



# Pollination & Illinois Agriculture

Recent research shows that 75 to 95% of all flowering plants on the earth need help with pollination. Most of this work is done by pollinators, such as bees, butterflies, bats, birds, moths, flies, and small mammals. Pollinators are responsible for pollination on more than 180,000 different plant species and more than 1,200 crops that people eat every day around

the world. It is estimated that one in every three bites of food is only available because of the hard work of pollinators.

Pollinators contribute \$217 billion to the global economy. In the United States, pollinators contribute \$29 billion worth of crops every year. Unfortunately, pollinator populations are on the decline for a variety of

reasons. It is important to take steps to help our pollinator populations thrive. We can all help to keep our pollinators healthy. We can start by adding flowers and plants to our yards and landscapes that provide food and shelter for pollinators throughout the growing season. In doing this, we can help create habitat for pollinators while also supporting our own need to eat!

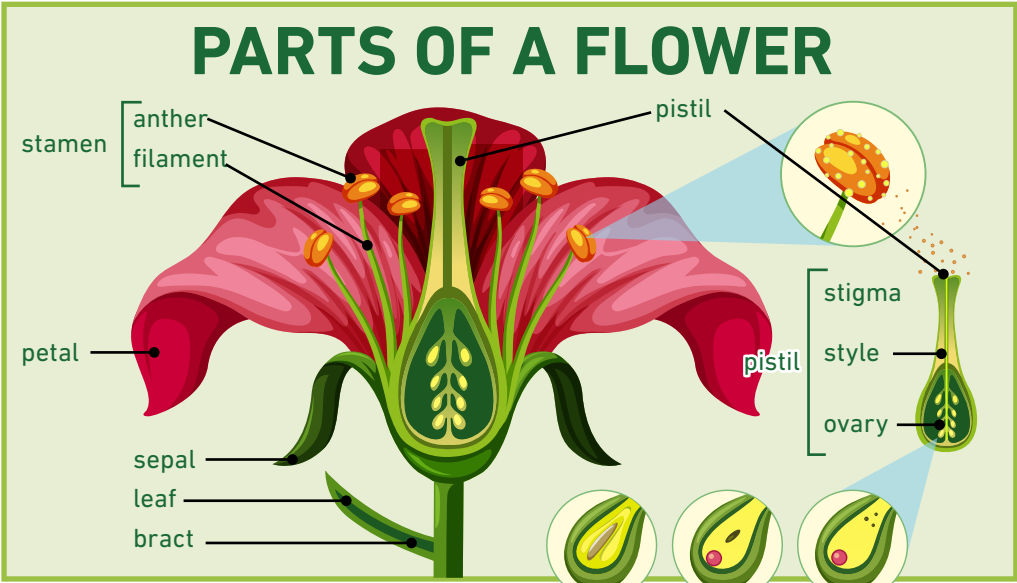
# What is Pollination?

The goal of every living organism, including plants, is to create offspring for the next generation. One of the ways that plants can produce offspring is by making seeds. Plants cannot produce seeds unless they are fertilized through pollination. Pollination is the transfer of pollen from the

stamen to the pistil of the flower. There are two methods of pollination. The most common method is cross-pollination in which pollen is transferred between flowers on two different plants of the same species. Self-pollination takes place when pollination occurs within just one flower or between flowers on the same plant. Many plants rely on pollinators to help them reproduce.

# How Pollination Works

Pollinators don't actually know that they're helping to pollinate plants. Pollinators visit flowers to search for nectar and pollen, their sources of food. In the process, pollen from one flower sticks to the body of the pollinator and is unintentionally deposited on the flower of the next plant the pollinator visits. When the pollen reaches the pistil of the flower, then the plant has been pollinated and can begin producing a seed. Some plants can be pollinated by the wind, but many of them could not reproduce without this accidental pollen transfer by foraging animals and insects!



# VOCABULARY

**ANTENNA(E):** The moveable, sensitive feelers on an insect's head, which detect odor and movement.

**ANTHER:** The part of a flower's stamen that contains the pollen.

**APIARY:** A place where bees are kept; a collection of beehives.

**BRACT:** A modified or specialized leaf, especially one associated with a reproductive structure such as a flower.

**CROSS-POLLINATION:** Pollen is transferred from the flower of one plant to the flower of another plant of the same species.

**FILAMENT:** Supports the anther, which is where pollen develops.

**INSECT:** A six-legged, air-breathing invertebrate with a body that has well-defined segments, including a head, thorax, abdomen, two antennae, and usually, two sets of wings.

**INVERTEBRATE:** An animal without a backbone.

**MAMMAL:** A warm-blooded vertebrate characterized by a covering of hair on some or most of the body, a four-chambered heart, and the ability to create milk for offspring.

**NECTAR:** A sweet liquid secreted by flowers of various plants.

**PETAL:** A leafy flap in a flower, often brightly colored to attract animal pollinators.

**PISTIL:** The female part of a flower, which consists of the stigma, style, and ovary.

**POLLEN:** A fine powdery substance, often yellow, produced by the anthers and collected by pollinators.

**POLLINATION:** The transfer of pollen from the stamen to the pistil of the flower.

**POLLINATOR:** Moves pollen from the male anthers of a flower to the female stigma of a flower, resulting in fertilization.

**SELF-POLLINATION:** Takes place when pollen is transferred from the stamen of one flower to the pistil of the same flower or plant.

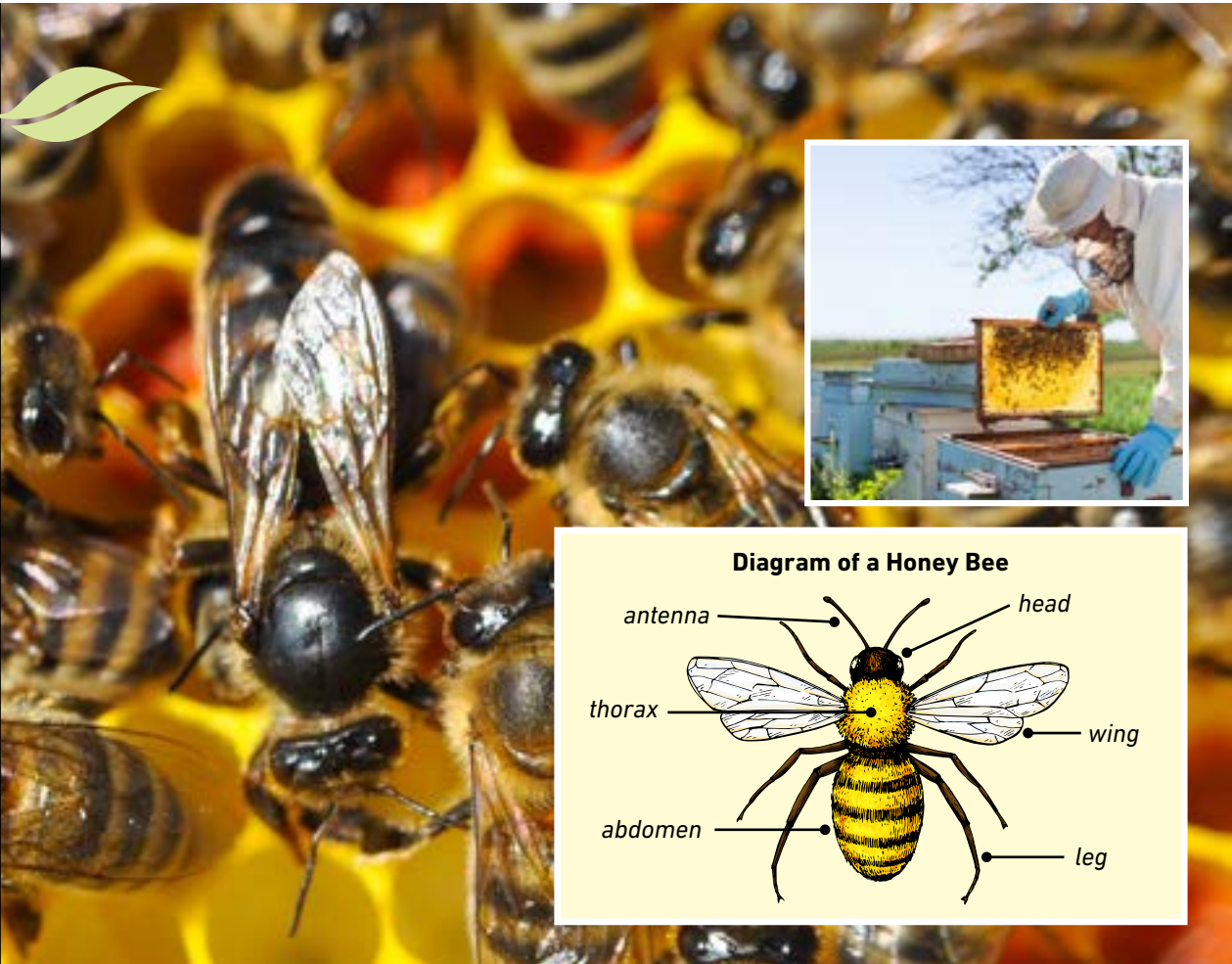
**STAMEN:** The male part of a flower, which produces pollen and consists of a filament and an anther.

**STIGMA:** The female part of a flower which receives pollen during pollination.



# HONEY BEES & AGRICULTURE

Honey bees live in large colonies made up of one queen bee, a small number of male drone bees, and thousands of female honey bees. The female honey bee, also called a worker bee, performs all the important duties to keep hives healthy. These tasks include taking care of the young, protecting the hive, and bringing back nectar and pollen and turning them into honey for the hive to eat. Many honey bees in the U.S. are managed in hives by over 200,000 beekeepers. In Illinois, there are currently over 4,000 beekeepers and over 30,000 honey bee hives! Honey bees produce six hive products used by humans for nutritional and medicinal purposes: honey, pollen, royal jelly, beeswax, propolis, and venom. But the most important contribution that honey bees make is in the number of vital crops that they pollinate across the country. Honey bees alone account for about \$15 billion in U.S. crops every single year. Many crops we eat every day are only on our plates because of honey bees. Nuts, vegetables, apples, cantaloupe, cranberries, pumpkins, sunflowers, and many more crops are dependent on honey bee pollination.



## Other Important Pollinators



**Butterflies:** Butterflies are very active during the day. In this time, they visit a wide variety of wildflowers. They are not as efficient as bees at moving pollen between plants, but they are still a vital pollinator. Many plants are completely reliant on butterflies for pollination. Butterflies prefer flowers that grow in clusters and provide landing platforms. They also like brightly colored flowers that produce lots of nectar. The monarch butterfly is even the Illinois State Insect!



**Birds:** Since most birds have a poor sense of smell, they are attracted to flowers by the shape. Most flowers visited by birds are tubular in shape with petals that curve outward. Most birds also prefer flowers that are bright red, yellow, or orange, and have strong supports for perching. Hummingbirds are a common pollinator in Illinois. When hummingbirds thrust their long, slender bills into flowers for nectar, their faces are dusted with pollen.



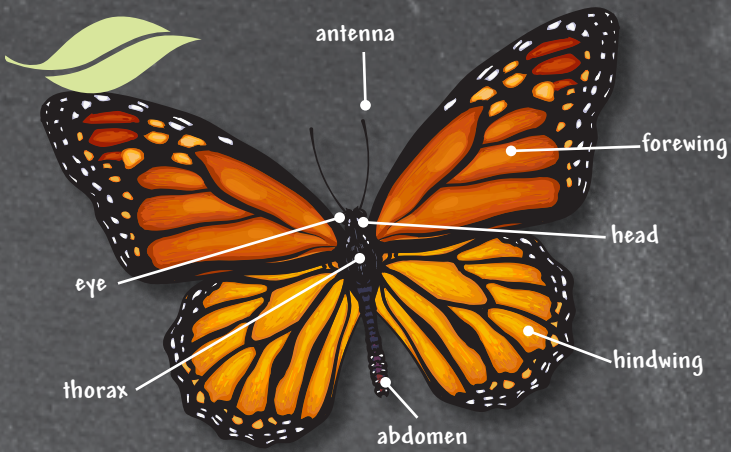
**Beetles:** Beetles were some of the first insects to visit flowers. Today, beetles make up 40% of all insect species. They are attracted to flowers with a large, bulb shape. Beetles eat pollen. As beetles visit flowers, they spread pollen that has stuck to their bodies from flower to flower.



**Flies:** There is a wide variety of fly species that can also be effective pollinators. Flies are attracted to an assortment of flower types and colors. Many flies especially like flowers that have an unpleasant odor!



**Native Illinois bees:** There are 400 to 500 species of native bees in Illinois. These include bumble bees, carpenter bees, cuckoo bees, mason bees, sweat bees, mining bees, and many more. These native bees live in wetland, woodland, grassland, and urban habitats across the state. All bees need a place to lay their eggs so that their larvae and pupae can safely develop into the next generation of bees. Native Illinois bees have a wide variety of nesting styles which allow them to raise their young. Some live solitary lives away from other bees. Some create communal and semi-social hives. The cuckoo bee is considered a “nest parasite” because it invades the hive of another species of bumblebees and tricks them into raising their young for them!



**Bats:** There are over 500 species of flowering plants that rely on bats for pollination. When bats drink nectar from plants and eat insects feeding from plants, pollen sticks to the hairs on their bodies. Some is then deposited on the next flower they visit. Flowers visited by bats are usually large in size and are open at night, when bats are active. Mangoes, bananas, guavas, and over 300 other species of fruit all depend on bats for pollination.



**Wind:** Some plants only need the wind for pollination. The wind is responsible for pollination of all grasses, most trees, and many agricultural crops, such as wheat, corn, and grain sorghum. Some plants that rely on wind pollination have long and feathery flowers, and many do not produce flowers at all. In either case, the wind blows pollen from one plant to another.

## The Illinois Monarch Project

Every spring, monarchs migrate from the mountains of Michoacán, Mexico to the prairies of Illinois. It actually takes two or three generations of butterflies to complete their migration! Then, in late summer, a “super generation” of monarchs emerges from their chrysalises to make the roughly 2,500 mile journey back to their winter homes in Mexico. Monarch butterflies rely on milkweed for their breeding and require nectar-producing flowers to feed them on their big journey. Habitat for monarchs has been in decline for decades, which makes it harder for monarch populations to thrive. The Illinois Monarch Project was recently started to organize efforts to enhance Illinois’ existing habitat and

create new habitat across the state to support monarch butterflies and other pollinators. The Illinois Monarch Project has brought together public and private partners, as well as individuals like you, to work together to try to add 150 million new milkweed stems and other nectar sources to Illinois by 2038. Everyone can help create habitat for pollinators. If your family would like to take the pledge to help, go to [illinoismonarchproject.org](http://illinoismonarchproject.org) to learn more. What could you do in your school and community to help out pollinators in Illinois?





# How Can You Help the Pollinators?

There are so many ways we can all do our part to help pollinators in our communities. Here are a few ways to get started:

- **Plant a mixture of pollinator-friendly plants in your landscape.**

Pollinators are a diverse group of organisms, and the plants that they are attracted to are even more diverse. Planting flowers with different colors, shapes, scents, and blooming times will help ensure a variety of pollinators have access to food. There are also various trees and shrubs that provide pollen and nectar to pollinators in early spring when other food sources are scarce. If you don't have much room, you can even plant flowers in containers on your deck or patio. Planting native plants is especially helpful to the native pollinator species in your area.

- **Be aware of proper usage of pesticides.**

If your family uses pesticides in your yard, be sure to read the instructions and only apply the suggested amounts and at times that have the least impact on pollinators in your area. Pesticides should only be applied if there is a strong need.

- **Provide clean water for pollinators.**

Adding a shallow dish, bowl, or a birdbath with submerged stones in it for perches will provide water for both birds and insect pollinators.

- **Give bees nesting places.**

Leaving a few dead logs in your landscape can provide habitat for bees and beetles. You can also buy or make your own native bee houses to provide vital shelter for the many native bees in Illinois.

- **Plant milkweed.**

Monarch butterflies, our Illinois State Insect, relies on milkweed as its only caterpillar host plant. Planting milkweed in your landscape will attract monarchs and give them a place to lay their eggs.

- **Support land conservation in your community.**

Volunteer to help with community gardens, green spaces, and other efforts meant to protect pollinators.

- **Spread the word.**

Talk to others in your community, neighborhood, and school. Help them understand the role they can also play in protecting our pollinators!



## Create a Throw & Grow!

You can attract pollinators to more places than just your yard. Ditches, vacant lots, and other un-mowed parts of the landscape are great places to improve habitats for pollinators. By making a Throw and Grow, you can plant a pollinator garden just about anywhere!

**To make a Throw and Grow, you will need the following:**

- Air dry modeling clay (*available at craft stores*)
- Potting soil or compost
- Wildflower seeds (*try to find a variety of native plant seeds*)
- Water

1. Pull off a piece of the modeling clay and pinch it between your fingers to flatten it into a small disk.

2. Pour a pinch of potting soil onto the clay.

3. Next, pour a pinch of seeds onto the potting soil.

4. Add a small amount of water to the seeds, just enough to moisten the potting soil.

5. Fold and knead the mixture into a tight ball with your fingers. The clay should hold everything together.

6. Your Throw and Grow has everything a seed needs to germinate. To "plant" your seeds, simply throw them somewhere in your neighborhood to grow and attract pollinators. Locations that do not receive regular mowing will work best. Remember, you should always ask permission if the property does not belong to you.



## FUN FACT!

Honey bees must fly about **90,000 miles**, the same as three times around the globe, to make one pound of honey!



## NATIVE FLOWERS

A native plant is one that has been a part of the balance of nature for hundreds or thousands of years. Only plants found in our country before European settlement are considered to be native to the United States. The native plants of the Midwest help support a diverse group of pollinators. Illinois is a vital breeding area for the monarch butterfly and is home to hundreds of other pollinator species. Our natural world relies on pollination, but so does our agricultural industry. So much of what we eat would not be available without the help of pollinators.

You can help our diverse pollinator populations by planting native plants and flowers in your landscape that provide food and shelter throughout the year. Try to plant at least three different flowering plants for each part of the growing season. You should also aim for a variety of colors and flower shapes to attract a diversity of pollinators. This will help ensure that pollinators always have a food source in your neighborhood. There are hundreds of plants and flowers that you could plant in your landscape that can help pollinators. Here are a few easy plants to get started with.



**Butterfly Weed:** The butterfly weed has reddish-orange blossoms that open in early summer. Expect hummingbirds and butterflies to be drawn to this flower.

**Joe Pye Weed:** This is a tall woodland plant that shows off clusters of pink or purple flowers from July to September. Butterflies and bees love its nectar and birds like goldfinches and mourning doves will visit to eat the seeds.



**Echinacea:** These flowers include many varieties of coneflowers and rudbeckia. The blooms can range from purple to orange to pink. Flowers will continue throughout the summer. Hummingbirds and butterflies feed on this flower's nectar and goldfinches eat its seeds.

**Bee Balm:** Bee balm flowers will grab attention with their unique spidery dark pink, red, or purple blossoms. As the name suggests, bees love the flowers, but butterflies and hummingbirds do as well.



**Switchgrass:** Switchgrass is a prairie grass that is shaped like a fountain. The foliage is blue-green in the summer and then changes to golden-red in the fall. Many insects, including butterflies, lay their eggs on native grasses.

**Goldenrod:** The mustard yellow flowers of goldenrod are a beautiful sight from late summer to late fall. This late blooming flower provides a much-needed nectar source for many species of bees and butterflies at a time of year when not many other flowers are producing nectar.





# CAREERS



**Alicia Bunting & Amber Rutledge**  
Wild Harvest Honey Farm  
Heyworth, IL  
Size of Farm: 20 acres  
Year Established: 1964  
Crops/products sold: Honey & Honey Products  
Primary Market: Retail & Farm Store

**Can you describe your farming operation?**

We are an apiary with 24 hives. We have an educational room that overlooks our harvest room and a boutique that helps support future educational projects. In our boutique, we have one of the largest honey tasting bars in the Midwest with over 30 different honey varieties from all over the world. We teach honey tasting classes to educate about the importance of authentic honey.

**How did you get started with keeping bees and producing honey? Why did beekeeping interest you?**

Our great-grandfather was a beekeeper and it's been in our family for many years. After our grandfather passed away, the farm sat empty for over 20 years and we wanted to bring life back to the farm in a way that not only honored him, but also helped the environment.

**What kind of work do you need to do throughout the year to best manage your beehives?**

In the spring, summer, and early fall we are in the hives every two weeks completing inspections that take about 30 minutes to an hour per hive. Late fall, we start getting the bees ready for winter. We harvest any summer honey so the bees can fill their hive for winter with honey from our fall flowers. The frames we extract have to be put in the freezer before being put in storage for the winter. We freeze over 250 wax frames. The purpose of freezing wax frames is to kill the eggs and larvae of wax moths. Wax moths can destroy beeswax comb. In the late fall, we also set up wind breakers around the hives to protect them from winter winds. In the winter months, we take inventory of all of our supplies and equipment. We fix, clean/sterilize, purchase, assemble, and paint equipment as needed. We also have to ensure that the hive cover is properly secured. After heavy snows, we watch the entrance of the hive for ice and remove ice that might be blocking the hive entrance. This will give the hive better ventilation and give the bees room to do a cleansing flight on days over 50 degrees. We also put mice guards on the entrances to keep critters from living in the nice, toasty hives. Hive inspections are still done in the winter using a thermal camera to check on hive health.

**What do you enjoy most about beekeeping?**

We enjoy being part of nature and watching how amazing and smart bees are. The bees have helped create a whole new ecosystem here. We have been able to watch not only our pollinator gardens thrive, but also existing flowers become healthier than ever. Our food gardens have never been so plentiful. The amount of new butterflies and birds that have moved in has been such a reward. Teaching adults and children new facts about bees and watching their faces light up is priceless too.

**What can students do to help pollinators in their area?**

The best thing anyone can do is plant, plant, plant. Bees are starving and it's getting harder and harder for them to naturally find food in the wild. If you don't have the space to plant a small pollinator garden, a simple window planter works great too.



**Dr. Sedonia Sipes**  
Associate Professor  
SIUC School of Biological Sciences  
Carbondale, IL

**Can you tell us about your job?**

I'm a pollination ecologist in the School of Biological Sciences at SIUC. I teach courses in Pollination Ecology, Evolution, General Biology, and Ethnobotany. My position is a teaching and research position, so I also conduct research, write grant proposals, publish research papers, and mentor graduate and undergraduate students as part of my job. I also participate in various types of outreach education.

**Can you explain some of your recent research projects related to pollinators?**

Recently, my lab has conducted a multi-year inventory of pollinator biodiversity in southern Illinois. This work is really ongoing, but since 2017, we have documented over 200 species of bees, and around 100 species of hover flies. We are still working on analyzing the wasps, bee flies, and beetles. We have found at least two species of bees that we believe are new to science.

**Why are pollinators so important to agriculture?**

Somewhere between 25-30% of the foods we eat require pollinators. A few examples are most orchard fruits, melons and squash, and tomatoes and peppers. Among foods that are imported from distant lands, chocolate depends upon the pollination services of specific species of tiny flies, while mangoes depend on a diverse guild of small bees, flies, wasps, and other insects. Even when the harvested crop is a part of the plant other than seeds or fruit, pollinators may be required to produce the seeds to plant that crop.

In our corner of the world, much crop pollination is carried out by honey bees, which are domesticated animals not native to North America. But research has shown that native pollinators also contribute significantly, depending on the crop.

**Which bees need saving, and what can we do to help them?**

Everyone has heard "the bees" are declining and want to know what they can do to help save "the bees". But there's a huge conflation of bee conservation and honey bee productivity. Honey bees are domesticated species—put them in the same category as soybeans, corn, and cows. We rely on them to feed the eight billion humans on the planet. Beekeepers are struggling with a number of problems that threaten our food supply. But honey bees are not in danger of extinction, and because they are not native to the U.S., are not of conservation concern.

The species that need conserving are the native pollinators. The main threat to native pollinator biodiversity is habitat loss and declining floral resources. Planting native wildflowers in gardens, roadsides, urban green spaces, and ag field margins can all help out pollinators. I'm slowly converting most of my turfgrass lawn to wildflowers plantings.



**Jeff O'Connor**, Farmer  
OC Farms, Kankakee, IL  
Size of Farm: 800 acres  
Year Established: 1988  
Crops/products sold: Corn, Soybeans, & Wheat  
Primary Market: Wholesale Export Market

**Describe your background in agriculture and your current farming operation?**

I am a 6th generation farmer in Kankakee County where I currently raise corn, soybeans, and wheat. Many of the acres are used to raise non-GMO grains, which are dedicated to specialty markets and exported across the Pacific. Most all of my fields include some type of conservation practice which improves our long term sustainability. Conservation has been a focus of our family for several generations, and much of what I do on the farm has an underlying question of, "How will this impact the surrounding area?" I have also planted pollinator habitat in certain areas since 2017.

**In what ways are you trying to create pollinator habitat on your farm? Why is this important?**

One of my main priorities on the farm is to improve overall water quality, whether it is surface water as it runs off a field, or drainage water from below ground. On several farms I utilize the federal Conservation Reserve Program (CRP), which helps farmers set aside highly erodible land to better protect the environment. On my CRP land, I seed pollinator habitat on the edges of fields where the water runs off into neighboring fields. The pollinator habitat slows down the water enough to allow any soil and residue in the water to settle out. This pollinator habitat is planted into a mix of grasses and forbes (flowers) that will guarantee at least three species of flowering plants from late spring to early fall.

**You are a Certified Crop Advisor (CCA) and Sustainability Specialist, what does this mean? How does this role impact your work with pollinators?**

Being a CCA includes seeking out the latest information on current issues in 21st century agriculture. Protecting and improving our environment has become a focal point for many people, not just in farming. Placing pollinator habitat in key locations not only protects the productivity of our farms, but it also provides an incredible habitat for pollinators and other insect species.

**What do you want students to know about agriculture today?**

Farming is more complicated than anyone imagines. The planting and harvesting of crops are genuinely the most rewarding times of the year, even though they only take up three months. It is easy to overlook the soil on which we annually grow our crops, but soil is the basis upon which all other decisions are made. Sometimes the best use for the soil is to place it into a long term habitat which benefits pollinators, as well as reduces erosion.



## Build a Bee Hotel

Create more habitat for native solitary bees by building them a bee hotel! Be sure to ask an adult for help when you use power tools.

**You will need:**

- A waterproof container, such as a milk carton, small bucket, old crate, or a pipe
- Wood blocks or logs
- Straws or natural stalks, such as bamboo or raspberry canes

1. Use a power drill to drill holes into the wood blocks. The holes can range in size from 1/8" to 1/4" in diameter. Try to drill the holes 6" to 12" into the wood blocks.
2. Arrange the wood blocks in your container with the holes facing outward. Add the straws or stalks into the remaining empty spaces.
3. Hang or mount your bee hotel outside and watch for the bees to move in!

**This Ag Mag complements and connects to the following Common Core and Next Generation Science Standards:**

**Common Core State Standards:**  
ELA-Literacy RI.4.2; RI.4.4; RI.4.7; RI.4.10; W.4.7; W.4.8; W.4.9; SL.4.1; SL.4.4; L.4.1; L.4.6

**Next Generation Science Standards:**  
Engineering Design: 3-5-ETS1.B; Earth Sciences: 4-ESS3-1; Life Sciences: 4-LS1, MS-LS1-7; Physical Sciences: 4-PS3, 5-PS1-3, 5-PS1-3, 5-PS3