

# Protecting our Pollinators & Pollination (Best Bee for the Job)



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<https://vegento.russell.wisc.edu/>



**2022 WISCONSIN  
FRESH FRUIT & VEGETABLE  
CONFERENCE**

January 23-25, 2022 | Wisconsin Dells, WI



# Vegetable Entomology Program

<https://vegento.russell.wisc.edu/>



University of Wisconsin-Madison

## Vegetable Crop Entomology

Extension and Research

Wisconsin Vegetable Entomology

Research ▾ Extension ▾ Crops & Insects ▾ IPM ▾ Lab Members

Quick Links

- Field Trials
- Pest Factsheets
- Crop Information
- Research Projects
- Extension Publications
- Research Publications
- Lab Members

Degree-day modeling

- What is degree-day modeling?
- Wisconsin Vegetable Disease & Insect Forecasting Network (VDIFN)
- UC IPM DD concepts
- USPest DD models
- USPest DD map maker
- USA National Phenology Network
- PRISM Climate Data Portal

Other Resources

Related sites:

- Entomology Department
- Plant Pathology Department
- Horticulture Department
- Insect Diagnostic Lab
- Plant disease diagnostic clinic
- CALS AgWeather

Newsletters:

- UW-IPM vegetable crop update newsletter
- WI-DATCP pest bulletin

### Welcome to the Groves Lab

Our research and extension group is located in the [Department of Entomology](#) at the [University of Wisconsin-Madison](#). Our program is centered on the ecology and management of insect pests of vegetable crops. Specifically the focus of our research and extension program is on:

- Research to meet the current and emerging challenges of Wisconsin vegetable growers and producers.
- Extension education to deliver research-based information to the state vegetable growers.
- Improving sustainability of commercial and fresh market vegetable production through research-based IPM practices.

### What is vegetable entomology?

Traditional vegetable crop entomology programs focus on pests and pest control. As the concept of Integrated Pest Management (IPM) develops, new ways of understanding the agricultural landscape have become important. Part of this new understanding is taking into consideration that the agricultural field is an ecosystem, despite the intensive manipulation that goes into most farm land. It is important to remember that pollinators, a key group of insects necessary for most vegetable productivity, are vulnerable to many sprayed insecticides. Similarly, natural enemies (natural predators of common insect pests) are important allies to have in the field, and they too are sensitive to insecticides. By pursuing an IPM strategy, one that takes into account how many insects interact in the agricultural ecosystem, it is possible to effectively manage pests while reducing unwanted consequences.

### Information & Resources

**Crops »**

It is estimated that about 1,500 small-acreage producers grow well over 50 crops in Wisconsin. Information on many of the crops grown in Wisconsin and common pests is included on this page.

**Pests »**

Here you will find information on many of the common arthropod pests encountered by Wisconsin vegetable producers and home gardeners.

**Pollinators »**

There are many different types of pollinators in the world, including flies, beetles, butterflies, birds, and bats. North America has more than 3,600 species of wild bees, many of which are solitary and soil-nesting. These bees can enhance or even surpass the crop pollination provided by honey bees. Click here for more information on native and domestic pollinators.

Crop Information

Pests

Pollinators

Natural Enemies

Insect-Vectored Plant Pathogens

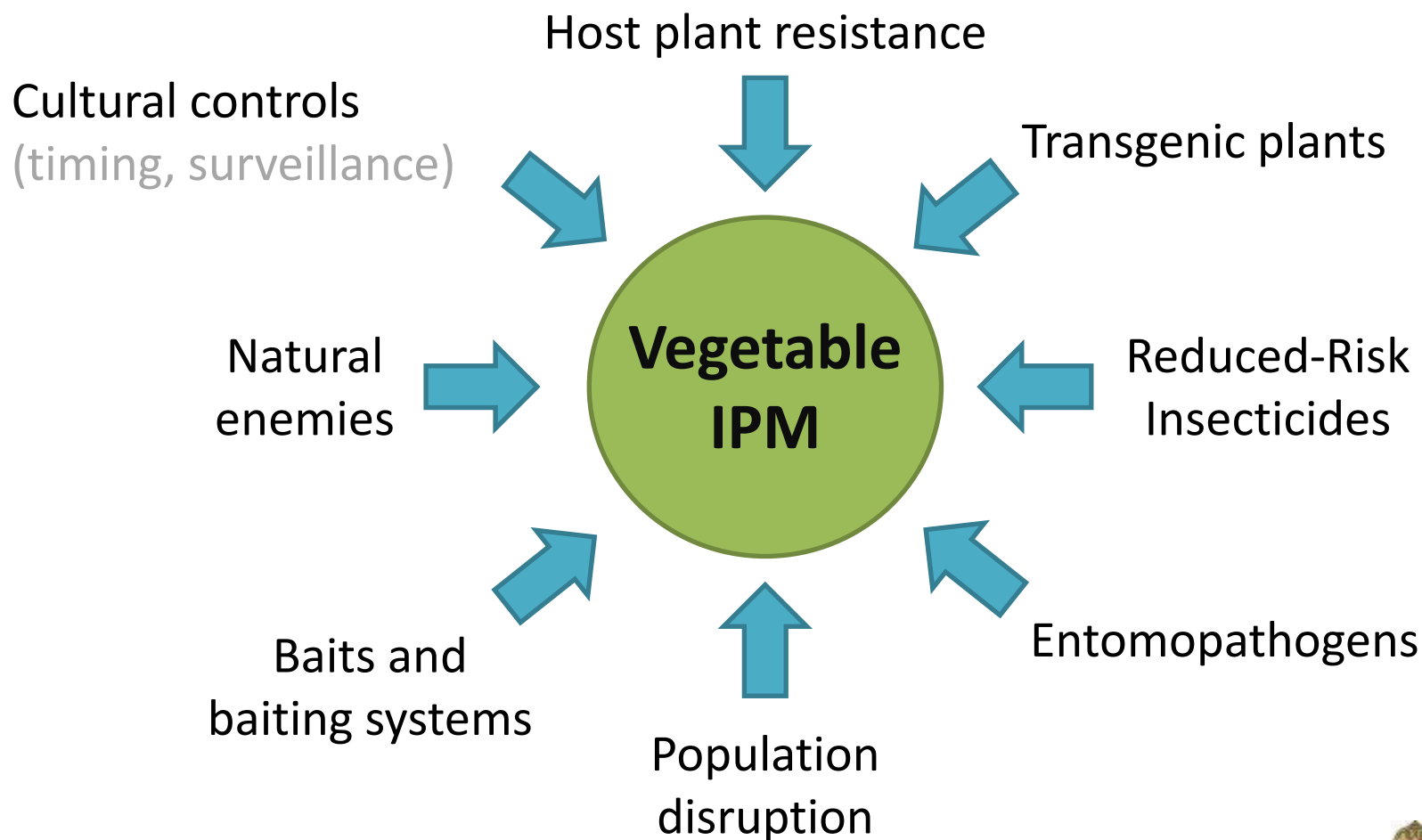
Wisconsin Growing Regions

**Pests / Pollinators  
Information**

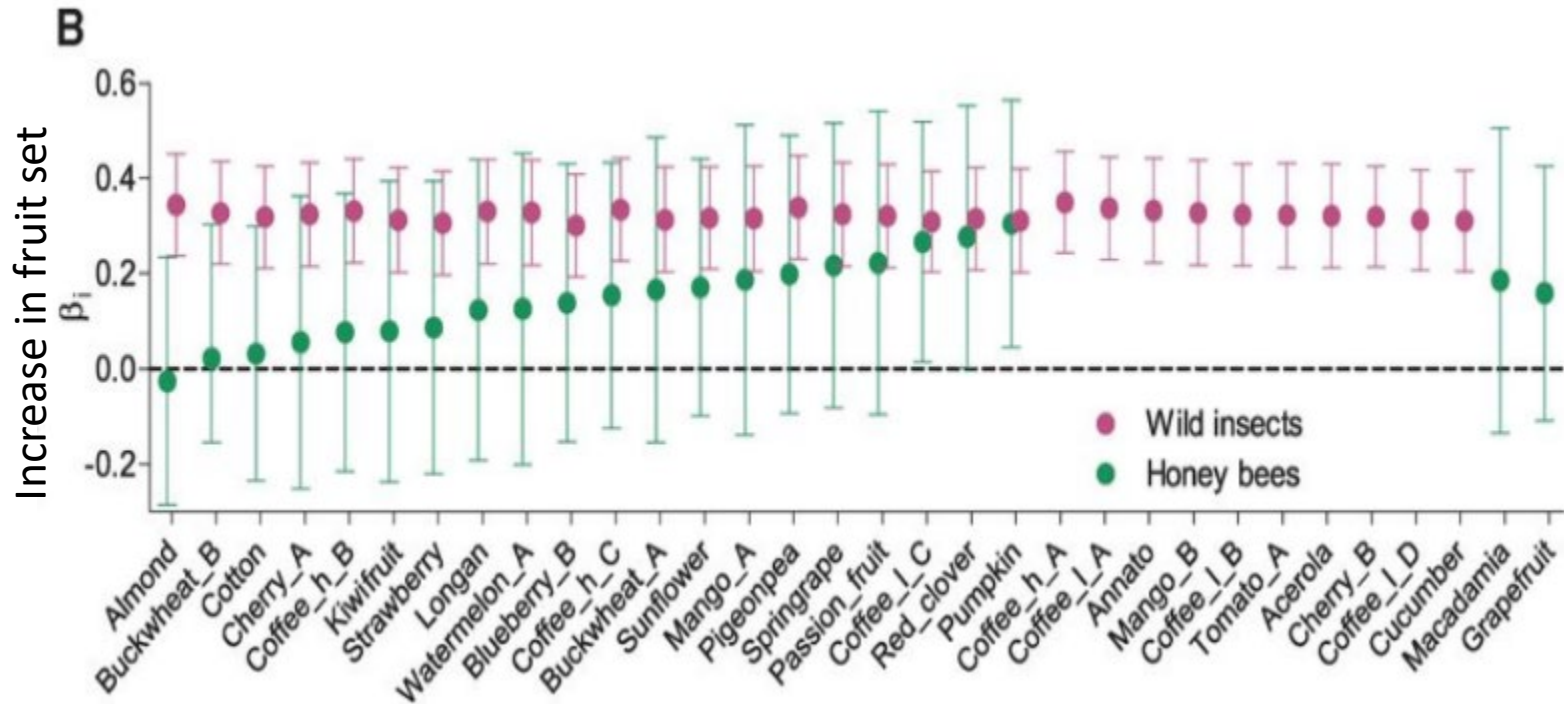
# Insect pest management tactics for vegetables

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***Use all available tools to manage pest damage in the most economic, socially, and environmentally sound way***



# Wild bees are important pollinators

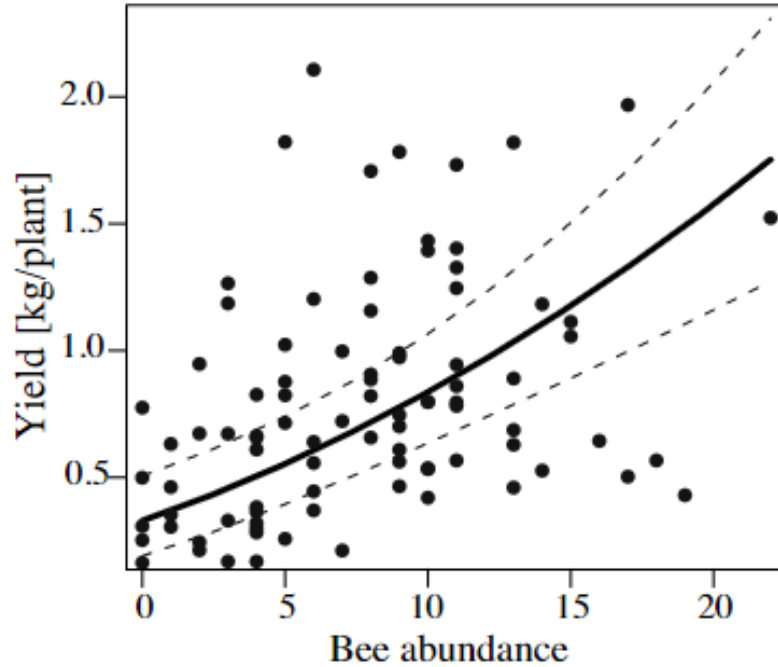


Garibaldi, L.A. *et al. Science* **339**, 1608-1611 (2013)

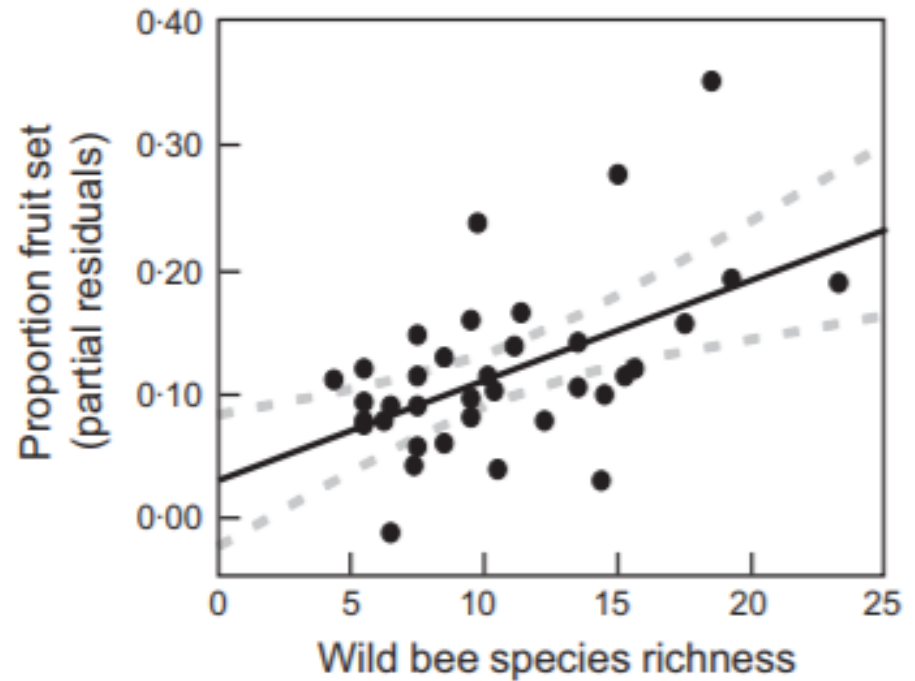




# Wild bee abundance and richness matters



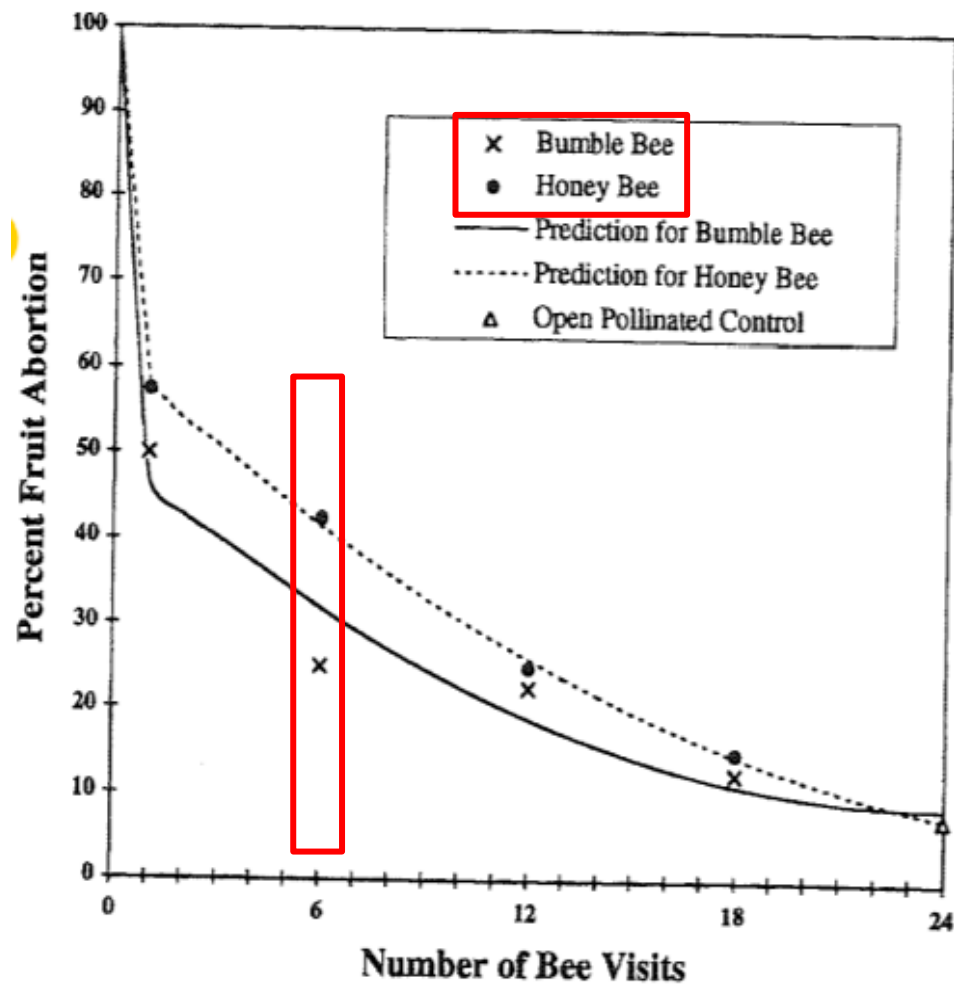
Motzke I.K et al. *Agriculture, Ecosystems, and Environment* 233, 144-151 (2016)



Mallinger, R.E. and Gratton, C. *Journal of Applied Ecology* 52, 323-330 (2015)

# Honeybees remain critically important

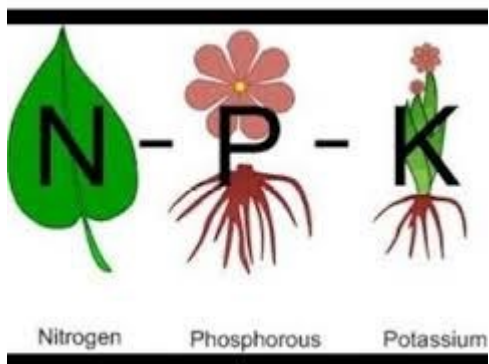
Stanghellini, M.S. *et al. American Bee Journal* 137(5), 386-391 (1997)





# Inadequate pollination - Eliminate other sources

Plant fertility



Irrigation stress (during bloom)



Few local pollinators

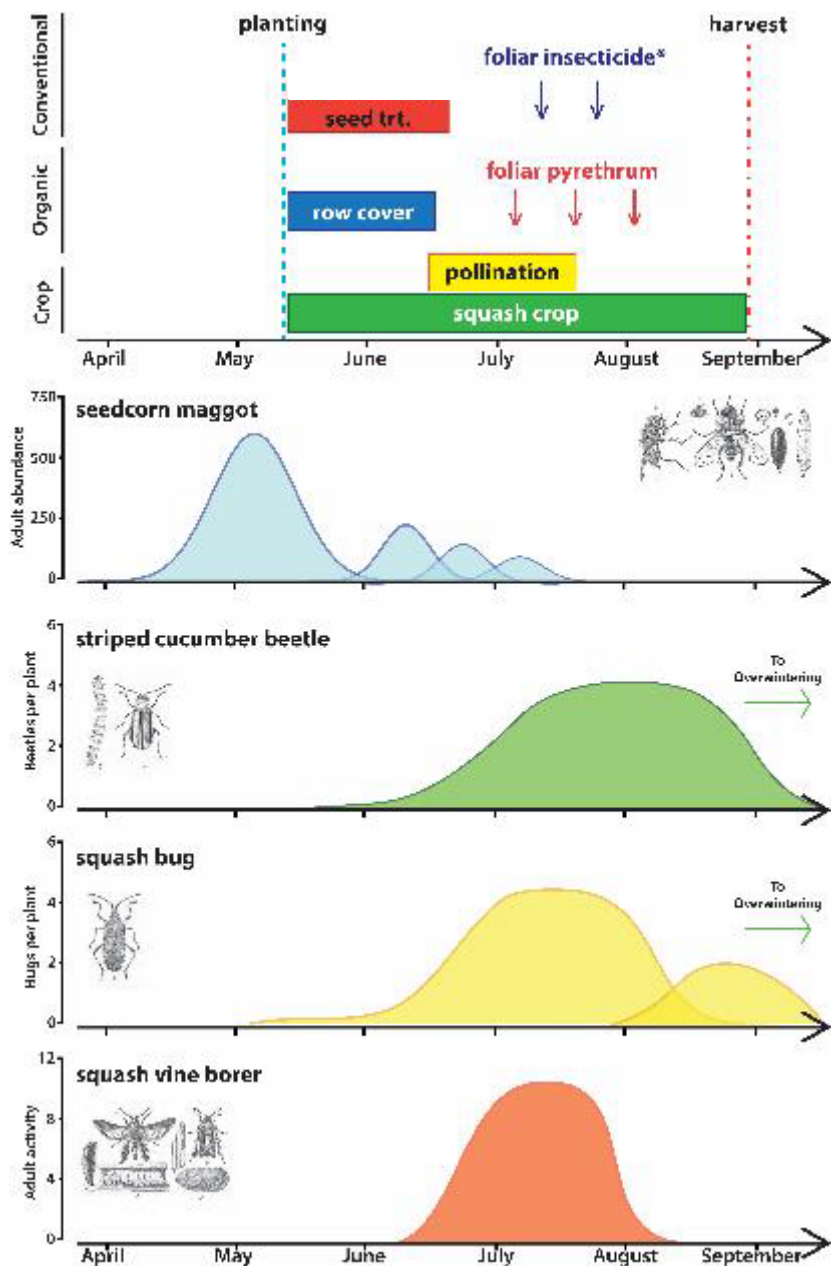


Extreme heat  
(nighttime temps > 76°F)





# Season long management plans



- Early season control with seed treatment or cultural methods
- Timing of foliar insecticides dependent on flowering stage of the crop
- Scouting for pests will save money and reduce extra sprays
- Read labels and active ingredients

***How does pest management fit into the broader sustainability picture to limit impact on pollinators?***

# Key insect pests of squash

**Squash bug**

*Anasa tristis*



**Squash vine borer**

*Melittia cucurbitae*



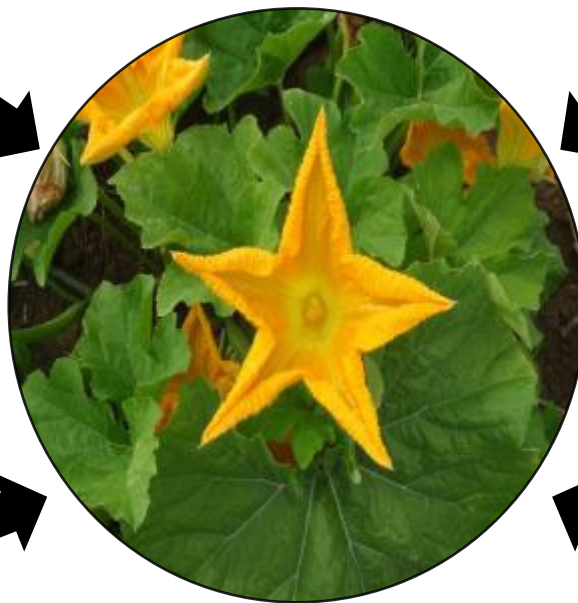
**Seed maggots**

*Delia spp.*



**Striped cucumber beetle**

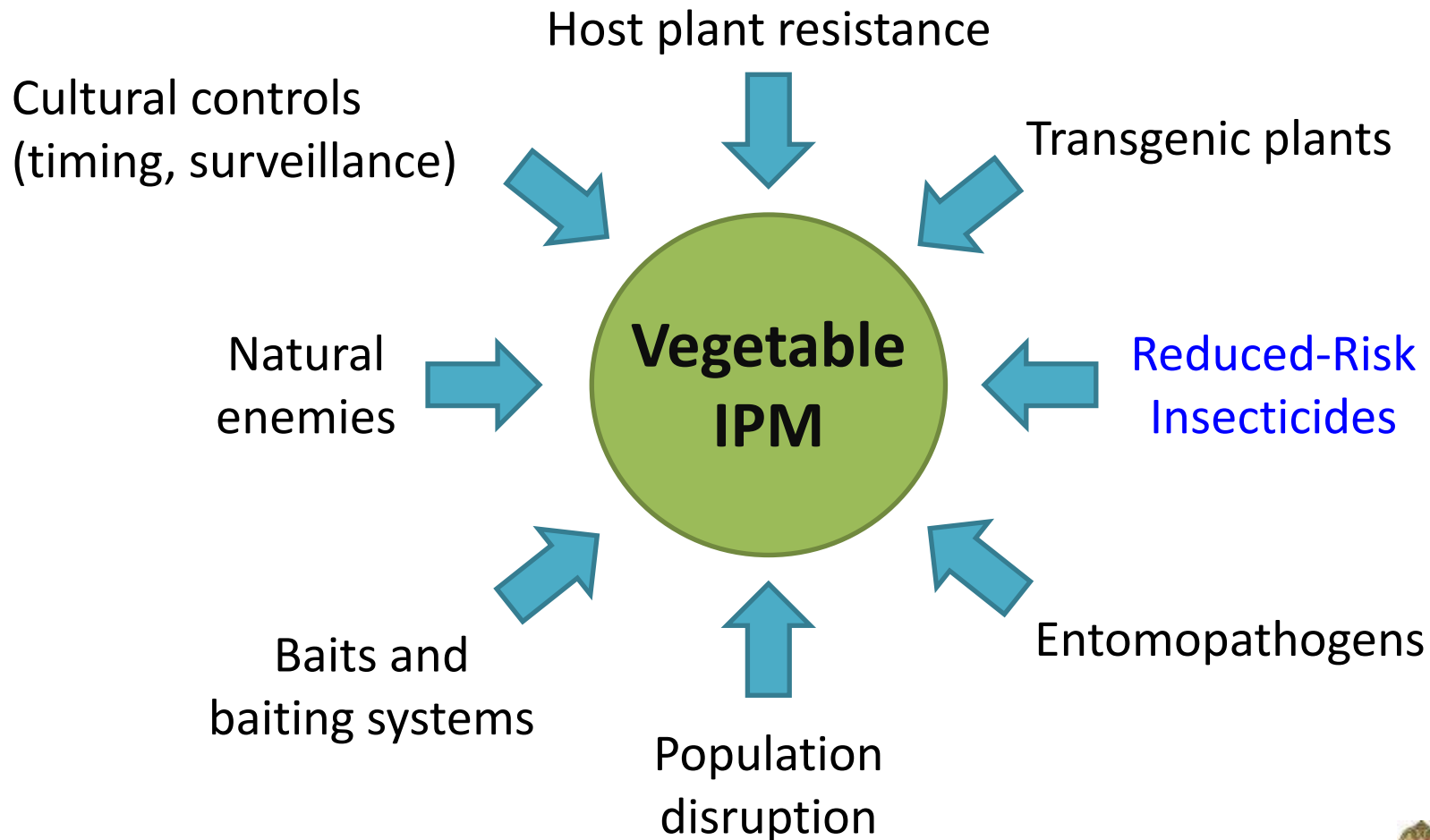
*Acalymma vittatum*



# Insect pest management tactics

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***Use all available tools to manage pest damage in the most economic, socially, and environmentally sound way***





# Insecticides registered in Wisconsin

## Seed treatments

Commercially applied to most varieties

Thiamethoxam – FarMore F1400



## At-plant applications

Applied as at-plant, in-furrow, banded applications to seed furrows or transplant row or as a soil drench, side dress applications, or drip

imidacloprid – AdmirePro® (7-10.5 fl oz/acre)

thiamethoxam – Platinum 75SG (3.67 oz/acre)

clothianadin – Belay (12.0 fl oz/acre)



# Balancing trade-offs, improving sustainability

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## Pest control and pollination services

- Insecticides remain an important component of cucurbit production
- Exposure of several pollinator guilds to agro-chemicals are thought to reduce beneficial insect health



## Growers can adjust management to reduce exposure

- Avoid applying to crops in bloom or blooming
- Apply late in the day/evening
- Choose short residual products
- Insecticide formulations are not equal:

# Cucumber beetle – insecticides

- broadcast foliar applications:
  - pyrethrum (Pyganic 1.4 and 5.0 EC)

PyGanic 

- pyrethrum + azadirachtin

azera 

- synthetic pyrethroids

**BRIGADE**  
WSB  
INSECTICIDE / MITICIDE

**MUSTANG**  
MAXX  
INSECTICIDE

 **Warrior II**  
with Zeon Technology®

- neonicotinoids

 **Actara**®

 **ASSAIL** 30SG  
INSECTICIDE



- Foliar sprays (thresholds) – “caution with pollinators”!!



# USDA and EPA Release Honey Bee Health 2 May 2013



## Key findings include:

### **Parasites and Disease Present Risks to Honey Bees:**

The parasitic Varroa mite and new virus species have been found in the U.S. and several of these have been associated with Colony Collapse Disorder (CCD).

### **Increased Genetic Diversity is Needed:**

Genetic variation improves bees thermoregulation, disease resistance and worker productivity.

### **Poor Nutrition Among Honey Bee Colonies:**

Bees need better forage and a variety of plants to support colony health.

### **Need for Improved Collaboration and Information Sharing:**

Best Management Practices associated with bees and pesticide use, exist, but are not widely or systematically followed by members of the crop-producing industry.

### **Additional Research is Needed to Determine Risks Presented by Pesticides:**

The most pressing pesticide research questions relate to determining actual pesticide exposures and effects of pesticides to bees in the field.

# EPA's response and summary

[Environmental Topics](#)[Laws & Regulations](#)[About EPA](#)[CONTACT US](#)[SHARE](#)

## Pollinator Protection

[Pollinator Protection Home](#)[Pollinator Health Concerns](#)[— Colony Collapse Disorder](#)[— Factors Affecting  
Pollinator Health](#)[— Risk Assessment](#)[— EPA Actions to Protect  
Pollinators](#)[— Partners in Pollinator  
Protection](#)[What You Can Do](#)[— Report Bee Kills](#)[— Best Management  
Practices](#)

## EPA Actions to Protect Pollinators

Pesticide risk management must be based on sound science, consistent with the laws under which pesticides are regulated in the United States. EPA has been working aggressively to protect bees and other pollinators from pesticide exposure.

**EPA's actions to protect pollinators from pesticide exposure include:**

Implemented a policy in 2017 that protects bees from agricultural pesticide spray and dust applications while the bees are under contract to provide pollination services. The policy also recommends that states and tribes develop pollinator protection plans and best management practices.

- [EPA's Policy Mitigating Acute Risk to Bees from Pesticide Products](#)
- [Read the policy announcement](#)

### Related Information

- [EPA Releases Neonicotinoid Assessments for Public Comment](#)
- [EPA's Risk Management Approach to Identifying Options for Protecting the Monarch Butterfly](#)
- [Working with Partners on pollinator protection](#)

<https://www.epa.gov/pollinator-protection/epa-actions-protect-pollinators>

# EPA's response – New labeling requirements - foliar

## DIRECTIONS FOR USE

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

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

**See individual crops for specific pollinator protection application restrictions. If none exist under the specific crop, for foliar applications, follow these application directions for crops that are contracted to have pollinator services or for food/feed & commercially grown ornamentals that are attractive to pollinators:**



### FOR CROPS UNDER CONTRACTED POLLINATION SERVICES

Do not apply this product while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen unless the following condition has been met.

If an application must be made when managed bees are at the treatment site, the beekeeper providing the pollination services must be notified no less than 48-hours prior to the time of the planned application so that the bees can be removed, covered or otherwise protected prior to spraying.

### FOR FOOD CROPS AND COMMERCIAL GROWN ORNAMENTALS NOT UNDER CONTRACT FOR POLLINATION SERVICES BUT ARE ATTRACTIVE TO POLLINATORS

Do not apply this product while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen unless one of the following conditions is met:



- The application is made to the target site after sunset
- The application is made to the target site when temperatures are below 55°F
- The application is made in accordance with a government-initiated public health response
- The application is made in accordance with an active state-administered apiary registry program where beekeepers are notified no less than 48-hours prior to the time of the planned application so that the bees can be removed, covered or otherwise protected prior to spraying
- The application is made due to an imminent threat of significant crop loss, and a documented determination consistent with an IPM plan or predetermined economic threshold is met. Every effort should be made to notify beekeepers no less than 48-hours prior to the time of the planned application so that the bees can be removed, covered or otherwise protected prior to spraying.



GROUP 4A INSECTICIDE



**Safari**  
20 SG INSECTICIDE

 **Actara® 25 WG**

syngenta

# EPA's response – New labeling requirements - systemics

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- **Pollinator Precautions:** Platinum is highly toxic to bees exposed to direct treatment on blooming crops. Do not apply during pre-bloom or during bloom when bees are actively foraging. Do not apply Platinum or allow it to drift to blooming crops or weeds if bees are foraging in/or adjacent to the treatment area. This is especially critical if there are adjacent orchards that are blooming. **After a Platinum application, wait at least 5 days before placing beehives in the treated field.** If bees are foraging in the ground cover and it contains any blooming plants or weeds, always remove flowers before making an application. This may be accomplished by mowing, disking, mulching, flailing, or applying a labeled herbicide. Consult with your local cooperative extension service or state agency responsible for regulating pesticide use for additional pollinator safety practices.





# EPA's response – existing label language (non-neonicotinoids)

## Environmental Hazards

This pesticide is extremely toxic to fish and aquatic invertebrates. Use with care when applying in areas adjacent to any body of water. 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 make applications when weather conditions favor drift from treated areas. Drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwaters.

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 or weeds while bees are actively visiting the treatment area.

The use of Brigade 2EC is prohibited in areas that may result in exposure of endangered species to bifenthrin. Prior to use in a particular county contact the local extension service for procedures and precautions to use to protect endangered species.

**BRIGADE<sup>®</sup>**  
**2EC**  
INSECTICIDE / MITICIDE

## ENVIRONMENTAL HAZARDS

This product is extremely toxic to aquatic invertebrates. For terrestrial uses, 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 apply when weather conditions favor drift from areas treated. Drift and run-off may kill aquatic invertebrates in water adjacent to treated areas. Do not contaminate water by cleaning equipment or disposal of wastes. Do not contaminate water when disposing of equipment washwaters.

Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) Permit and the permitting authority has been notified in writing prior to the discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your state water board or regional office of the EPA.

**BEE CAUTION: MAY KILL HONEYBEES AND OTHER BEES IN SUBSTANTIAL NUMBERS.**

This product is highly toxic to bees exposed to direct treatment or residues on crops or weeds in bloom.

For crops in bloom, do not apply this product to target crops or weeds in bloom. Notifying beekeepers within 1 mile of treatment area at least 48 hours before product is applied will allow them to take additional steps to protect their bees. Limiting application to times when bees are least active, e.g., within 2 hours of sunrise or sunset, will minimize risk to bees.



**Sevin<sup>®</sup> SL**

**Carbaryl Insecticide**

## ENVIRONMENTAL HAZARDS

**TOXIC** to bees exposed to direct treatment, drift or residues on flowering crops or weeds. **DO NOT** apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize the spray drift to reduce harmful effects on bees in habitats close to the application site.

**TOXIC** to birds and wild mammals. Applications may adversely affect birds and wildlife visiting the treatment area.

The use of this product may result in contamination of groundwater particularly in areas where soils are permeable (e.g., sandy soil) and/or the depth to the water table is shallow.

**TOXIC** to aquatic organisms. Observe buffer zones as specified under DIRECTIONS FOR USE.

**Orthene<sup>®</sup>**

# What are we trying to protect??

## What bees are in our crops??



**Wisconsin Pollinators**  
Bees, butterflies, and their conservation

[About us](#) [The WiBee App](#) [Habitat Assessment](#) [Bumble Bees](#) [Pollinator-friendly solar](#) [Pollinator Resources](#)

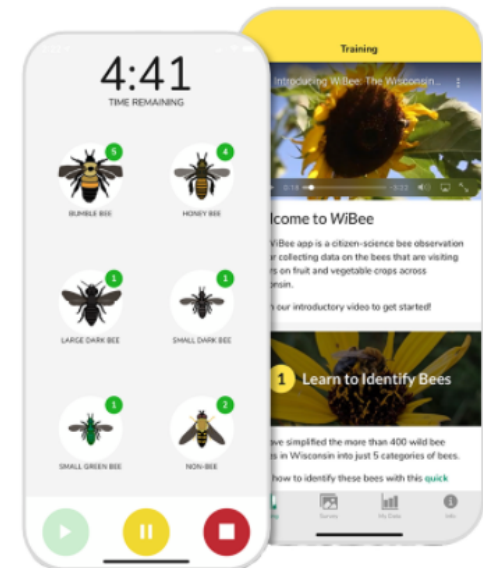
[HOME](#) / [WIBEE: THE WISCONSIN WILD BEE APP](#) / [HOW TO GET STARTED](#)

## How to get started

At its core, the WiBee app is a citizen-scientist bee observation tool. Growers and interested citizen scientists, like you, who use the app will be collecting data on the bees that are visiting flowers on fruit and vegetable crops across Wisconsin. As we continue to develop the program, you will be able to see more detailed information and recommendations in the app about wild bee pollination management specific to your farm.

### Your role in this program is important

Citizen scientists have become incredibly important to the study of insect ecology, by collecting more biological data across spatial and temporal scales. It is challenging for one research team to collect data all over Wisconsin during each crop bloom. With your eyes on the ground, we can gather a more robust dataset on wild bee abundance, pollination, and ultimately their impact on fruit set and yield in our food system.



<https://pollinators.wisc.edu/wibee/how-to-get-started/>

# Categories of bees in the application

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Bumble Bee



Large Dark Bee



Honey Bee



Green Bee



Small Dark Bee



Non-Bee





Using the WiBee app, you will be categorizing the bees you observe visiting flowers into only five broad morphogroups: the honeybee, bumble bees, large dark bees, small dark bees, and metallic green bees.

There are over 400 species of native, wild bees in Wisconsin.

Different bee species prefer different flowers and are pollinating at different times of the day and the growing season, so the bees you see throughout the season will vary!

## LARGE DARK BEE

100+ species in Wisconsin

Family: Apidae, Andrenidae, Colletidae, Halictidae, Megachilidae...

- » Medium to large size (honey bee size or larger).
- » Abdomen striped or solid.
- » Dark brown, black or deep blue colored. Can have light-colored hair on body.



Body size: Over 1/2 inch long



Leafcutter bee



Mining bee

This diverse group of solitary bees includes mining bees, mason bees, and leafcutter bees, and they each have very different nesting and foraging behaviors. A mining bee, for example, will nest in underground tunnels. A mason bee will often find a hollow stem or beetle burrow where she builds her nest.

## BUMBLE BEE

20 species in Wisconsin

*Bombus* spp.

Family: Apidae

- » Large to very large size.
- » Dense hair covers entire body.
- » Black & yellow coloring. A few species have brown/orange patches.
- » Pollen in tight balls on leg.



Body size: 1/2 to 1 inch long  
(Markings vary by species)



Bumble bee



Bumble bee

Due to their large size and dense hair, bumble bees can fly and pollinate in cooler temperatures and carry more pollen than other bees. They are also active the entire length of the growing season, from April to October. Bumble bees are social, living in colonies below ground with anywhere from 50 to 500 individuals.

## SMALL DARK BEE

100+ species in Wisconsin

Family: Andrenidae, Apidae, Colletidae, Halictidae...

- » Tiny to small (ant size or smaller).
- » Brown, black, or golden colored.
- » Hairs are much smaller and less noticeable. Bodies narrower.



Body size: ~ less than 1/4 inch long



Carpenter bee



Sweat bee

This group of tiny to small solitary bees includes many species of sweat bees, carpenter bees, and more. Look for them crawling around inside flowers. A carpenter bee will create her nest in woody stems and twigs while other bee species will excavate a nest in the ground.

## GREEN BEE

9 species in Wisconsin

*Agapostemon* spp., *Augochlora* spp., *Augochlorella* spp., *Augochloropsis* spp.

Family: Halictidae

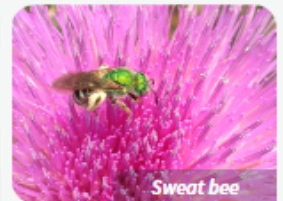
- » Tiny to small (ant size or smaller).
- » Metallic green on all or part of body.
- » May have striped yellow & black abdomen. Bodies narrower.



Body size: ~ less than 1/4 inch long



Sweat bee



Sweat bee

These solitary sweat bees are very small but stand out due to their bright coloring. They are generalists, visiting many different types of flowers, and you can see them carrying pollen on their hind legs. They nest in the ground, and are most active summer and fall.



# WiBee: THE WISCONSIN WILD BEE APP

## A Quick Guide to Collecting Data



### STEP 1: SELECT A LOCATION

For each location, such as an orchard or garden, that you want to observe, plan to complete 3 surveys per day on 3 different days. Each survey takes just 5 minutes.

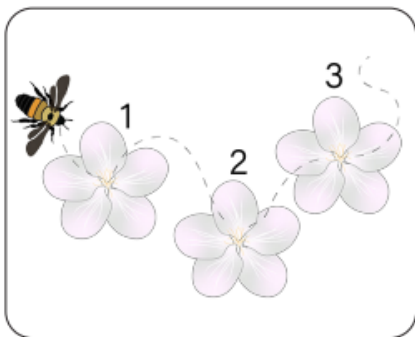
- » To gather the best data about wild bee pollination in your location, plan to complete a minimum of 3 surveys per day on 3 different days (9 surveys total).
- » If you'd like to collect data on the bees at two different locations on a property plan to complete 9 surveys at each one.
- » If you grow multiple crops that bloom at different times during the growing season, surveying the bees pollinating each crop will provide a more accurate picture of the local bee community.



### STEP 2: SELECT A 3 X 3 FOOT AREA TO OBSERVE

When flowers are at peak bloom and the weather is appropriate for bee activity, select a 3 by 3 foot area to complete a survey.

- » Choose 3 different 3x3' areas in a location to conduct your surveys. It's best to survey the same flower species in each of these 3 areas. Choose areas based on the presence of blooming flowers, not based on the presence of bees. The bees will come to the flowers!
- » Survey when the flowers you are observing are at peak bloom.
- » Survey only when bees are active. The weather should be sunny or bright (you should see your shadow), 60 degrees F or warmer, and not too windy.



### STEP 3: COMPLETE A 5-MINUTE BEE SURVEY

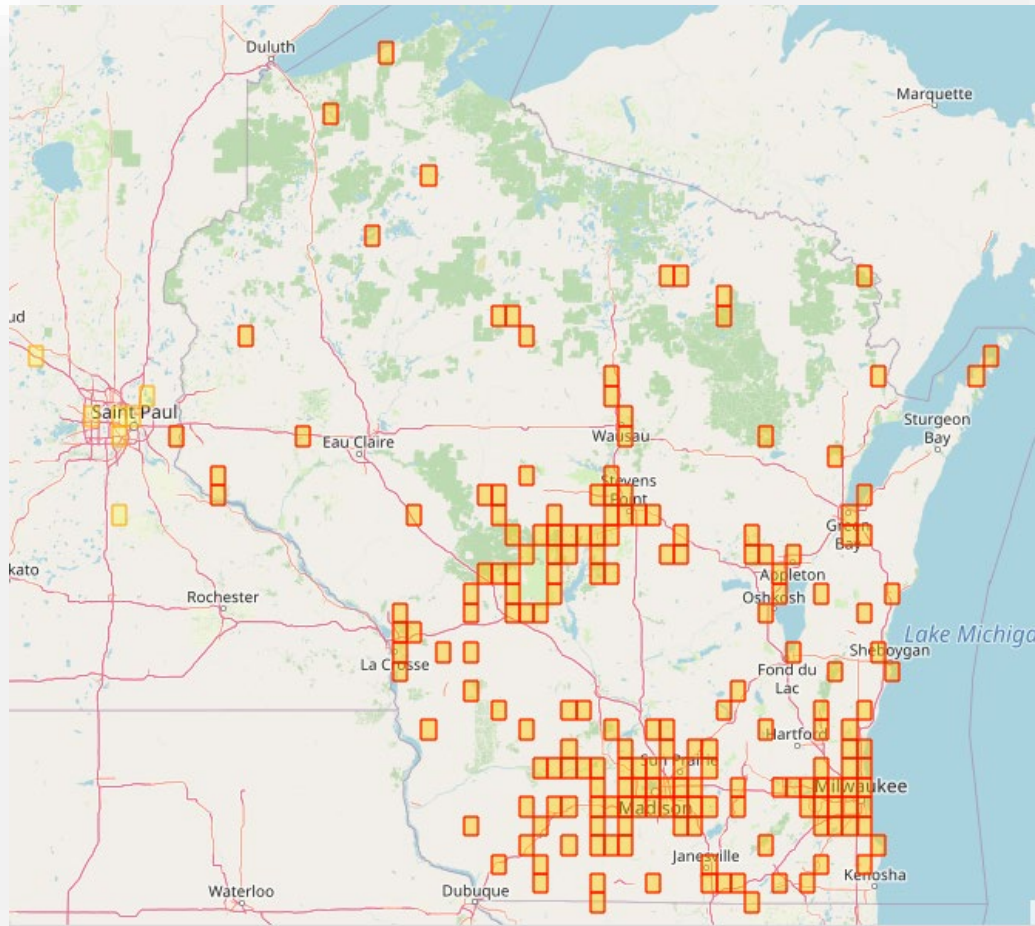
Use the app to **RECORD FLOWER VISITS, NOT INDIVIDUAL BEES**. Tap the appropriate category each time a pollinator (bee or non-bee) lands on the reproductive part of a flower.

- » A single bee will often visit multiple flowers in your observation area. If one bumble bee visits 5 flowers in your observation area, record 5 bumble bee flower visits in the app.
- » It's okay if you don't observe any bees during the 5 minute survey. It's important for us to record zero-visit data as well.

# WiBee Data Dashboard

<https://data-viz.it.wisc.edu/wibee/>

View and explore pollinator data collected with the WiBee app



## Project summary

Unique users: 537

Total completed surveys: 3,312

Most recent survey: 2021-11-20

Total insect observations: 154,000

- Honey bees: 29,421 (30.2%)
- Wild bees: 56,699 (58.3%)
- Non-bees: 11,181 (11.5%)

Dashboard can be sorted by:

- Year/Date  
(2020-22)
- Habitat / Management type  
(Conventional & organic)
- Pollinator group  
(All)
- Crop/Flowering plant  
(Fruits & Vegetables)

# WiBee Data Dashboard

View and explore pollinator data collected with the WiBee app

View or download data from selected surveys:

Species composition

Activity by date

Surveys by date

Compare habitats

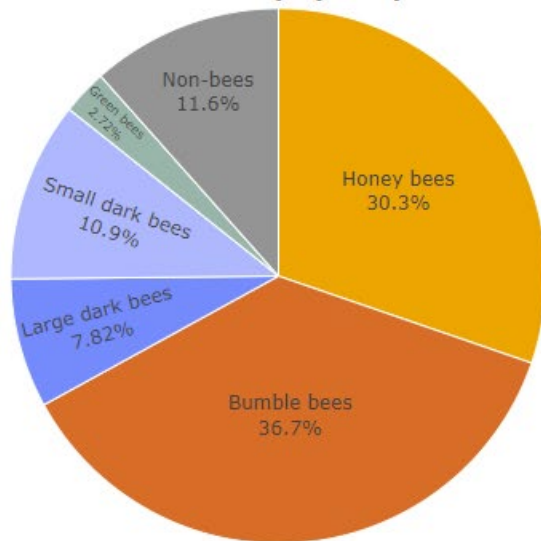
Compare managements

Compare crops/flowers

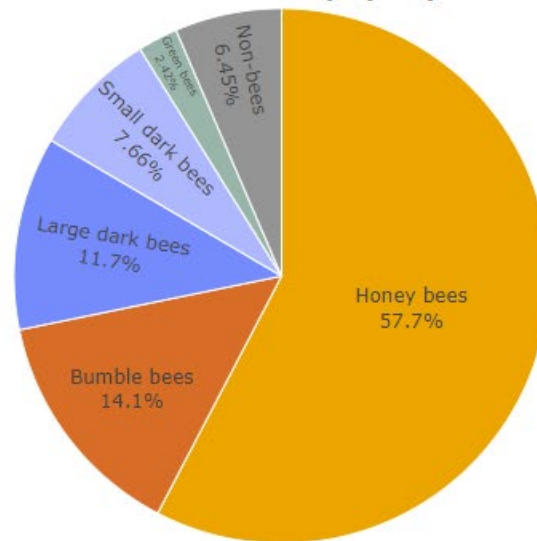
View as data table

User statistics

All surveys (3312)



Selected surveys (373)



# WiBee Data Dashboard

View and explore pollinator data collected with the WiBee app

View or download data from selected surveys:

[Species composition](#)

[Activity by date](#)

[Surveys by date](#)

[Compare habitats](#)

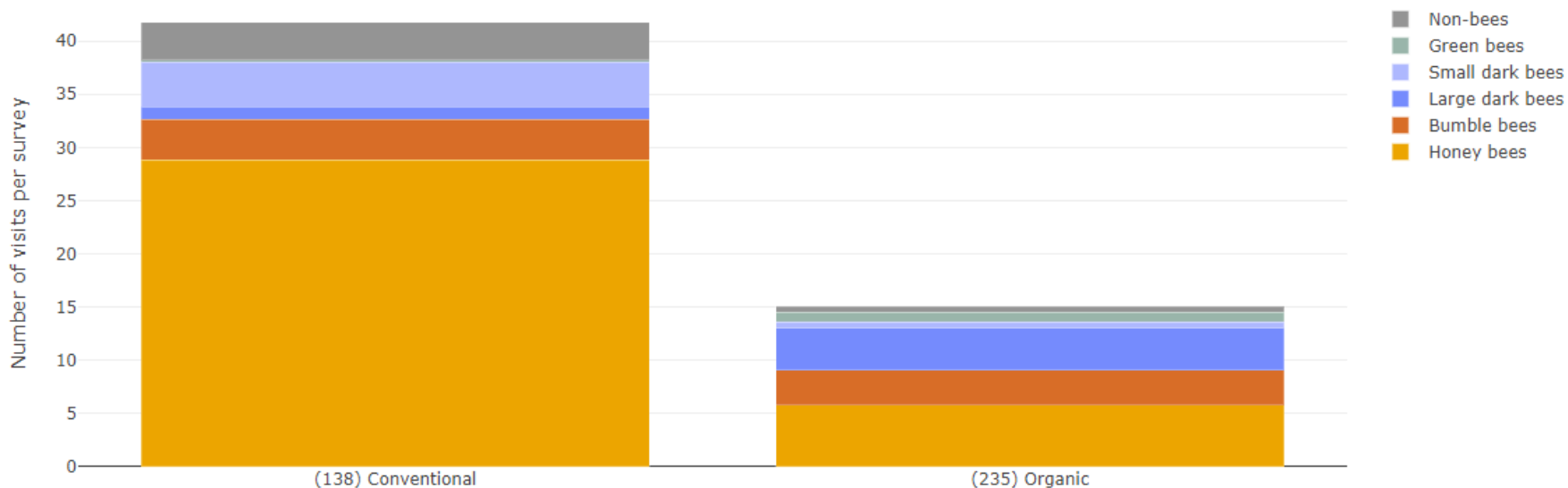
[Compare managements](#)

[Compare crops/flowers](#)

[View as data table](#)

[User statistics](#)

**Pollinator visitation rates by management type**



*This chart compares total pollinator visitation rates by user-reported management practices. The number of surveys represented by each practice is shown in parentheses in the labels.*



# WiBee Data Dashboard

View and explore pollinator data collected with the WiBee app

View or download data from selected surveys:

[Species composition](#)

[Activity by date](#)

[Surveys by date](#)

[Compare habitats](#)

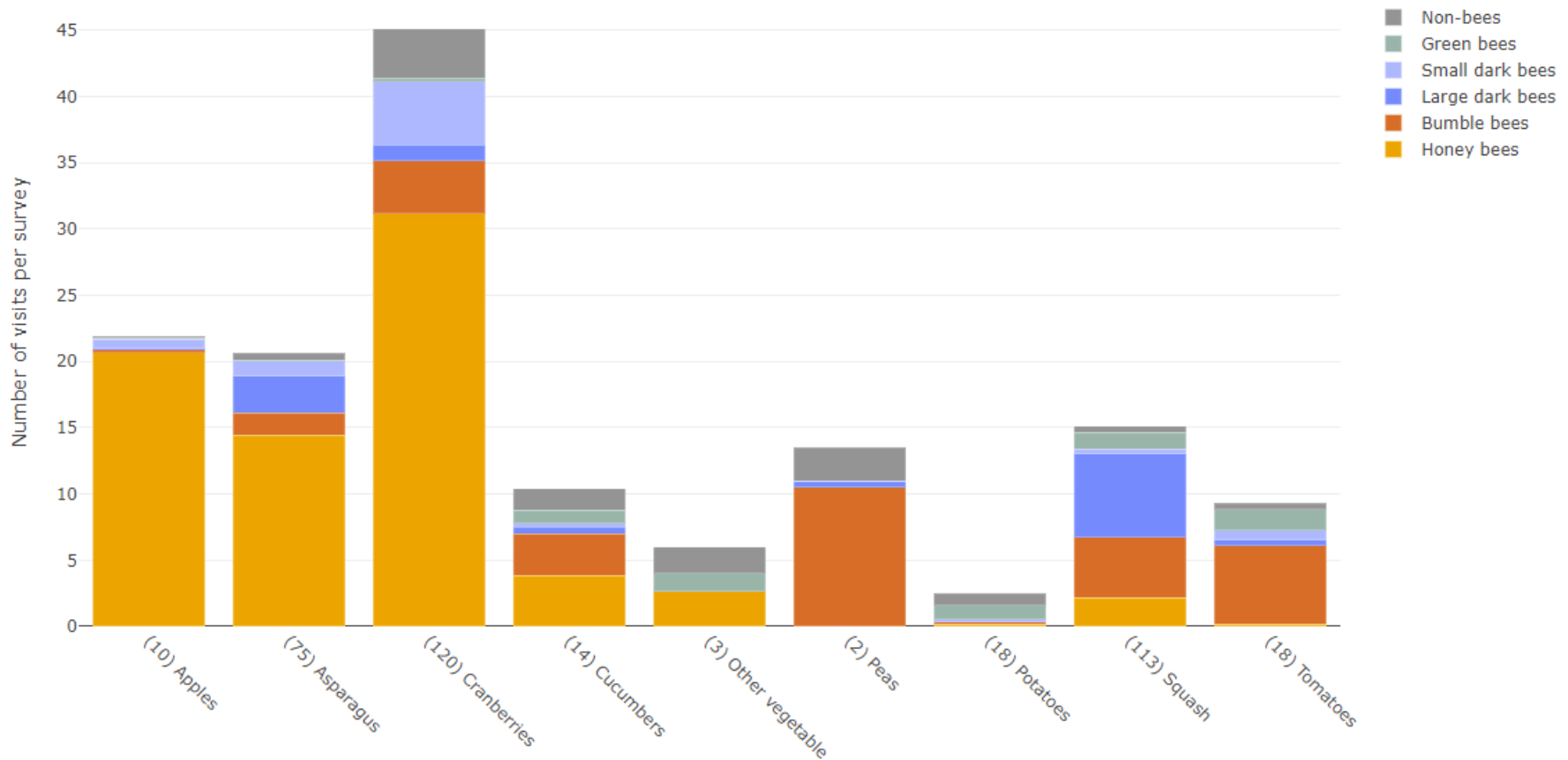
[Compare managements](#)

[Compare crops/flowers](#)

[View as data table](#)

[User statistics](#)

Pollinator visitation rates by plant type



# Protecting pollinators through conservation

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## Resources for Growers



[Farming for Bees: Guidelines for Providing Native Bee Habitat on Farms.](#) (The Xerces Society)

*A detailed PDF booklet describing actions farmers can take to protect bees on their farm.*

[Protecting Pollinators and Improving Pollination on Wisconsin Cranberry Marshes.](#) (University of Wisconsin-Madison Extension)

[Wild Pollinators in Wisconsin's Apple Orchards.](#) (UW-Madison Department of Entomology)

[Wild Pollinators of Eastern Apple Orchards and How to Conserve Them.](#) (Cornell University, Penn State University, and The Xerces Society)

[NRCS portal: How Farmers Can Help Pollinators](#)

*A portal to USDA sponsored programs for pollinator conservation.*

A photograph of a field of green plants, likely a crop field, at sunset. The sun is low on the horizon, creating a bright glow and long shadows. The sky is filled with soft, white clouds. The plants in the foreground are dark green and appear to be in rows. The overall mood is serene and contemplative.

# Questions?