

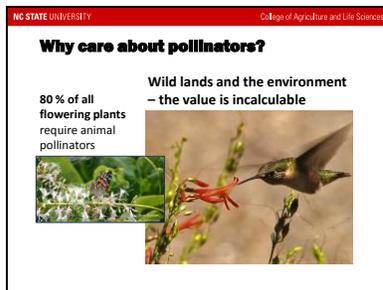
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The value of pollinators to our environment is incalculable. Pollinators visit flowers in search of pollen and/or nectar, and in the process, the pollen grains often stick to their bodies and are carried from flower to flower. In this way, they facilitate the process we call pollination.

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Why care about pollinators?

-Fruit and seed production needed for the survival of the majority of flowering plants in our environment.

Food for wildlife

- Song birds
- Wild turkeys
- Sage grouse
- Bear
- Deer
- Elk



Without pollination, seed and fruit production in animal-pollinated plants can not be successful, not only for our food crops, but for wildlife diets, too.

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Importance of Pollinators

- Essential to the production of more than 90 crops in the U.S.
- **1 out of every 3 bites** of food we eat daily can be attributed to pollinators.



Humans depend on pollinators for our well being. An estimated 1 out of every 3 bites of food we eat each day result from the work of pollinators.

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Your breakfast with bees



Your breakfast without bees



Value of crops in US that depend on pollination: >\$18.9 billion
\$217 billion worldwide

Case in point: your breakfast with and without bees.

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Undoubtedly, our grocery store shelves would look quite different without bees pollinating our crops. We are left with mostly grains and starches.

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The Wild World of Pollinators

Insects are the most common and abundant

- Honey bees
- Bumble bees
- Blueberry bees

...and also

- Butterflies
- Beetles
- Flies
- even, Wasps



When a pollinator is visiting a bloom in search of nectar (carbohydrate) and pollen (protein), it is called "foraging."

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**Champion Pollinator of Food Crops:
The European Honey Bee**

Honey bees are relied on to perform most of the commercial pollination.



A truckload of honey bee colonies is delivered for blueberry pollination in Maine

Honey bees are the most important pollinator for food crops

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750,000+ acres of almonds in Central CA require 1.5 million colonies of honey bees for pollination



No Bees, No Nuts

Some crops, like almonds, are completely dependent upon honey bees for pollination. 80% of the world's supply of almonds comes from California.

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72,000 acres of blueberries across U.S. require 150,000 colonies of honey bees for pollination



90% of the pollination of blueberries is done by honey bees!

One of NC's most important crops, blueberries, also requires honey bee pollination.

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Why care about pollinators?

In NC...
Apples
Blueberries
Cucumbers
Squash
Pumpkin
Watermelon
Strawberries
Peaches
Blackberries
Raspberries
Others



A partially pollinated cucumber (top) compared with a completely pollinated one (bottom). The seed did not form throughout the poorly pollinated cucumber and consequently the fruit did not grow around that portion.

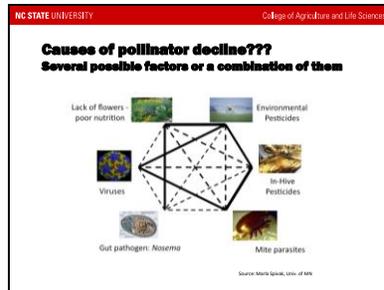
Besides blueberries, other important crops grown in NC are highly or somewhat dependent on honey bees for pollination. For some crops, like cucumbers, lack of honey bee pollination causes misshapen or underdeveloped fruit.

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Some pollinators, such as bees, are suffering losses both in population sizes and in species numbers. This is putting stress on our ability to produce food and ensure environmental stability.

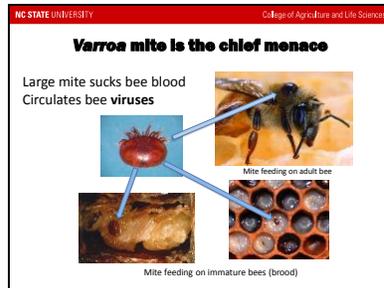
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It is believed that pollinator (especially, honey bee) declines can be caused by a combination of factors including predatory mites and parasites, pathogens, nutritional stress, and pesticides, though the exact combination and impact of each factor remains uncertain.

As you might imagine, pollinators can be highly sensitive to many pesticides, especially insecticides.

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The Varroa mite is a large mite that behaves much like a tick. It sucks the blood of adult and immature bees. Immature bees are called brood. The mite is also capable of passing several viruses as it feeds.

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Questions

Why is it important to protect pollinators?

- a) Humans are highly dependent on pollinators for crops
- b) Many plants need animal pollinators
- c) Pollinators are important for wildlife
- d) All of the above



d) All of the above

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Questions

Which of the following foods depend on animal pollination?

- a) Apples
- b) Blueberries
- c) Cucumbers
- d) Wheat



a), b), and c)

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Questions

In addition to honey bees, what other animals can pollinate flowers?

- a) Butterflies
- b) Birds
- c) Bats
- d) Flies
- e) Cattle



All but cattle

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Questions

What are the factors affecting pollinator health?

- a) Mites and parasites
- b) Nutrition and forage
- c) Pesticides
- d) A combination of these and/or other factors



d. is correct

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Pesticide applicators can help by reducing risks to honey bees and other pollinators

- Understand How Pesticides Can Harm Bees
- Recognize Pollinator Foraging Habits
- Read the Label
- Use IPM
- Follow Best Management Practices



As a pesticide applicator, it's important that you understand how pesticides can harm bees, recognize the daily habits of bees, read the label to help select appropriate pesticide materials, and consider application methods and strategies (such as IPM and BMPs) to minimize exposure to bees.

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Did You Know?

- Most pesticides are not toxic to honey bees and other pollinators.
- As a general rule, insecticides are more toxic to pollinators than fungicides and herbicides.
 - However, not all insecticides are toxic to pollinators.



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Pollinator poisoning can occur from:

- **Direct exposure** during application
- **Residues** picked up through foraging (pollen and nectar) and taken back to the hive
- **Residues** from non-crop plants (ground cover, field edges, ditches, etc.)



Those pesticides that are toxic to bees can cause harm in one or more of the following ways:

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Recognize Residual toxicity

Some pesticides remain toxic to bees for some time after the application is made via contact with residues on the treated plant, including bloom. **This is residual toxicity.**



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Extended Residual Toxicity (ERT)

Compounds that remain toxic to bees for an extended period of time following foliar applications are referred to as **Extended Residual Toxicity or ERT.**



ERT pesticides may not be applied to blooming crops or weeds.

If products remain toxic for an extended period of time following foliar application the product is referred to as having an Extended Residual Toxicity or ERT. ERT pesticides may not be applied to blooming crops or weeds when pollinators are present or will be visiting soon after application.

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Pesticides with Extended Residual Toxicity

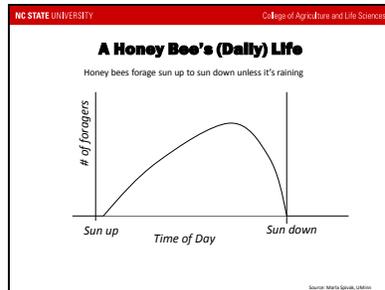
The *families* of pesticides most commonly associated with ERT include:

- Organophosphates (e.g., acephate, chlorpyrifos, malathion)
- Carbamates (e.g., carbaryl)
- Neonicotinoids (e.g., imidacloprid)
- Pyrethroids (e.g., deltamethrin and cyfluthrin)

Always read the label to determine if a pesticide leaves residues that are toxic to bees.

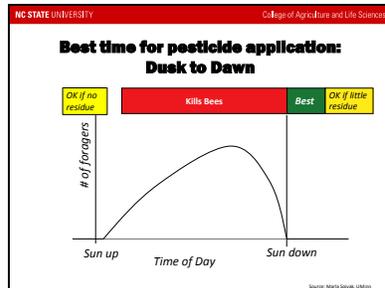


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Most pollinator poisoning occurs when bee-toxic pesticides are applied to crops during bloom. This is a time when pollinators are most likely to be attracted to the crop while actively searching for pollen and nectar. A honey bee will take to flight when temperatures are 55 degrees or above. They are most active from late morning through mid afternoon.

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The worst time of day to apply bee-toxic pesticides, therefore, is from late morning through early afternoon. Some bee-toxic pesticides can be applied from dusk till dawn as long as little or no toxic residue is left behind.

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Pollinator protection statements should inform you of pesticide selection and application timing decisions

REMEMBER:
Take time, uninterrupted and undisturbed, to read and understand the label

Your actions must protect bees during application (and afterwards!).

As the applicator, it is your responsibility to follow all statements and instructions on the label. Pollinator protection statements are called by a variety of names – “Bee Caution”, “Bee Hazard”, “Bee Warning” among others. These statements are based on the evaluated risk to honey bees. Don’t assume that all pollinator protection statements are the same. READ and FOLLOW label restrictions. Watch closely for label changes.

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Key questions to consider

- What is the growth cycle of the crop?
- When will the crop be in bloom?
- What are the predicted dates that pests will need to be treated?
- What else is blooming in or near the field?
 - Cover crops
 - Weeds
 - Fencerow vegetation
 - Adjacent crops or orchards
- What pollinator activity is nearby?
- Can (non-crop) blossoms be removed by mowing or other methods before applying bee-toxic pesticides?

With this information in mind, there are a number of key questions to consider when using pesticides in or near crops that are attractive to bees.

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Know the landscape

- Observe the surroundings
- Observe fields and adjacent areas



Be familiar with your fields and the surrounding areas so you will know which areas may have potential pollinator activity. Note what other plants (weeds, plants in hedgerows, in drainage ditches, etc.) are present and may be blooming.

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Develop an IPM Plan

- Use a variety of tools beyond chemical controls only
- Use pesticides only when needed
- Determine the need for treatment through pest scouting or monitoring
- When using pesticides, prevent drift!

Develop an Integrated Pest Management plan and consider other methods of pest prevention or control. Be sure you have a pest problem before applying pesticides through scouting or monitoring for the presence of pests in damaging numbers. Use pesticides wisely and prevent drift.

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Cooperate and Communicate with Beekeepers

- Get contact information
- Maintain open dialogue before problems
- Locate beekeepers in the area
- Build consensus
- When we help the beekeeper, we're helping ourselves.

An illustration showing a white truck with a trailer parked on a green field. A person in a blue shirt and white pants stands next to the truck, gesturing towards it. The background is a light green gradient.

To protect pollinators, communication is key. The underlying cause of most bee poisoning incidents is a lack of information or awareness, rather than intent to do harm. Most pest management programs can be modified so that little or no bee poisoning occurs, without undue cost or inconvenience to the grower. Both beekeepers and pesticide applicators benefit from forming working relationships and familiarizing themselves with each other's management practices. The more you learn from others, and educate others, the better off you will be. Good communication will help you avoid problems from occurring.

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Questions

What has the EPA recently changed with regard to pesticide labels that will help protect pollinators?

- a) The color
- b) Pollinator protection language
- c) Added a bee hazard icon



B and C

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Questions

What does it mean to have foraging bees on the intended application site?

- a) You can apply any pesticide when you like
- b) You can apply non ERT pesticides from dusk until dawn
- c) You should avoid applying pesticides



b) You can apply non ERT pesticides from dusk til dawn

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Questions

When are pollinator poisonings most likely to occur?

- a) Whenever pesticides are used
- b) Whenever pesticides are sprayed from the air
- c) When pesticides are applied to crops during the bloom period



c. When pesticides are applied to crops during the bloom period

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Questions

What additional information might be useful to you when deciding what, where, and when to spray? (indicate all that apply)

- a) Location of the field
- b) What was in the field last year
- c) What is flowering in, around, and downwind of the target field
- d) Are there any sensitive areas (bee yards, natural areas, etc.) downwind of the target field?



A, C, and D

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The End



Photo Credit: Sarah Quisenberry (top right)

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Resources

Pollinators and Pesticide Stewardship. Penn State Pesticide Education Program.
extension.psu.edu/pesticide-education

Protecting Pollinators. A Training Module for Certified Pesticide Applicators.
North American Pollinator Protection Campaign.

Maria Spivak, PhD, University of Minnesota.

