



What is Pollination?

Pollination is a very important part of the life cycle of plants. Plants cannot produce seeds unless they are pollinated. 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** where pollen is transferred between flowers on two different plants. **Self-pollination** takes place when pollination occurs within just one flower or between flowers on the same plant.

Pollination & Illinois Agriculture:

Three-fourths of the world's flowering plants and about 35 percent of the world's food crops depend on pollinators to reproduce. Some scientists estimate that one out of every three bites of food we eat exists because of pollinators like bees, butterflies, moths, birds, bats, beetles and other insects.

Pollinators are a critical link in our food system. Abundant and healthy populations of pollinators can impact fruit sets as well as fruit quality and size which, in turn, increases production per acre across Illinois farms. Apples, pumpkins, soybeans, squash, melons, and many other crops raised in the region rely on pollinators.

Pollination by honey bees contributes to over \$19 billion worth of crops in the U.S. each year. Other pollinating insects, like butterflies, contribute to another \$10 billion in crops. Unfortunately, numbers of the native and domesticated bees are declining due to a variety of reasons. It is crucial to take steps to help pollinator populations thrive. Simply adding plants to the landscape that provide food and shelter for pollinators throughout their active seasons can make a difference. By doing so, we support the bees' need for habitat as well as our own needs for food.

How it Works:

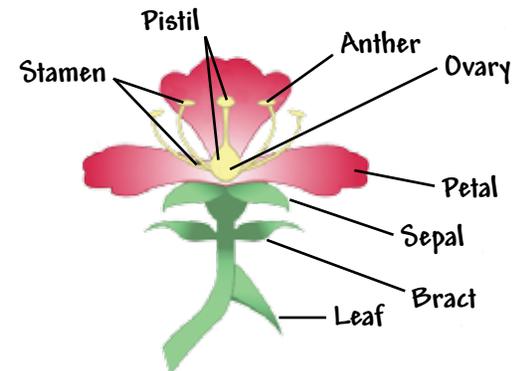
Pollinators visit flowers in their search for food (nectar and pollen). During a flower visit, a pollinator may unknowingly deposit pollen from a different flower. The plant then uses the pollen to produce a fruit or seed. Many plants cannot reproduce without pollen carried to them by foraging pollinators.

Native Flower

Look at the back page for help identifying the native flowers and pollinators throughout the Ag Mag.



Parts of a Flower:



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.

Cross-pollination: Pollen is transferred from the flower of one plant to the flower of another plant.

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.

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.

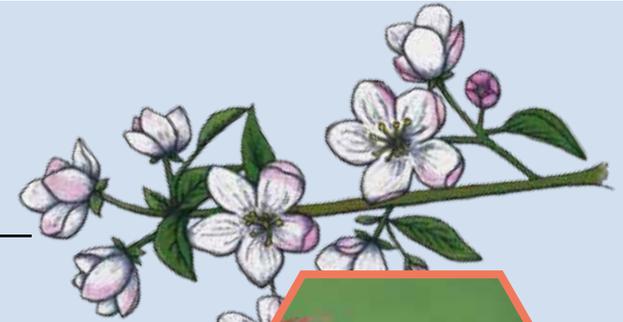
Vertebrate: An animal with a backbone.





Beetles

Beetles: Beetles are attracted to large, bowl shaped flowers. They only feed on pollen. While they feed, they crawl over the flowers, spreading the pollen that attaches to their bodies.



Native Flower

Birds: Most birds have a poor sense of smell, and the flowers that attract them may not have a strong smell. The flower's shape is what attracts the birds. They are often long tubes that grow sideways or droop instead of standing upright.



Birds

Flies: Flies are attracted to unpleasant smells; some are also attracted to nectar. Some flowers that are pollinated by flies are left with unpleasant odors. As flies lay their eggs in flowers, they also deposit pollen.



Flies

Bats: Bats are important pollinators. Over 300 species of fruit depend on bats for pollination. The flowers bats feed on are open at night, pale or white, and very fragrant. Bats also feed on the insects and the nectar inside the flowers.



Bats

Wind: Wind-pollinated plants do not rely on bright colors or smells. The wind pollinates all grasses, most trees and many agricultural crops like wheat, corn, and grain sorghum. Some of these plants produce flowers that are long and feathery, which allows the wind to blow the pollen from one flower to another.



Wind

Water: Plants pollinated by water release pollen onto the surface or beneath the surface of the water. On the surface of the water, the pollen floats to another flower. The pollen grains released beneath the surface are heavier than water. That pollen sinks and is caught by flowers that grow underwater.





How Can You Help the Pollinators?



Grow pollinator-friendly flowers.



Protect bee nests and butterfly host plants.

Make sure your plants get plenty of sunlight.

Check the wind conditions before planting.

Pollinator

Plant a variety of plants and flowers that bloom from spring to fall.

Provide a safe and attractive habitat.

Determine moisture conditions.

Make sure you are planting in good soil.



Native Flower

Native Flower



The most important pollinators are insects. Almost 90% of all flowering plants rely on insect pollinators. Other plants and trees are pollinated by the wind, water, birds and other animals.

Honey's Journey

Take the journey from flower to table

- Flowers produce nectar.
- Honey bees collect pollen and nectar from blooming flowers and plants and store it in honeycombs inside their hives. These honey bees are called worker bees, and are exclusively female.
- Bees fan the nectar by beating their wings to evaporate any water.
- As the water evaporates, the sugars thicken into sweet honey.
- Beekeepers pull frames out of beehives. They take off the wax that covers the cells.
- Beekeepers put frames in a machine called an extractor. It spins the frame very quickly, and the honey comes out.
- The honey goes through a very small strainer to catch any pieces of wax.
- Honey is sealed in jars and bottles.



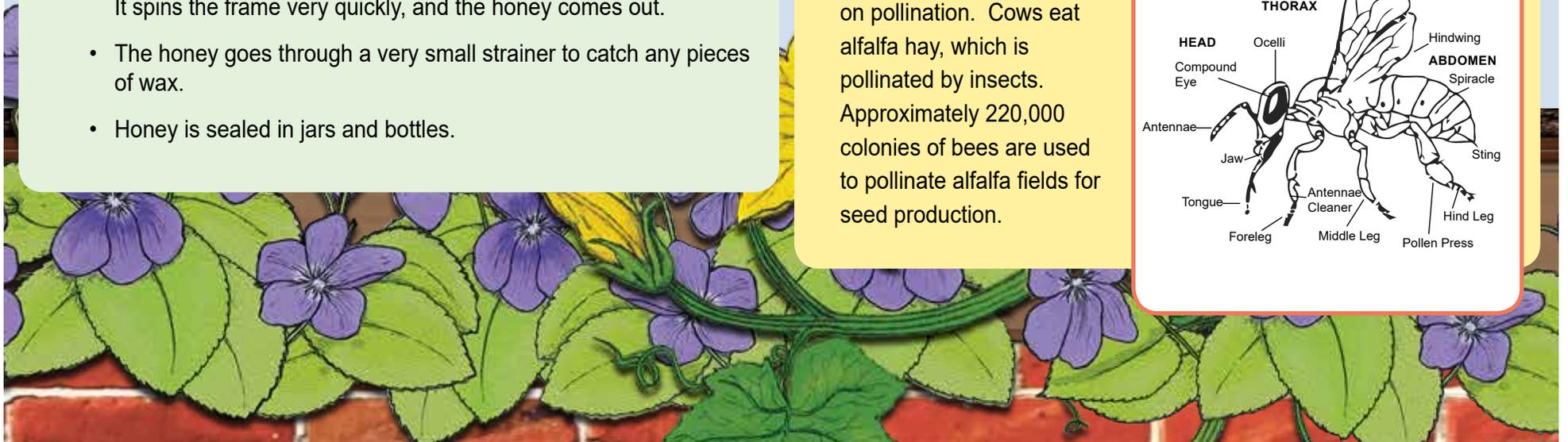
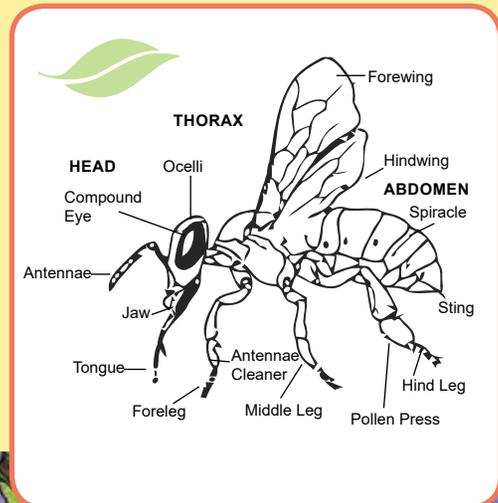
Honey Bees & Agriculture

One third of the foods you eat directly or indirectly depends on pollination by honey bees. Many crops, including nuts, vegetables, alfalfa (used for hay), apples, cantaloupe, cranberries, pumpkins and sunflowers, are 90 percent dependent on honey bee pollination.



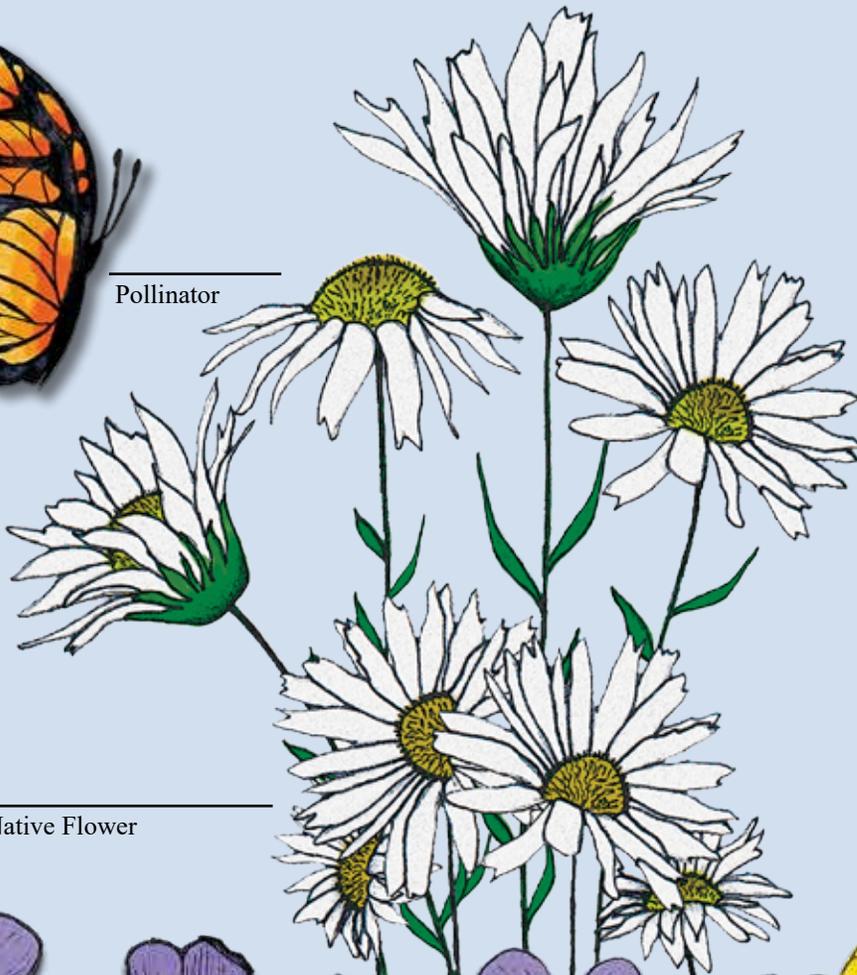
Other products, such as beef and dairy, also depend on pollination. Cows eat alfalfa hay, which is pollinated by insects.

Approximately 220,000 colonies of bees are used to pollinate alfalfa fields for seed production.

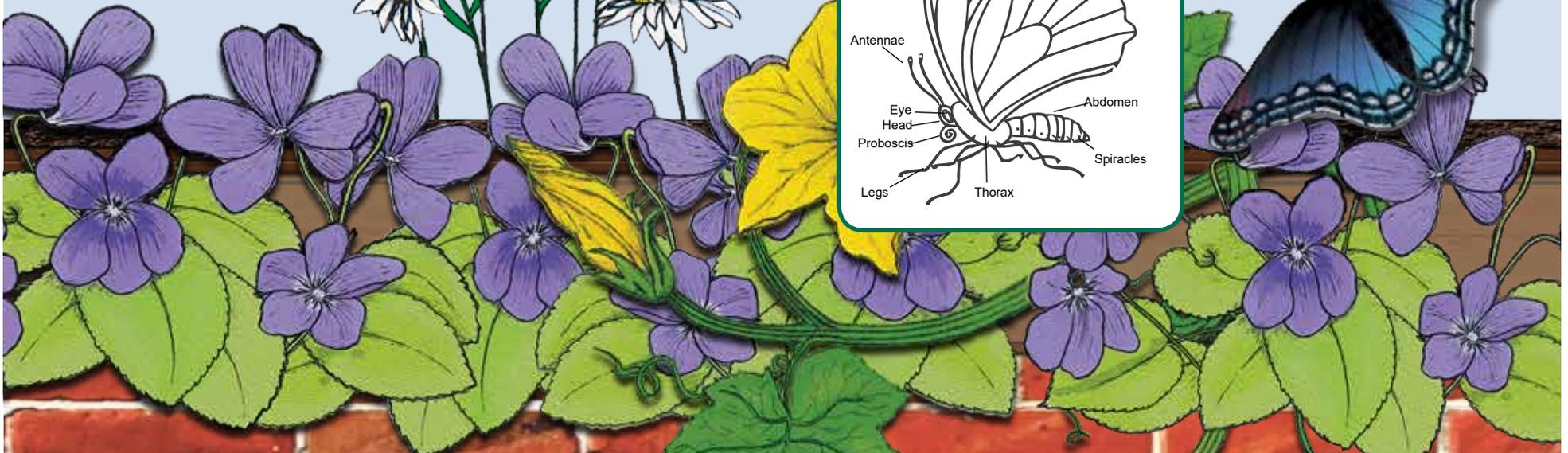




Pollinator

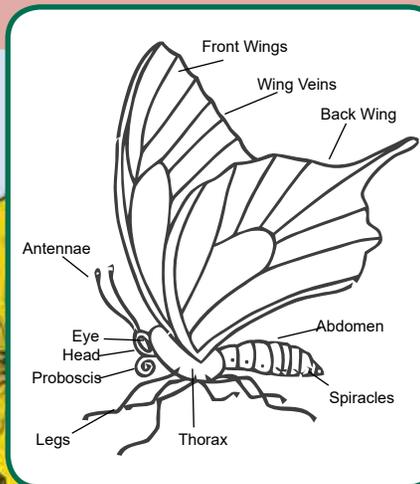


Native Flower

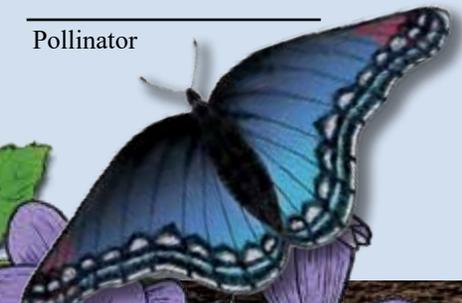


Butterflies

- Butterflies are very important pollinators. They spread pollen as they move from one flower to another in search of nectar. They perch on a flower as they drink nectar. Butterflies prefer flowers with strong perfumes and brilliant colors like red, pink, orange, blue or yellow.
- The world's food supply depends on pollinators.
- Butterflies are an indicator species that tell us about the health of our environment. Make sure your yard has plenty of butterflies and other insects happily buzzing about!
- Butterflies are sensitive to changes in climate, the presence of harmful chemicals, and pollution in the air and water.



Pollinator



Career Corner

Nancy Timpner, Perry County Agriculture Education Coordinator, Pinckneyville, IL

Describe your background and how you became interested in pollinators.

I knew very little about honey bees and decided to talk to a local beekeeper to learn the facts. I became fascinated with bees, their lifestyles and how detailed their lives are, relying on each other for survival. A friend of mine became a beekeeper and I decided I could contribute to the population and help my garden by purchasing a hive for my yard. With his help, I learned how to raise bees and joined a local beekeeping organization before joining the Illinois State Beekeepers Association. My apiary is registered with the State of Illinois and I attend meetings to continue my education on the best care for my hives. I have six hives, four of which I captured from wild swarms. It is exhilarating and rewarding to be a beekeeper. I enjoy helping others collect bees from their yards in order to give the bees a new home where they are protected.

Tell us about your current job.

I teach children from Kindergarten to 4th grade about the benefits of farming and where our food comes from. Without agriculture, we would live a very different life.

Why do you think it is important to teach about pollinators and agriculture?

One of every three bites of food in the U.S. depends on pollinators. If we understand how pollinators live, how they benefit us, and what will happen if we do not take care of our environment, we can hopefully make the earth a better place with an abundance of food for future generations.

What is your favorite pollinator?

The honey bee of course! They live such an interesting life. They are amazing little creatures to be admired and protected. Don't forget the honey. It has healing properties that help in so many ways. It helps allergies, sore throats, coughs and skin disorders!



Jeff O'Connor, Farmer, Kankakee County

Your farm has acres dedicated to help the pollinator habitat. How are these acres different?

Farming requires good quality farm ground to be both productive and profitable. However, not all farm ground is of good quality. This is where pollinator habitat fits in best. It's a win for both the farmer and the pollinators.

How does being a Certified Crop Adviser help the pollinator population?

Being a Certified Crop Adviser has helped expose me to the needs of pollinators and the pollinator program. It has also given me the opportunity to share what I know with other farmers and landowners. After planting my first 20 acres of pollinator habitat, I was able to promote it through a newspaper article which helped make other farmers and landowners aware of not only the pollinator program, but also the need for pollinators and pollinator habitat.

Tell us about your background in agriculture and describe your current farming operation.

My family came to the area in the 1870s with no farming background. All the challenges of a farm were new to them. Today we raise corn, soybeans and small grains. Many of our acres are devoted to conventional non-GMO production for specialty markets overseas. Most of our acres have some sort of established conservation practice in place, with cover crops getting most of the focus. We also add a little diversity to our farm with Christmas trees and pastured Heritage turkeys for the Thanksgiving market. For fun, we also make our own maple syrup.

What do you want everyone to know about agriculture today?

Two things come to mind. The first is farming is tougher than you think, but very rewarding. It does not just involve the planting and harvesting of fields. The planning and preparation that must take place to be successful is hard work. The second thing is most farmers really want to take care of the environment. I don't know of a farmer who isn't aware that his future success is dependent upon the land. We really want and need to be great stewards of the land. No one can better accomplish this than a farmer.



Dr. Alexandra Harmon-Threatt, University of Illinois, Department of Entomology, Assistant Professor

Describe how you became interested in working with pollinators.

I initially began working with plants as a sophomore in college, but the project required watching pollinator visits. I realized that pollinators were much more interesting. I switched to studying insects in grad school and never looked back. Pollinators are incredibly interesting and important parts of our ecosystem. As they decline, our entire ecosystem is at risk.

Tell us about your current job and some of your favorite projects you have worked on.

I'm an Assistant Professor of Entomology at the University of Illinois, Urbana-Champaign. I have many exciting projects occurring in my lab. Some of the most interesting right now are investigating how bees respond to prairie restoration practices, like burning and grazing. Conservation of



pollinators is incredibly important, but we don't know a lot about how they respond to conservation efforts and if they are effective.

Why are pollinators so important to agriculture?

It has been estimated that 75% of crop species require or benefit from pollinators. Most of these are the fruits and vegetables that provide the bulk of our nutrients, although they are only about 1/3 of the food we eat. If we lose pollinators, many crop prices will increase as yields decrease and that will negatively affect human health. We'd still have plenty of corn and wheat, which are wind pollinated, but most crops would be gone. Native plants also require pollinators, so pollinator losses can threaten natural areas and communities.

What subjects at school are important for a student to study if they are interested in entomology?

Entomology is a very diverse field and can pull information from many areas. You should focus on Biology, Math and English, which will help you understand insects, conduct research, and write papers.

Native Flowers & Pollinators

Look for the six native flowers and three native pollinators listed below throughout the Ag Mag while reading all about the importance of pollination.



The native plants of the Midwest support a diverse range of pollinators including thousands of species of native bees, butterflies, flower-visiting beetles, flies, wasps, and moths. The Midwest region is an important breeding area for the monarch butterfly and is also home to several species of bumble bees. Pollinators in the Midwest maintain healthy, productive plant communities, provide food that sustains wildlife, and play an important role in crop production.

You can create a positive environment with plants that provide a good habitat for our pollinators. The most effective plantings for pollinators will have at least 3 different types of plants, in each part of the growing season, with as many colors as possible to attract a diversity of pollinators.

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The Dooryard Violet
(Scientific Name: *Viola sororia*)

This purple violet is the Illinois State Flower



Pale Purple Coneflower (*Echinacea pallida*)



Tall Sunflower (*Helianthus giganteus*)



White Panicle Aster (*Symphyotrichum lanceolatum*)



Pumpkin Blossom (*Cucurbita pepo*)

Illinois grows the most pumpkins in the world, with the majority processed in Morton, Illinois, the Pumpkin Capital of the World!



Apple Blossom
(*Malus pumila*)



Red Spotted Purple Butterfly (*Limenitis arthemis*)



Monarch Butterfly (*Danaus plexippus*)

The Monarch is the Illinois state insect.



Honey Bee (*Apis mellifera*)

This Ag Mag complements and can be connected to the following Common Core, Next Generation Science, and Social Science Standards:

Common Core State Standards: ELA-Literacy.RI.4.2; 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

Mathematics-Content.4.OA.3; 4.MD.1; 4.MD.2; 5.OA.3 **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-PS3 **Social Studies Standards:** SS.EC.2.4; SS.G.3.4

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