena, 28. Dahlia, 29. Antirrhinum, 34. Celosia, 35. Portulaca, 37. Lobularia

Top 25 Herbaceous Perennial Crops

1. **Chrysanthemum/ Dendranthema**
2. **Hosta**
3. **Hemerocallis**
4. **Sedum**
5. **Dianthus**
6. **Salvia**
7. **Phlox**
8. **Coreopsis**
9. **Lavandula**
10. **Echinacea**
11. **Heuchera**
12. **Rudbeckia**
13. Leucanthemum
14. **Astilbe**
15. Delphinium
16. Gaillardia
17. Aquilegia
18. **Veronica**
19. **Iris**
20. **Paeonia**
21. **Penstemon**
22. Digitalis
23. **Perovskia**
24. **Hibiscus**
25. **Achillea**

Preliminary Assessments of Top 25 Crops and All Crops listed in NASS Census of Horticulture

- Reviewed available pollinator attractiveness data
  - 11 published studies and preliminary/non-analyzed count data from research team (CA, CT, KY, MI, PA, SC)
  - Normalized count data reported to number of pollinators per 10 minutes
  - Applied scale:
    - < 1 bee per 10 minutes = not or virtually not attractive (0)
    - 1 up to 3 bees per 10 minutes = minimally attractive (1)
    - 3 up to 10 bees per 10 minutes = moderately attractive (2)
    - > 10 bees per 10 minutes = highly attractive (3)
  - Pollinators included so far
    - Bumble Bees, Honey Bees, Other Bees (carpenter bees, cuckoo bees, dark hairy belly bees, green sweat bes, large dark bees, long-horned bees, metallic hairy belly bees, small dark bees, small sweat bees), Syrphid Flies

Crops where preliminary count data were available

CA (Casey)	CT (Stoner)	MI (Smitley)	PA (Grozinger/Patch)	SC (Chong)
Achillea millefolium	*Celosia sp.*	*Begonia sp.*	*Lantana sp.*	*Antirrhinum majus*
Bidens sp.	*Echinacea purpurea*	*Chrysanthemum sp.*	*Lobularia maritima*	*Astilbe sp.*
Epilobium canum	*Nepeta sp.*	*Dianthus caryophyllus*	*Pentas sp.*	*Catharanthus roseus*
Erigeron karvinskianus	*Phlox sp.*	*Dianthus chinensis*	*Tagetes erecta*	*Hibiscus sp.*
Erigeron sp.	*Sedum sp.*	*Dianthus sp.*	*Tagetes sp.*	*Lavandula sp.*
Escallonia x exoniensis	*Tagetes erecta*	*Echinacea sp.*	*Zinnia elegans*	*Nepeta sp.*
Gaillardia sp.	*Zinnia angustifolia*	*Heuchera sanguinea*	*Zinnia sp.*	*Portulaca sp.*
Hylotelephium spectabile	*Zinnia elegans*	*Heuchera sp.*	*Zinnia x marylandica*	*Solenostemon sp.*
Lantana montevidensis	*Zinnia haagenana*	*Impatiens hawkeri*		*Tagetes erecta*
Leucophyllum frutescens	*Zinnia sp.*	*Impatiens walleriana*		*Verbena sp.*
Nepeta x faassenii	*Zinnia x marylandica*	*Nepeta sp.*		*Veronica sp.*
Perovskia atriplicifolia		*Pelargonium sp.*		*Zinnia x marylandica*
Salvia greggii		*Petunia sp.*		
Salvia nemorosa		*Phacelia grandiflora*		
Tagetes erecta		*Tagetes erecta*		
Teucrium chamaedrys		*Viola tricolor*		
Verbascum sp.		*Zinnia x marylandica*		
Verbena sp.				
Zinnia elegans				

Woody Plants Included in KY Study (Potter)

Abelia sp.
Aesculus flava
Aesculus parviflora
Aesculus x carnea
Amelanchier sp.
Amorpha fruticosa
Aralia spinosa
Buxus sempervirens
Calycanthus floridus
Catalpa speciosa
Cephalanthus occidentalis
Cercis canadensis
Chionanthus virginicus
Cladrastis kentukea
Clethra alnifolia
Cornus drummondii
Cornus florida
Cornus kousa
Cornus mas
Crataegus viridis
Deutzia scabra
Forsythia sp.
Fothergilla gardenii
Hamamelis vernalis
Heptacodium micronioides
Hydrangea arborescens
Hydrangea macrophylla
Hydrangea paniculata
Hydrangea quercifolia
Hypericum frondosum
Hypericum sp.
Ilex opaca
Ilex verticillata
Ilex x attenuata
Ilex x meserveae
Itea virginica
Koelreuteria paniculata
Lagerstroemia sp.
Lindera benzoin
Lonicera fragrantissima
Maackia amurensis
Magnolia liliiflora
Magnolia stellata
Malus sp.
Nyssa sylvatica
Oxydendrum arboreum
Philadelphus sp.
Physocarpus opulifolius
Prunus laurocerasus
Prunus sp.
Prunus subhirtella
Prunus virginiana
Pyracantha sp.
Rhododendron sp.
Rosa setigera
Rosa sp.
Sambucus canadensis
Sassafras albidum
Spiraea japonica
Spiraea virginiana
Spiraea x vanhouttei
Syringa reticulata
Syringa vulgaris
Tetradium daniellii
Tilia cordata
Viburnum burkwoodii
Viburnum carlesii
Vitex agnus-castus

Comparing Plants Sold with Attractiveness Ratings

Pollinator Attractiveness Ratings for Crops

Numerical Rating	Description	# Bees per 10 Minutes
0	Not or virtually not attractive	< 1
1	Minimally attractive	1 < 3
2	Moderately attractive	3 < 10
3	Highly attractive	10 +

+

2012 CENSUS OF AGRICULTURE

Census of Horticultural Specialties (2014)

Volume 3 • Special Studies • Part 3

AC-12-SS-3

Issued December 2015

United States Department of Agriculture
Tom Vilsack, Secretary
National Agricultural Statistics Service
Joseph T. Reilly, Administrator

PROTECTING BEES

Comparing Plants Sold with Attractiveness Ratings

- If a crop had a season-long average of greater than 2.5 attractiveness rating for any bee species, the number of units sold were included in percentage calculation
    - Season-long means when the plant was blooming
    - Somewhat conservative assessment in that if any pollinator species was attracted to the crop, the crop was considered attractive
- Crops listed in the NASS Census of Horticulture 2014 were included in the calculations if there were attractiveness data available or if they are primarily sold as houseplants (ie African violet) or are wind pollinated (ie conifers)
- We used number of units sold (pots, flats, etc) rather than dollar value

Comparing Plants Sold with Attractiveness Ratings

- Caveats:
  - As additional data are generated by our team, the percentages may shift
  - As additional published manuscripts are reviewed and included, the percentages may shift
  - As public preferences change for purchasing pollinator-attractive plants, the percentages may shift
  - We don’t know how to assess roses at the moment

Cultivars within crop species may be highly variable in their attractiveness due to a number of characteristics.

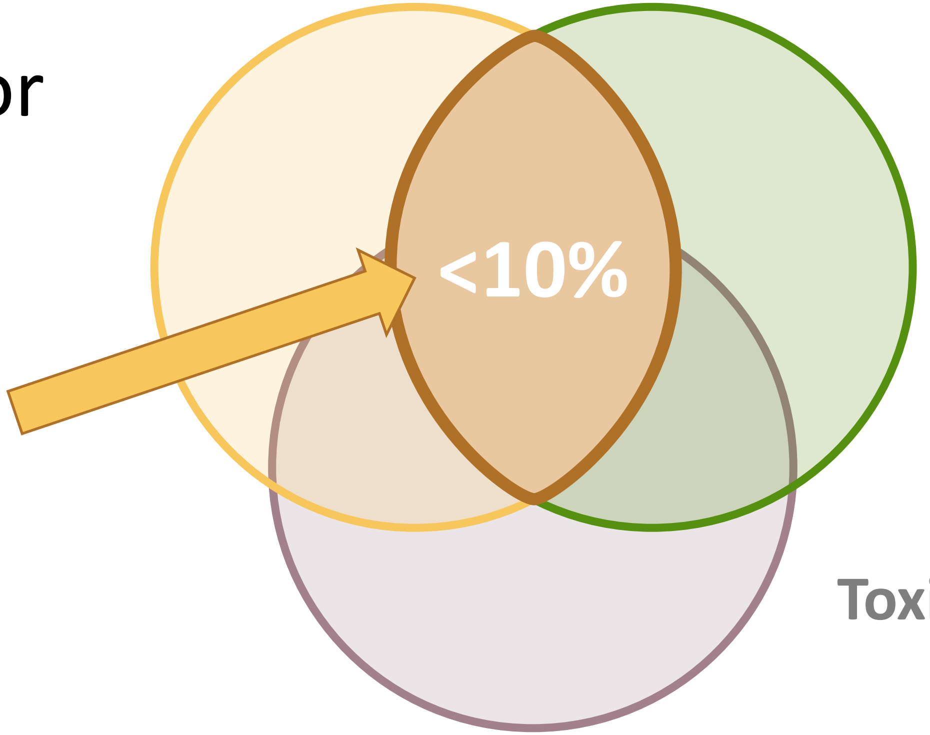
Cristi Palmer

PanAmerican Seed

Systemic insecticides and pollinator risk

Pollinator

Plant

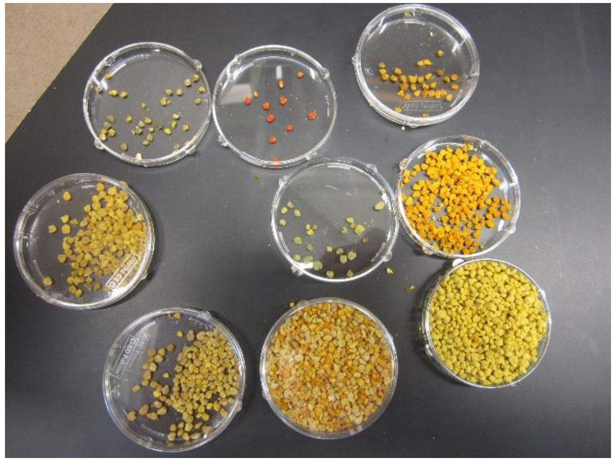


What we think we know right now with our experiments still occurring

Toxicity X Exposure = Risk

Insecticide

Pollen Collection & Analysis in CT



2017 CT Pollen Collection. Photos by Alejandro Chiriboga

In Connecticut, honey bee hives were placed in three commercial plant nurseries and pollen was collected through the season from May to September.

The pollen was tested for pesticides, and the samples with the highest pesticide toxicity to honey bees were sorted by color and each color was tested again for pesticides.

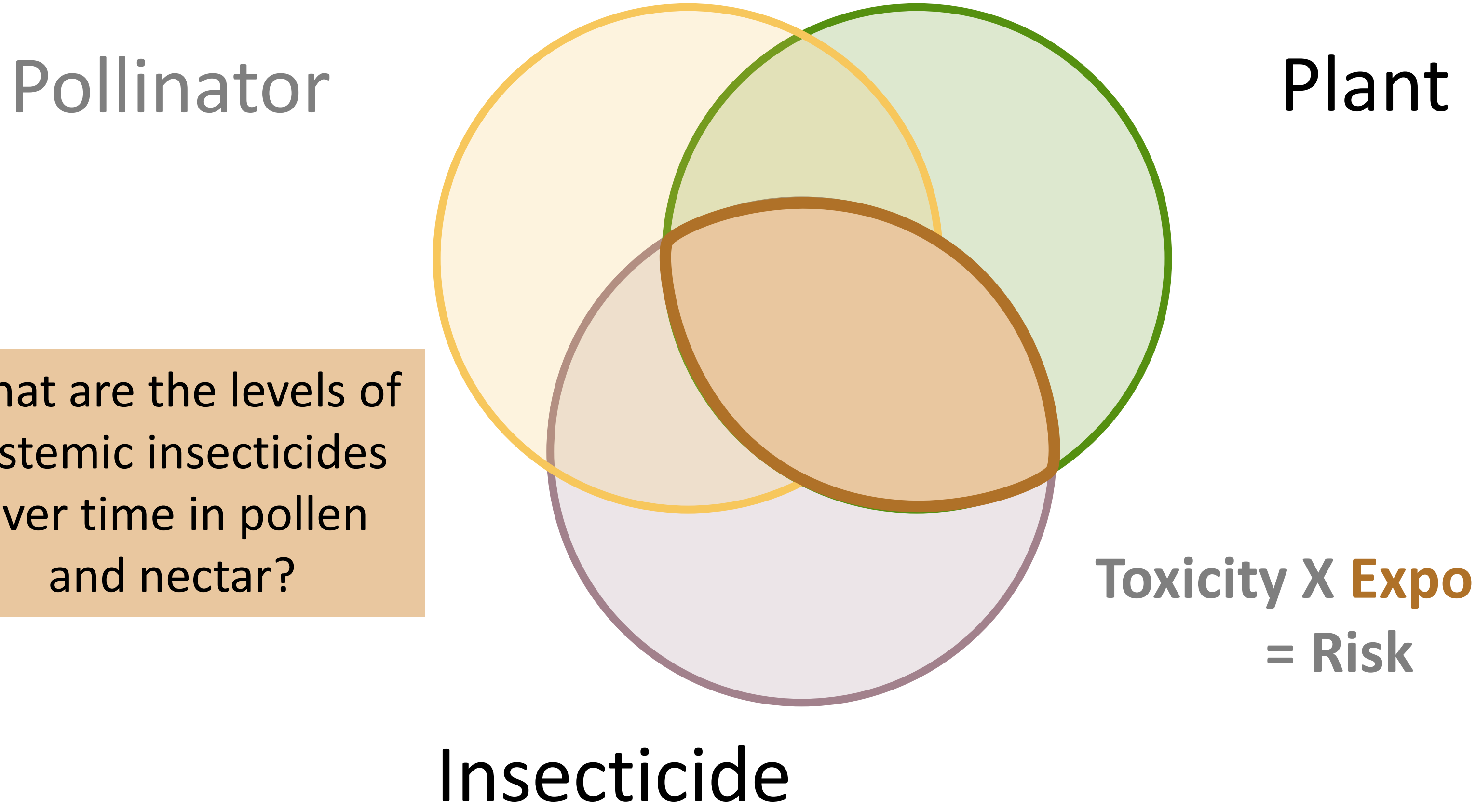
The pollen is now being identified to identify 1) what ornamental plants honey bees use as pollen sources 2) what ornamental plants contribute the most pesticide residue to honey bees through their pollen.

Researchers: Dr. Kim Stoner*, Brian Eitzer, Rich Cowles

States: CT

PROTECTING BEES

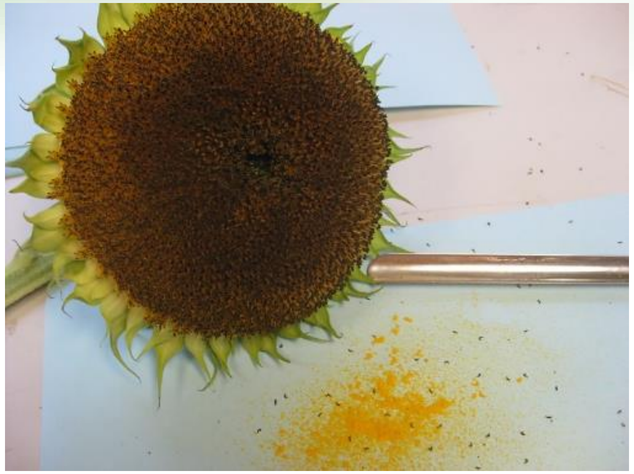
Systemic insecticides and pollinator risk



What are the levels of systemic insecticides over time in pollen and nectar?

Toxicity X **Exposure**
= Risk

Residue Analysis



2017 CT Pollen Collection. Photos by Rich Cowles

2017 NJ Nectar Collection. Photos by Cristi Palmer

Rhododendron and Sunflower are good model crops to study residues because their flowers produce copious amounts of pollen and/or nectar.

Pollen and/or nectar are being collected during bloom and are being analyzed for residues.

Researchers: Drs. JC Chong, Rich Cowles*, Brian Eitzer*, Cristi Palmer*, Dan Potter, Dave Smitley, Nishanth Thayaril*

States: CT, MI, NJ, PA, SC

Residue Analysis: Planned Model Crops

Plant Type	Pollen	Nectar
Annual	Sunflower ‘Taiyo’ (*Helianthus* sp.)	Annual salvia (*Salvia splendens*) Snapdragon (*Antirrhinum majus*)
Herbaceous Perennial	Dahlia ‘Bishop’ series (*Dahlia sp.*)	Red Hot Poker (*Kniphofia uvaria*) Salvia ‘Black & Blue’
Woody Perennial	Rhododendron PJM or *R. catawbiense boursault*	Rhododendron PJM or *R. catawbiense boursault* Geraldton Wax Flower (*Chamelaucium uncinatum*)

Residue Analysis: Planned Model Crops

Plant Type	Pollen	Nectar
Annual	Sunflower 'Taiyo' (*Helianthus* sp.)	Annual salvia (*Salvia splendens*) Snapdragon (*Antirrhinum majus*)
Herbaceous Perennial	Dahlia 'Bishop' series (*Dahlia sp.*)	Red Hot Poker (*Kniphofia uvaria*) Salvia 'Black & Blue'
Woody Perennial	Rhododendron PJM or *R. catawbiense boursault*	Rhododendron PJM or *R. catawbiense boursault* Geraldton Wax Flower (*Chamelaucium uncinatum*)

Residue Analysis: Active Ingredients

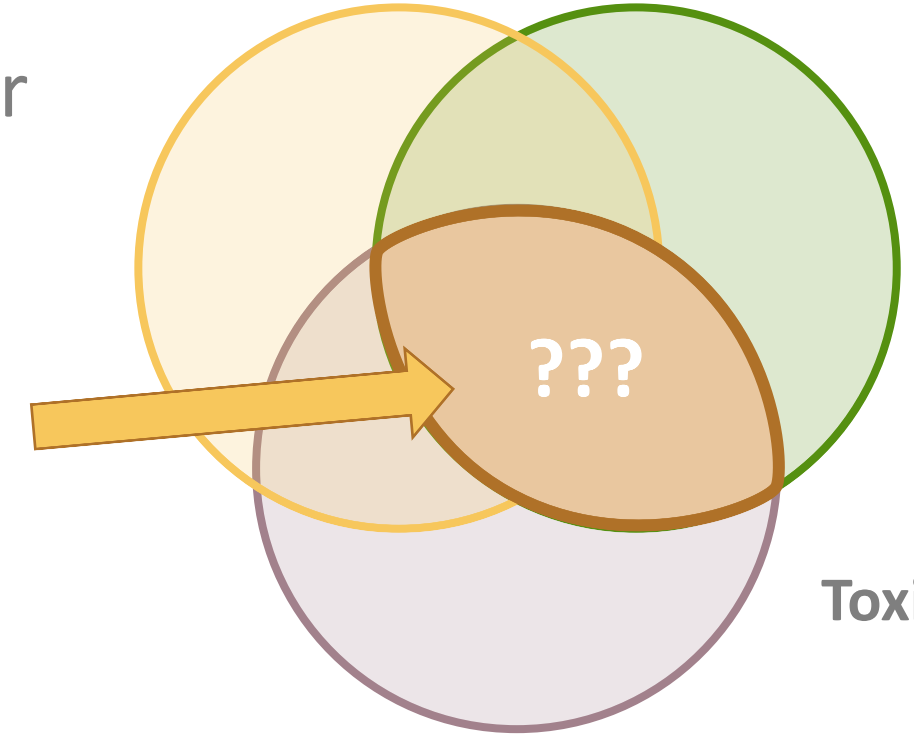
Product (active ingredient)	Application Methodology	Rates (according to label with exception of those highlighted to provide a minimum of ½ x for a rate range)	
		Product 1	Product 2
Marathon (imidacloprid) + Altus aka BYI-2960 (flupyradifurone)	Foliar	0.85 fl oz per 100 gal	7 fl oz per 100 gal
		1.7 fl oz per 100 gal	14 fl oz per 100 gal
	Drench	0.85 fl oz per number of pots in sufficient volume to wet pot without loss of liquid **	14 fl oz per acre **
		1.7 per number of pots in sufficient volume to wet pot without loss of liquid **	28 fl oz per acre **
Safari (dinotefuran)	Foliar	4 oz per 100 gal	n/a
		8 oz per 100 gal	
	Drench	12 oz per acre **	
		24 oz per acre **	
Flagship (thiamethoxam) + Mainspring (cyantraniliprole)	Foliar	2 oz per 100 gal water	1 fl oz per 100 gal water
		8.5 oz per 100 gal water	16 fl oz per 100 gal water
	Drench	4 oz per 100 gal water**	6 fl oz per 100 gal water**
		8.5 oz per 100 gal water**	12 fl oz per 100 gal water**

Systemic insecticides and pollinator risk

Pollinator

Plant

What we think we know right now with our experiments still occurring

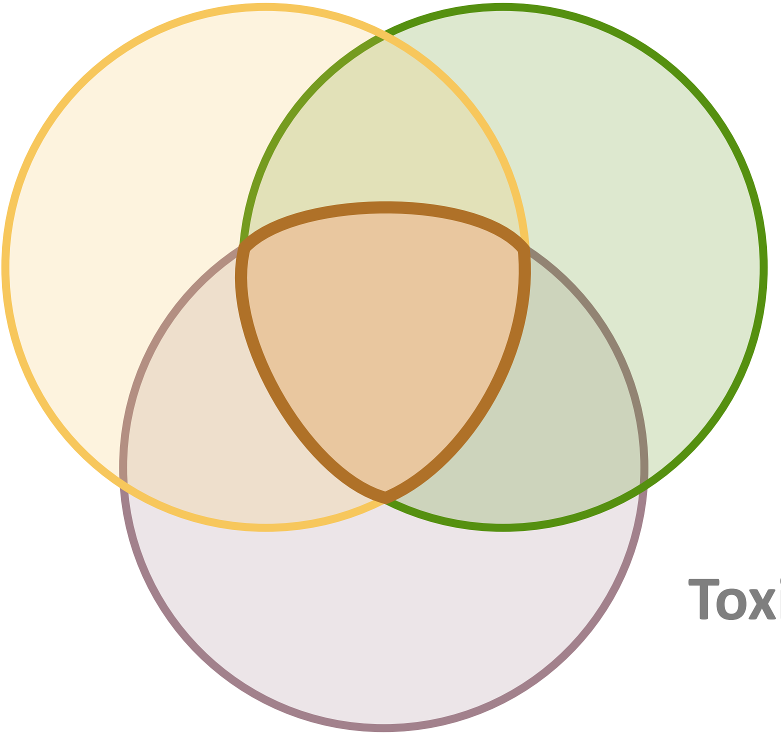


Insecticide

Toxicity X Exposure
= Risk

SCRI: Protecting Pollinators with Economically Feasible and Environmentally Sound Ornamental Horticulture

Systemic insecticides and pollinator risk



Does confinement on plants treated with systemic insecticides impact bumble bee colonies?

Toxicity X Exposure = Risk

IR-4 Project

PROTECTING BEES

Caged Bumble Bee Trials

In Michigan, 7 different annual crops were used as forage to test impact of imidacloprid drenches during production (petunia, verbena, geranium, marigold, portulaca, salvia, begonia)

2017 MI Caged Trials. Photos by Dave Smitley

Caged Bumble Bee Trials

2017 MI Caged Trials. Photos by Dave Smitley

Half of each crop was drenched with imidacloprid 6 weeks prior to when bumble bee colonies were placed in each tent for 10 days.

Afterward each colony was moved to individual shelters for the rest of the summer and bees were able to forage on non treated plants nearby.

SCRI: Protecting Pollinators with Economically Feasible and Environmentally Sound Ornamental Horticulture

Caged Bumble Bee Trials

Bumble bee colonies were brought into the lab at the beginning of the experiment and once every two weeks throughout the summer for counting.

Each bee was marked with a small dot of paint during each count.

Different colors were used to monitor bee fidelity to their colony and the amount of drift to other colonies.

2017 MI Caged Trials. Photos by Dave Smitley

Caged Bumble Bee Trials: Results

- Bumble bee workers remained faithful to their own specific colony (95%)
- Bumble bee counts in the colonies declined immediately after caging (30 – 50%, possibly due to lack of suitable forage even though supplemented with sugar water) but remained steady throughout summer with imidacloprid exposed colonies containing ~25% less workers

Collection of Flower Heads for Residue Analysis

Caged Bumble Bee Trials: Results

Two of the seven plants did not have imidacloprid in **whole flowers** plus some stem and sepal tissues.

Bee forage (pollen and nectar) were not analyzed separately

Crop	Imidacloprid ppb (ng/g)	Imidacloprid 5-OH ppb (ng/g)	Imidacloprid Olefin ppb (ng/g)
Begonia	139 (96 - 204)	ND	ND
Geranium	0 (0 - 0)	ND	ND
Marigold	455 (293 - 930)	ND	ND
Petunia	0 (0 - 0)	ND	ND
Portulaca	22 (16 - 33)	ND	ND
Salvia	396 (275 - 582)	ND	ND
Verbena	31 (20 - 55)	ND	ND

Caged Bumble Bee Trials: Results

Two of the seven plants did not have imidacloprid in **whole flowers** plus some stem and sepal tissues.

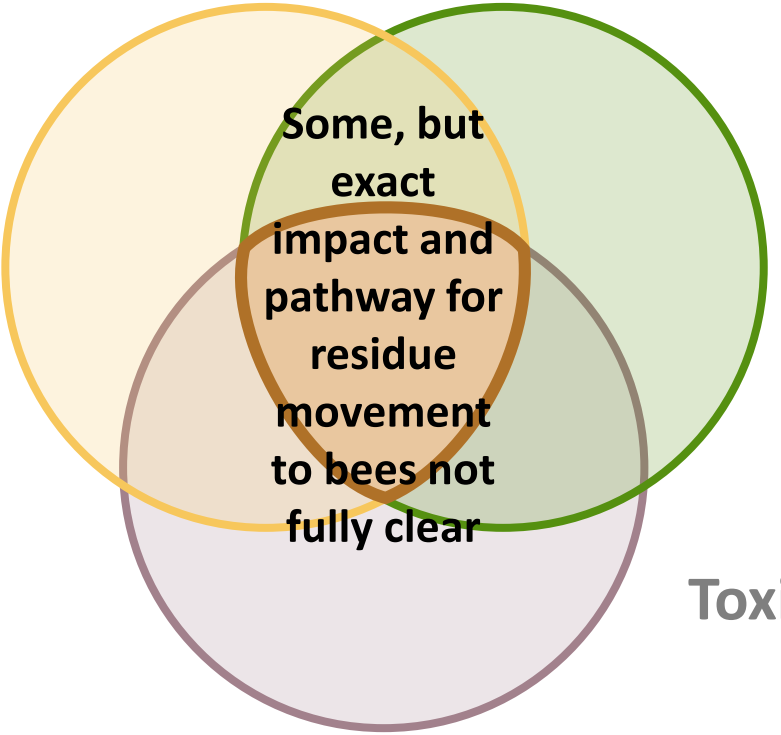
Bee forage (pollen and nectar) were not analyzed separately

Crop	Imidacloprid ppb (ng/g)	Imidacloprid 5-OH ppb (ng/g)	Imidacloprid Olefin ppb (ng/g)	Att. Rating
Begonia	139 (96 - 204)	ND	ND	<1
Geranium	0 (0 - 0)	ND	ND	<1
Marigold	455 (293 - 930)	ND	ND	~1
Petunia	0 (0 - 0)	ND	ND	0
Portulaca	22 (16 - 33)	ND	ND	<1
Salvia	396 (275 - 582)	ND	ND	~1
Verbena	31 (20 - 55)	ND	ND	~1.5

Systemic insecticides and pollinator risk

Pollinator

Plant

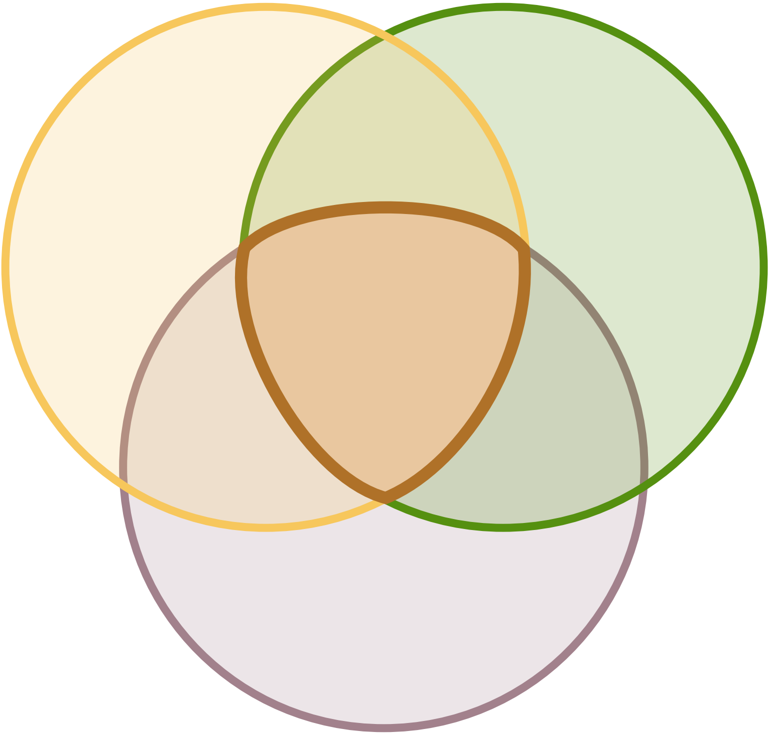


Insecticide

Does confinement on plants treated with systemic insecticides impact bumble bee colonies?

Toxicity X **Exposure** = Risk

Systemic insecticides and pollinator risk



Pollinator

What and how much do insect (bee) pollinators eat?

What are pollinator foraging patterns?

Are they social or solitary?

Plant

Are plants good forage materials for insect (bee) pollinators?

How many are available in the landscape?

Are plants treated to manage pest insects?

Insecticide

How impactful is the active to pollinator health?

When are applications needed to manage pests, protect pollinators?

How much is needed?

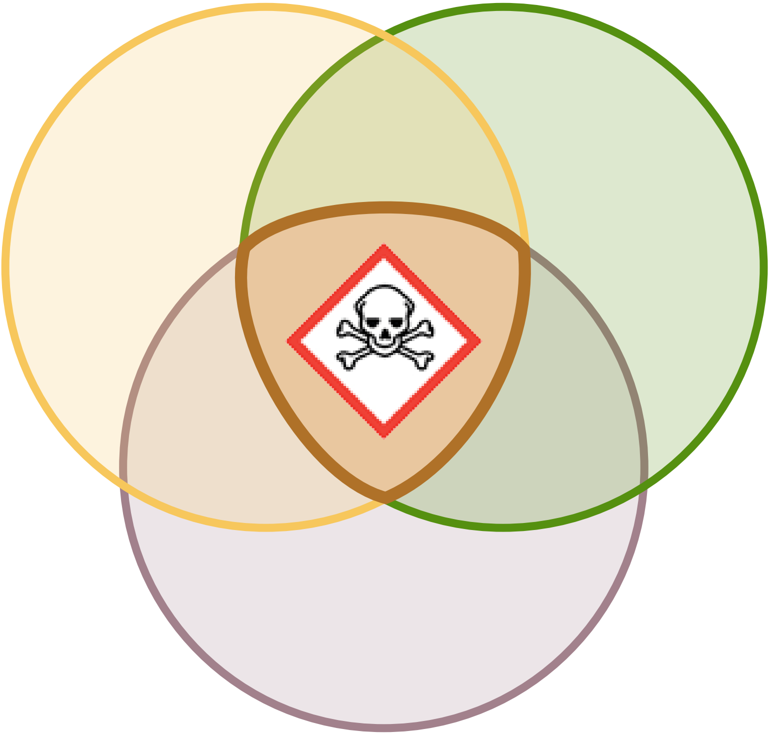
Systemic insecticides and pollinator risk

Pollinator

What and how much do insect (bee) pollinators eat?

What are pollinator foraging patterns?

Are they social or solitary?



Plant

Are plants good forage materials for insect (bee) pollinators?

How many are available in the landscape?

Are plants treated to manage pest insects?

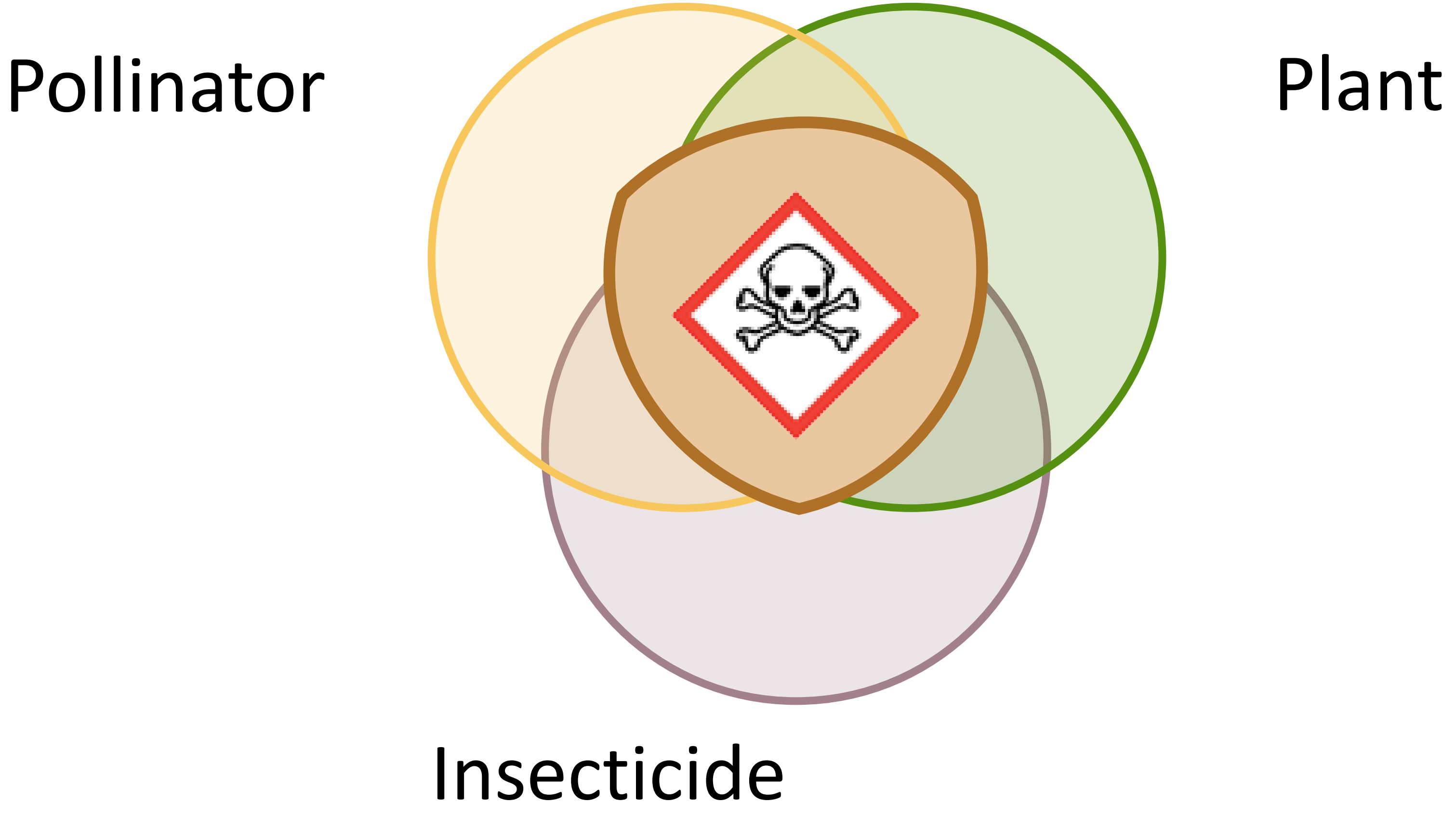
Insecticide

How impactful is the active to pollinator health?

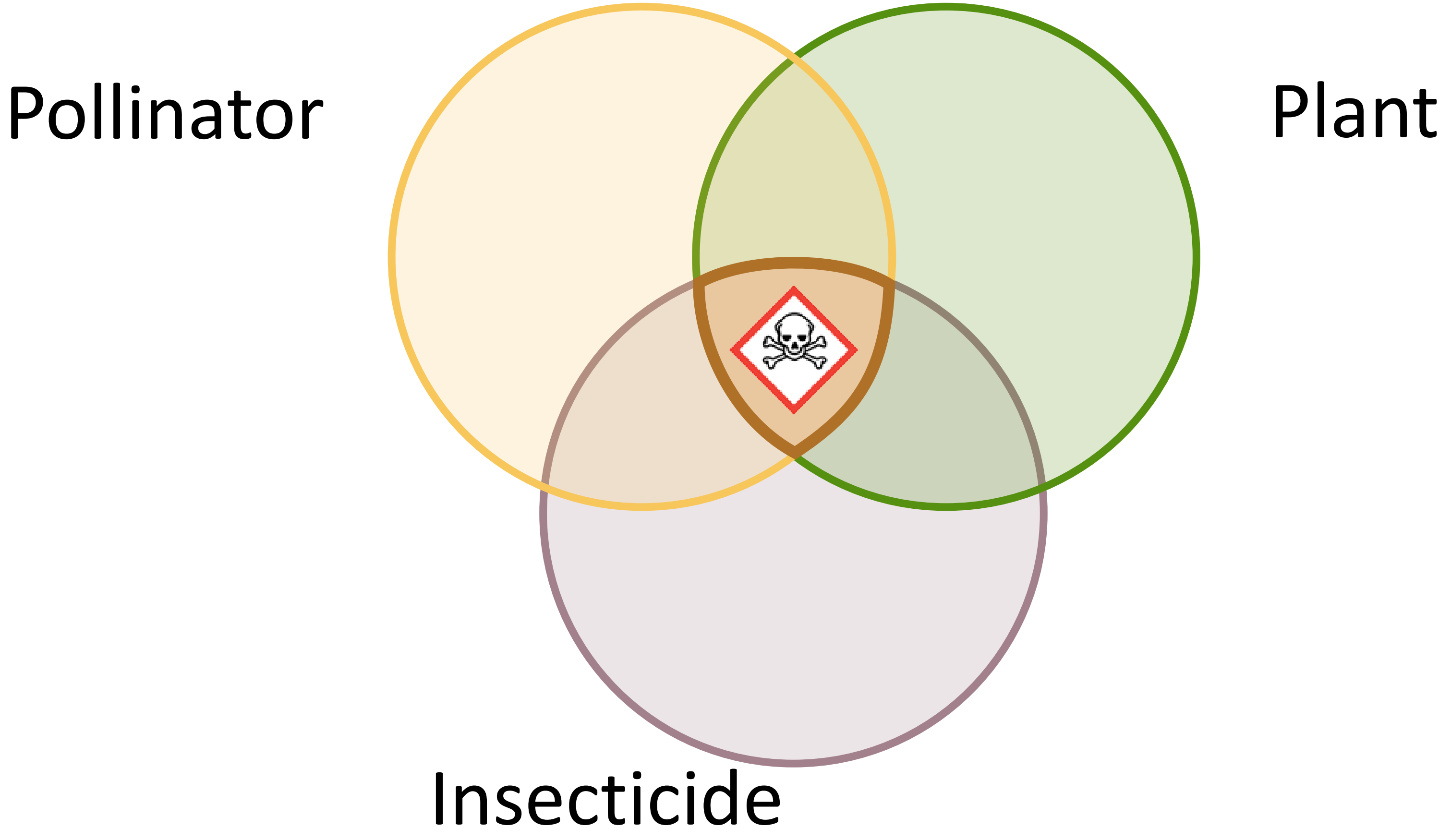
When are applications needed to manage pests, protect pollinators?

How much is needed?

Systemic insecticides and pollinator risk



Systemic insecticides and pollinator risk

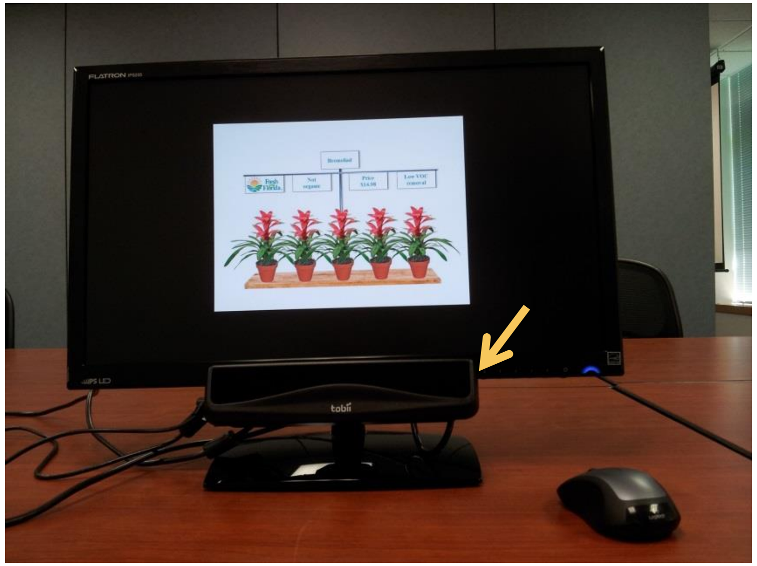


Protecting Pollinators Requires a Multi-prong Approach

- Pollinator Attractiveness of Ornamental Horticulture Crops
- Risk Assessment Data Gaps
- Economic, Efficacy, and Toxicological Comparisons of Alternatives
- **Public Perception of Management Practices & Point-of-Purchase Display Materials**
- Development of New BMPs
- Outreach

Public Perception of Management Practices & Point-of-Purchase Display Materials

- Questions:
  - What labelling is best suited to promote pollinator forage?
  - Is there a premium for "pollinator friendly" plants?
- Conjoint Analysis & Eye Tracking



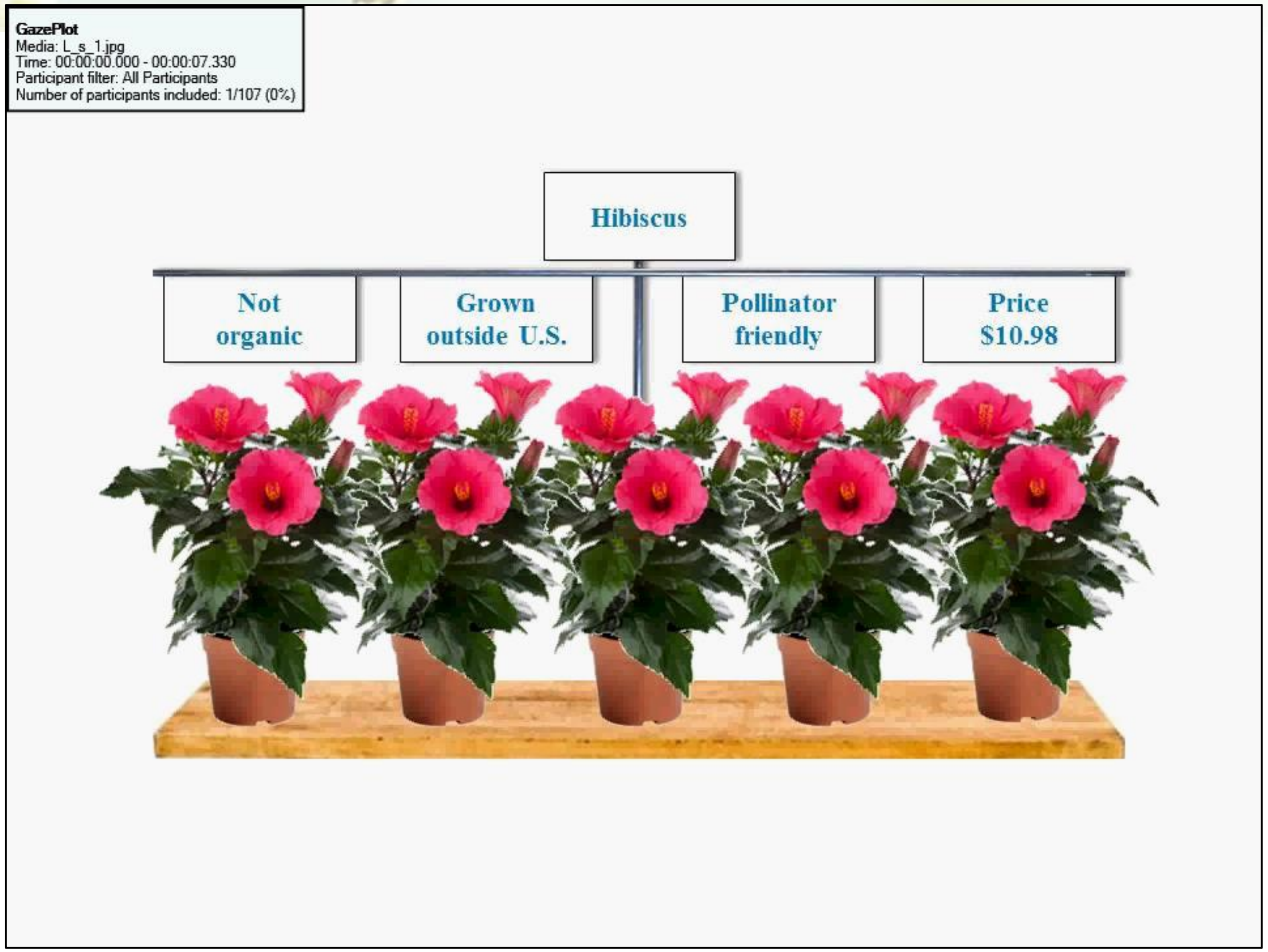
Tobii 1x Light Eye Tracker

Recordings – Fixation counts (FC)

Dr. Hayk Khachatryan
University of Florida

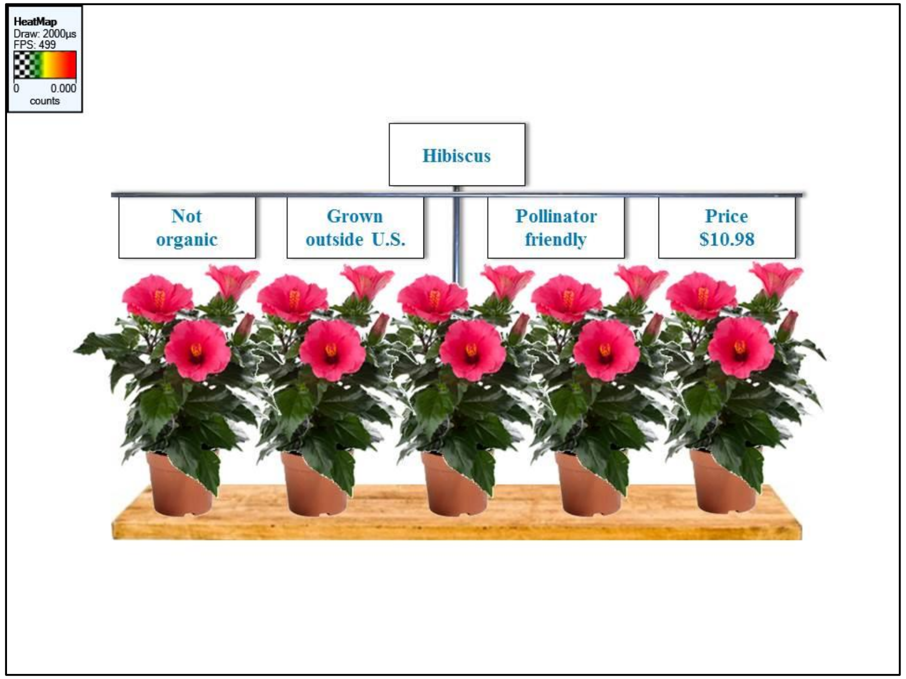
PROTECTING BEES

Example

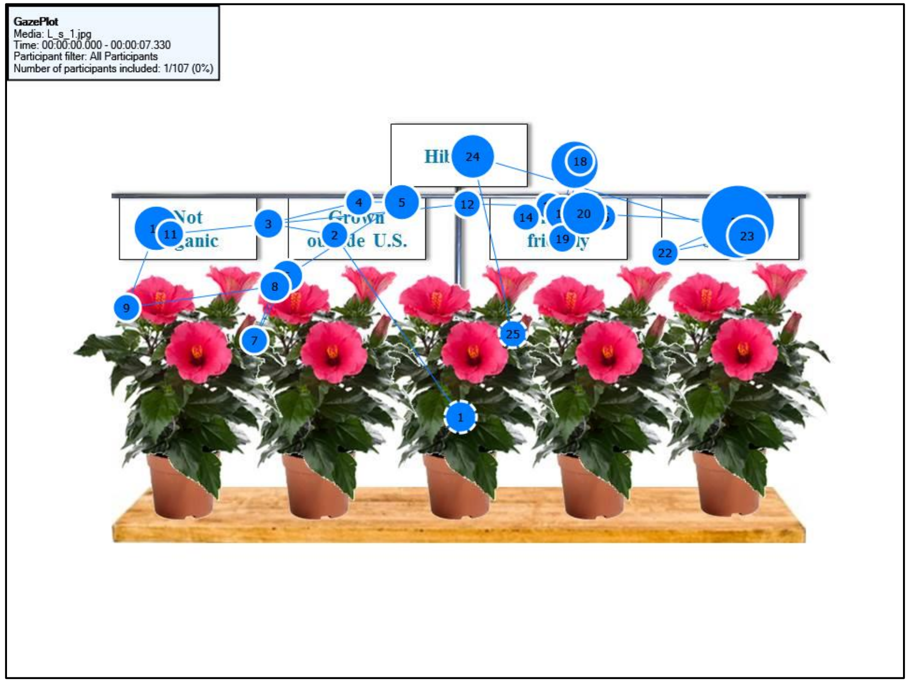


Dr. Hayk Khachatryan
University of Florida

Original Image



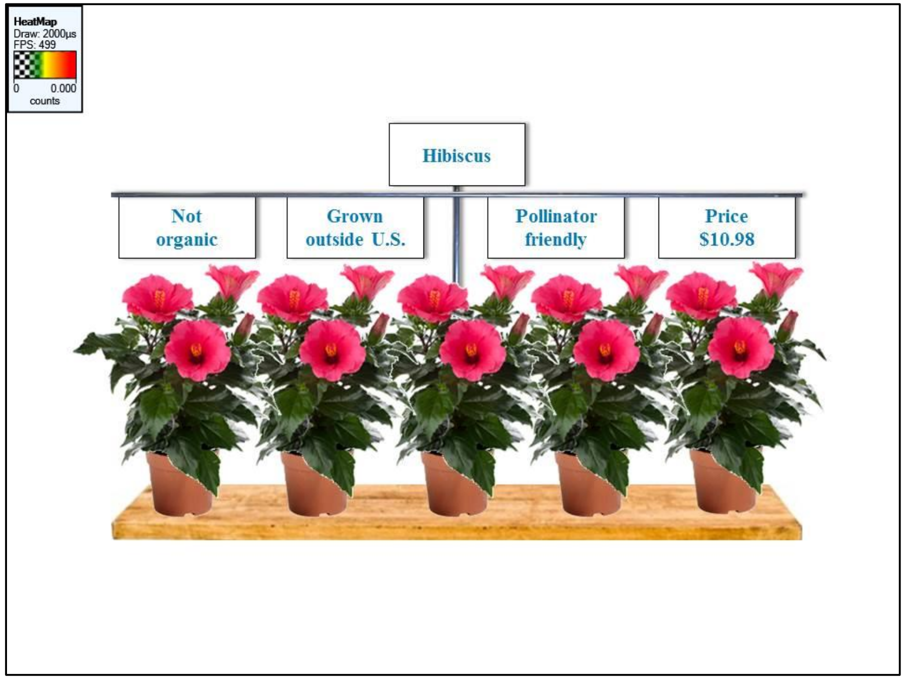
Gaze Plot of Image (n=1)



Dr. Hayk Khachatryan
University of Florida

SCRI: Protecting Pollinators with Economically Feasible and Environmentally Sound Ornamental Horticulture

Original Image



Heat Map of Image (n=104)

Dr. Hayk Khachatryan
University of Florida

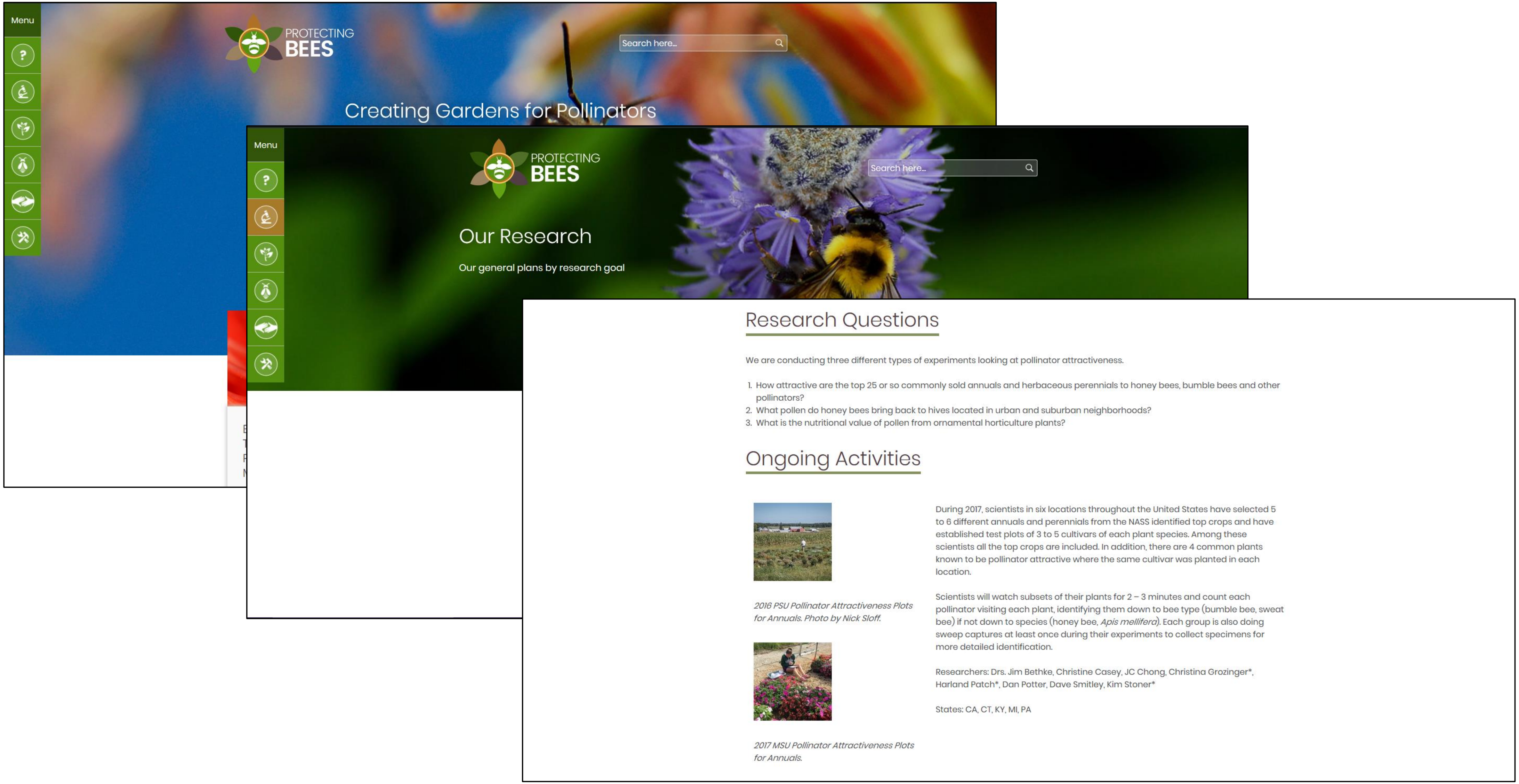
PROTECTING BEES

IR-4 Project

Protecting Pollinators Requires a Multi-prong Approach

- Pollinator Attractiveness of Ornamental Horticulture Crops
- Risk Assessment Data Gaps
- Economic, Efficacy, and Toxicological Comparisons of Alternatives
- Public Perception of Management Practices & Point-of-Purchase Display Materials
- Development of New BMPs
- **Outreach**

SCRI: Protecting Pollinators with Economically Feasible and Environmentally Sound Ornamental Horticulture



https://protectingbees.njaes.rutgers.edu/

PROTECTING BEES

IR-4 Project

Take Home Points

Not all the evidence is available yet

There is not consensus yet among the research community on the actual risk to pollinators from neonicotinoids and other systemic insecticides

We still want to reduce potential risk while growing quality plants

Take Home Points

Based on preliminary attractiveness data:

Most of the annual volume of plants produced are not highly attractive to bees, particularly non-edible annual bedding plants.

Take Home Points

- For those plants that are attractive to bees, be judicious in using insecticides.
  - Scout and know the hot spots
  - Manage pests as early as possible
  - Apply systemics and contacts which could impact bees early in crop cycle
  - Apply systemics and contacts which are relatively-non-toxic to bees later in crop cycle
  - Incorporate biopesticides and biocontrol options where possible
    - Confirm natural products or plant extracts are “soft” on beneficials including bees

Thank you!

Questions?

NIFA SCRI Grant 2016-51181-25399
"Protecting Pollinators with Economically Feasible and Environmentally Sound Ornamental Horticulture"

The IR-4 Project

PROTECTING BEES