

# Protecting Honey Bees in Production Agriculture

A MODULE FOR CROP CONSULTANTS, ADVISORS AND APPLICATORS



#### **ACKNOWLEDGMENTS**

Special thanks to the Honey Bee Health Coalition for facilitating the development of these materials. For more information about the coalition visit:

https://honeybeehealthcoalition.org/about-the-coalition/

Please note that the views expressed by the presenter do not necessarily represent the Coalition or its members.

For a copy of the presentation and further information about how you can protect pollinators please contact aaronweibe@npsec.us

#### **MODULE GOALS**

This module is for applicators and consultants with prior knowledge of IPM practices

After this module you will have a better understanding of:

- 1. The importance of honey bees to crop production and the challenges beekeepers face
- 2. Risk and the consequences of unintended exposures to honey bees
- 3. How everyone can help positively impact bees and the agricultural landscapes that rely on them.









## POLLINATORS ARE CLOSELY TIED TO SUSTAINABLE LAND STEWARDSHIP

Pollinators (e.g. bees, butterflies, beetles) support numerous plants that:

- Provide food
- Support wildlife
- Increase diverse root systems to promote soil health
- Reduce runoff and improve water

quality





Photo source: Tom Smith, NPSEC

NOTE: The focus of this module is on honey bees. Practices that support honey bee health also have positive impacts to native bees and other pollinators

## BEES PLAY AN INTEGRAL ROLE IN OUR AGRICULTURAL SYSTEM

- Bees forage for water, nectar (sugar), pollen (protein), & propolis (plant sap)
- Foraging by bees leads to the transfer of pollen from plant to plant and is required for the pollination of certain plants
- One third of our diet is dependent on pollination by insects; 80% of that is pollinated by commercial honey bees
- Honey bees contribute \$19 billion in added crop value

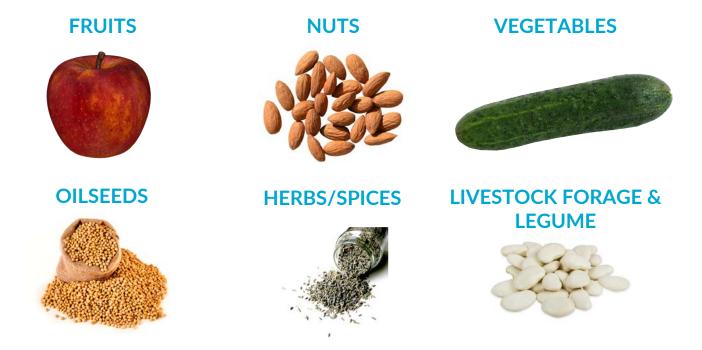


Foraging honey bee (photo:pixabay)



Honey bee colonies pollinating almond trees (photo: Bee Informed Partnership)

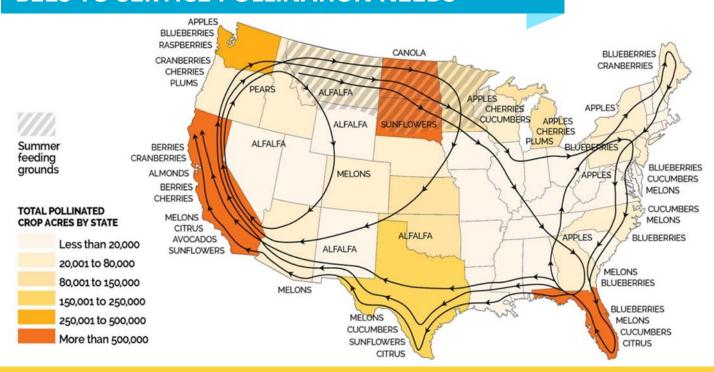
## BEES PROVIDE POLLINATION SERVICES FOR NUMEROUS FOOD CROPS



In many crops, bees contribute to increased yield, uniformity, size & taste



Source: USDA Economic Research Service, 2014

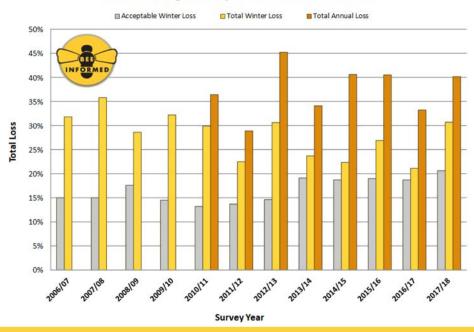


#### Migratory beekeepers:

- Move colonies according to pollination contracts or agreements with landowners
- Must also find locations for bees when they are not providing pollination services
- Find optimum locations to make a honey crop

# BEEKEEPERS ARE EXPERIENCING HIGHER THAN AVERAGE COLONY LOSSES

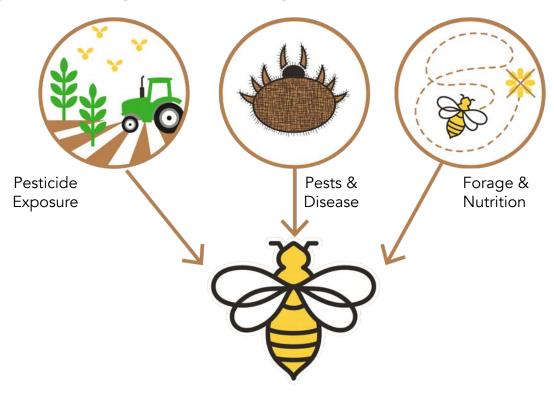
#### Total US managed honey bee colonies loss estimates



- Many beekeepers have experienced higher than average losses of colonies
- Beekeepers must replenish colonies by splitting their hives or replacing colonies by purchasing packaged bees and nucs

## BEE HEALTH DECLINE INVOLVES MULTIPLE INTERACTING FACTORS

Impacts on bee health have been linked to a variety of interacting factors, including:



## ALL STAKEHOLDERS IN AGRICULTURE HAVE A ROLE TO PLAY

- Beekeepers are improving practices including better managing hive pests & diseases
- Land owners and growers are:
  - Planting bee forage and/or letting flowering plants grow on marginal crop lands
  - Improving crop pest management practices to reduce pesticide exposure on bees
- Consultants and applicators are:
  - Crop scouting for pest presence and severity, potential economic damage, and presence of bees (and other beneficial insects)
  - Recommending pesticides as appropriate to the pest, crop, and local environment (including bees)
  - Ensuring safe and lawful application of pesticides



NOTE: The focus of this module is on crop pest management practices that protect bees while sustaining production agriculture and economic growth on the farm.



#### **EFFECTS OF PESTICIDES ON BEES VARY**

- Potential impacts on bees are product-specific
- Products vary in inherent toxicity and in routes and duration of exposure
- Many factors including application parameters and environment will influence magnitude and duration of exposure
- Impact of pesticide mixtures is mixture-specific and research is ongoing

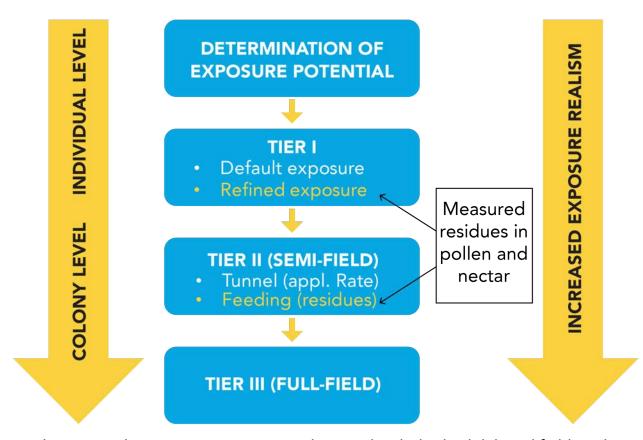


## RISK IS ASSESSED BASED ON TOXICITY AND EXPOSURE

- Product-specific risk is evaluated through multi-tiered testing, including:
  - Acute and chronic toxicity or colony effects, including impacts on behavior, development, and reproduction
  - Potential exposure via nectar, pollen and other sources
  - Evaluating the maximum single application rate
- Use of safety factors and conservative assumptions
- The EPA risk assessment process determines product-specific advisory language (Environmental Hazard statements) and mandatory language (Directions for Use)



#### **RISK ASSESSMENT IS MULTI-TIERED**



The required assessment process is robust and includes both lab and field studies

## SCIENTIFIC TESTING AND RISK ASSESSMENT ARE EVOLVING

- EPA bee safety risk assessment methods and requirements for scientific testing continue to evolve
- Researchers continue to explore the potential bee health impacts of specific insecticides, herbicides and fungicides and specific combinations of pesticides
- New science, data and risk assessment methodology are considered as part of EPA's normal process, which includes periodic registration reviews





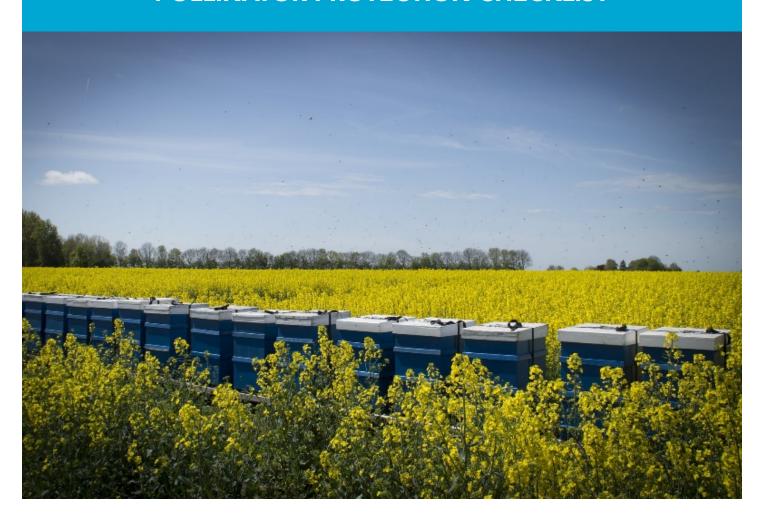
## **KEY PRACTICES ADDRESSED IN THIS SECTION**

- 1. Proactive communication
- Site assessment: knowing when to apply
- 3. Planting: using caution with treated seed
- 4. Planning to apply: following the label
- Executing application: managing bee exposure through timing and drift management
- 6. Post-application assessment

Photo: Bee Informed Partnership



#### **POLLINATOR PROTECTION CHECKLIST**



#### 1. COMMUNICATION:

#### SEEK PROACTIVE COMMUNICATION AMONG INTERESTED PARTIES

Know the landscape and have good communication among all parties involved

- The beekeeper will have knowledge of his bees and stressors the bees are facing
- The crop pest advisor/applicator will know his products and the pest issues
- The land owner or farm manager will know the landscape of the field the best

Read and follow your state's Managed Pollinator Protection Plan (MP3) (if applicable) for management practices and communications strategies. Check your state Dept. of Ag or Extension office to learn more.



#### **SCENE 1**

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8a/720p/Honey%20Bee Scene1 v2 1 .mp4?dl=0

#### 1. COMMUNICATION:

#### SUPPORT THE PLAN BETWEEN GROWER AND BEEKEEPER

#### Formal & informal plans may include:

- Contact details
- Hive locations
- Timing of crop blooms
- Timing on applications
- Notification of when applications made in area (48 hrs)
- Bee protection guidelines regarding applications
- Protection of water sources
- Protocols for bee kill investigations

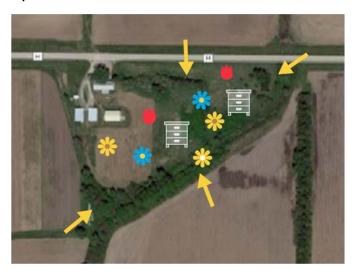


#### 2. SITE ASSESSMENT:

#### LOCATION OF HIVES IS AN IMPORTANT CONSIDERATION

Proper placement of hives may improve colony survival. **Advise** growers/landowners on proper placement to avoid unintended exposure.

- Use tree lines and structures to minimize direct pesticide exposure from drift
- Apiary locations should be clearly identified on a map and flagged for visibility by growers/applicators
- Provide floral resources away from target fields to minimize foraging activity in crops
- GIS-based bee colony (sensitive crop) registries (e.g., FieldWatch Inc.) exist in some states, and should be consulted. Check your state's Managed Pollinator Protection Plan (MP3) or agricultural extension service.





Apiary locations clearly marked on maps



Tree lines act as wind & pesticide drift barrier



Floral resources for bees

#### 2. SITE ASSESSMENT:

#### SEASONAL FORAGE AVAILABILITY CAN AFFECT PESTICIDE EXPOSURE

- Bees utilize flowering trees and weeds for nectar and pollen
- There is an increased likelihood of exposure for bees when forage is in close proximity to application sites
- Flowering weeds (forage) may be within or along treated fields. Remove flowering weeds in fields prior to applying pesticides or sowing treated seeds.
   Remember that drift of abraded treated seed coatings (dust-off or fugitive dust) can serve as a route of exposure for bees.



Flowering Henbit in corn field may attract pollinators into crop fields (photo by Purdue Agriculture photo/John Obermeyer)

#### 2. SITE ASSESSMENT:

#### USE IPM PRINCIPLES TO ASSESS THE NEED FOR PESTICIDES

Use pesticides only when:

- A need has been noted through biological (pest pressure) and/or weather monitoring (scouting)
- The timing of application is appropriate (see below)

If crops are flowering or you determine bees are present:

- Choose lower toxicity pesticides
- Choose pesticides with short residual life to reduce exposure risks
- Determine whether spraying after sunset is an option (bees are not active during this time)



#### **SCENE 2**

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Reference "How to Reduce Bee Poisoning from Pesticides" further information on pesticides with lower toxicity

https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/pnw591.pdf

#### 3. PLANTING:

#### IF USING TREATED SEEDS, REDUCE RISK TO BEES

- Follow all directions on treated seed container labeling
- Discuss with grower the need for, and benefits of, seed treatment versus the potential costs
- Minimize the dust drift onto hives and non-crop plants, especially those in bloom
  - New seed coating technology, planter equipment, and advanced seed flow lubricants can reduce drift
  - Eliminate flowering plants and weeds in and around the field prior to planting
  - Be aware of wind direction, bee presence and hive locations; communicate with beekeepers



Check the ASTA Seed Treatment Stewardship Guide (https://seed-treatment-guide.com)

#### 4. PLANNING TO APPLY:

#### READ AND FOLLOW THE ENTIRE PESTICIDE LABEL

Always use the pesticide according to the product's label

- Label language is product-specific and constructed based on scientific data and risk assessments for bee safety
- Label directions are intended to reduce potential pesticide exposure and thereby reduce risk to bees



#### 4. PLANNING TO APPLY:

#### READ AND FOLLOW THE ENTIRE PESTICIDE LABEL

#### Pay special attention to:

- Environmental Hazard Statement specifying advisory language on the toxicity to bees and if known, whether the chemical has short or extended residual toxicity times
- Directions for Use (DFU) specifying compulsory language specific to crops and methods of application.



Photo source: Chazzbo Media

#### 4. PLANNING TO APPLY:

#### LOCATING BEE INFORMATION ON THE LABEL IS THE FIRST STEP

- The Environmental Hazard Statement will indicate if the pesticide is moderately or highly toxic to bees if contact occurs
- Directions for Use identifies general and crop-specific instructions, including drift management directions
- Pesticide labels for some products have additional pollinator protection statements
  - A very few compounds carry a Bee Hazard Icon or a Bee Advisory Box. These alert the user of application restrictions.
  - Look for more information related to residuals that affect bees, if available
  - The absence of these alerts must not be construed as an absence of risk to bees



#### BEES CAN BE HARMED THROUGH DIFFERENT APPLICATION SCENARIOS

Bees may be harmed when:

- Hives are directly sprayed
- Bees come into direct contact with pesticide residues
- Bees forage on contaminated nectar/pollen/water

Avoiding exposure is one of the keys to protecting bees from harm



#### AVOID SPRAYING WHEN BEES ARE PRESENT AND ACTIVE

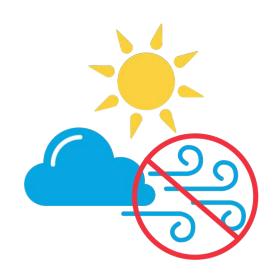
- Bees are usually present when there are blooms in the field
- Delay spray to avoid the peak of the day when foraging bees are most active
- If feasible and consistent with label directions, spray at dusk with chemicals that have short (less than 12-hour) residual times
- GIS-based bee colony (sensitive crop) registries (e.g., FieldWatch Inc.) exist in some states, and should be consulted. Check your state's MP3 or agricultural extension service.



#### MINIMIZE DRIFT

#### **Specific Label Information Takes Precedence**

- Avoid drift; see pesticide labels for guidance regarding wind speed, spray rig setup, and other information
- Follow spray drift buffer on label; establish wider buffer or remove surrounding forage if deemed appropriate. Consider available technologies to further reduce drift, including low-drift nozzles, wrap-around booms and hooded booms.
- Establish appropriate buffers (no-spray) zones between treated areas and bee habitat or hives
- Check the weather forecast before application and be mindful of changing weather conditions during application
- If wind is blowing toward flowering crops or plants, or areas where beehives are located consider alternatives



#### 5. EXECUTING APPLICATION: OTHER CONSIDERATIONS

- Water sources for bees can be a source of incidental pesticide exposure
  - Maintain buffer areas from water sources and wetlands with distances specified on product labels
  - Communicate with beekeepers to ensure they have provided adequate water source for their bees
  - Turn off sprayers near water sources
- Bees may be attracted to spray rigs
  - Utilize wash out stations for spray rigs
- Check labels for instructions on product mixing



#### RESCUE APPLICATION CAN POSE A RISK TO BEE HEALTH

- Pest populations may increase rapidly or be found unexpectedly and sometimes require immediate treatment
- Communicate with beekeeper to discuss the need for a treatment including the timing and compound that you are planning to use
- Determine if there is another compound that will be effective with lower toxicity and residuals
- Communicate with the applicator the location of the hives



#### **SCENE 3**

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## RESCUE APPLICATIONS: MOVING BEES IS NOT A SIMPLE UNDERTAKING

#### Considerations include:

- During pollination events it's difficult to remove and place thousands of hives in a narrow time frame, due to:
  - Availability of equipment and crew
  - Availability of alternative locations Foragers from hives moved less than a mile will likely return in large numbers to the original site
- Covering hives in summer may cause bees to over-heat and is not logistically feasible for large numbers of hives

Develop a plan for rescue applications with the beekeeper



#### **SCENE 4**

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Photo: Bee Informed Partnership

#### **REVIEW: POLLINATOR PROTECTION CHECKLIST**



#### 6. POST-APPLICATION:

#### REVIEW OF BEE HEALTH IS AN IMPORTANT STEP

In addition to determining if target pests are eliminated, it is also important to determine if bees have been impacted. Work with grower and beekeeper as appropriate.

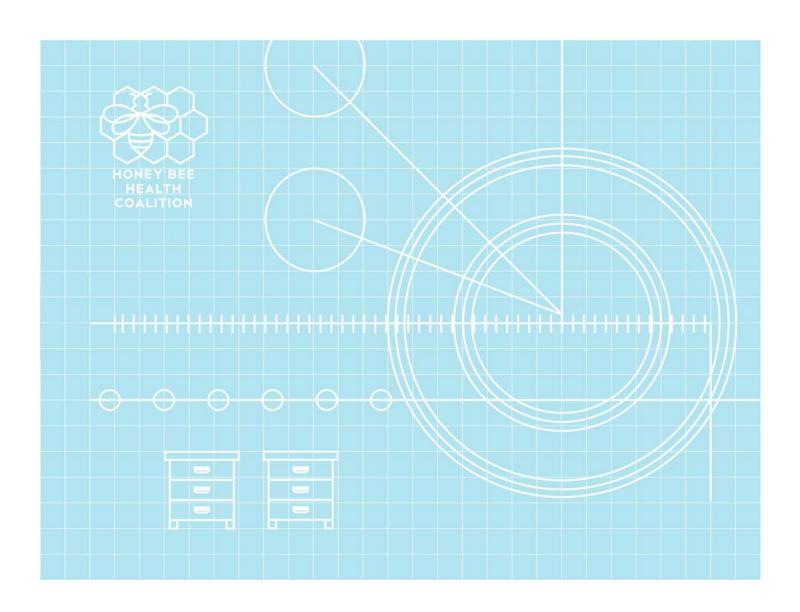
If it is determined that bee losses have occurred:

- Support investigation to determine the cause of the losses
- If it is determined that crop protection products caused the losses, work with the beekeeper and landowner to report the incident
- The Honey Bee Health Coalition's Quick Guide to Reporting a Pesticide-Related Bee Kill Incident can be used a resource and includes whom to contact for each state <a href="https://honeybeehealthcoalition.org/wp-content/uploads/2017/03/Quick-Guide-to-Reporting-a-Bee-Kill-Incident-Final-122316.pdf">https://honeybeehealthcoalition.org/wp-content/uploads/2017/03/Quick-Guide-to-Reporting-a-Bee-Kill-Incident-Final-122316.pdf</a>





Bee losses may be difficult to see



#### ADDITIONAL SLIDE FOR QUESTION/ANSWER

### RISK IS ASSESSED BASED ON THE EXTENT EXPOSURE AND TOXICITY

Product-specific risk is evaluated through multi-tier testing, including:

- Analytical studies of field residues in pollen, nectar and other sources of potential exposure
- Laboratory-based acute and chronic toxicity tests on individual adult and larval bees; and, semi-field and/or full-field colony-level tests evaluating effects on growth, development and/or survival.
- Tiered process intended to provide increasingly realistic understanding of potential risk under actual use conditions.
- The risk quotient (RQ) is the ratio of exposure divided by toxicity.
- RQ values are compared to respective acute (RQ>0.4) or chronic (RQ>1.0) risk levels of concern (LOCs) to determine whether further refinement(s) are needed and/or whether specific use restrictions (mitigations) are warranted.
- LOCs for bees are set against background mortality for acute risk and the no-observed adverse effect level (NOAEL) for chronic risk.





