

## **Week Four Environmental Project: Pollinators**



### **Pollinators are Important**

Probably the most common identified pollinators recognized by the public is honeybees and butterflies. The goal for this activity is to discover how many pollinators may be present in your backyard.

Pollinators come in all shapes and sizes. North Dakota has about 150 species of butterflies, more than 1,400 moths, and an unknown number of bee species. Insects represent the largest share of pollinators but other means are also involved in this important process. Bees both managed and native are the primary pollinators – However, 100,000 invertebrate species also serve as pollinators.



According to NCRS bulletin in 2005, pollination is an ecosystem process that has evolved over millions of years to benefit both flowering plants and pollinators. Pollinators visit flowers for many reasons, including feeding, pollen collection, and warmth. When pollinators visit flowers, pollen rubs or drops onto their bodies. The pollen is then transferred to another flower or a different part of the same flower as the pollinator moves from one location to the next. This process is a vital stage in the life cycle of all flowering plants and is necessary to start seed and fruit production in flowers. Not only do pollinators provide essential services in nature, they are also necessary for healthy, productive agricultural ecosystems as they ensure the production of full-bodied fruit and fertile seed sets in many crops.

According to the NCRS Fact Sheet 2019, North Dakota is the No. 1 honey-producing state in the nation. In 2018, North Dakota bees produced over 38 million pounds of honey valued at over \$71 million. The significance of the honey bee is both ecological and economical as estimates show that honey bees pollinate close to \$15 billion in crops annually. As the honey bee travels from plant to plant, the previous flower's pollen is transferred allowing these plants to produce their seeds and fruits. Without pollination, we would experience a detrimental loss in crops ranging from berries, melons, fruits and nuts to herbs and vegetables; which would in turn, increase the cost of food and the decrease the quantity available to feed our families.

### **Interesting Facts About Common Pollinators**

#### **Butterflies**

The Painted Lady and Monarch Butterfly have four generations a year. Except for the overwintering adult, adults only live a couple weeks. The butterfly awakens in the spring and finds a mate before it migrates north, lays its eggs in early spring, and then dies. The 2<sup>nd</sup> generation butterfly lays eggs in mid-summer and then dies. The 3<sup>rd</sup> butterfly lays its eggs in late summer and dies. The 4<sup>th</sup> generation butterfly will live four to five months. It will hatch and fly south and hibernate in a warmer climate until spring.



## **Honey Bee**

The honeybee has an extensive organization for adult bees. They may be workers, queens, or drones as the hive needs. A hive only has one queen and only another queen will be developed when the hive is too large or it needs a new one. A queen develops in the shortest time about 16 days and may live three to four years. Workers develop in 21 days and may live a couple weeks while drones emerge in 24 days and die after they mate.

Honeybees have a system of communication. Bees go out each day in search of a pollen source. When a source is found, the bee will return to the hive and create a signaling flight pattern near the hive that tells other bees where to go. Honeybees are active year around even in cold climates. They make short trips out of the hive even in cold weather.

## **Bumble bee**

Only new queens (produced at the end of the summer) overwinter. In the late summer and fall they mate (the males die) and the queens feed heavily on late summer and fall flowers such as asters and goldenrods. The queens then seek out protected overwintering sites in stonewalls and fallen trees. Many of these sites are in the forest edge. In the early spring, queens emerge from their overwintering sites and search for nest sites. Nest sites are often abandoned rodent or rabbit burrows that the queens find by smell. The queens lay fertilized eggs, incubate them and keep them warm with their body heat. When the eggs hatch, the queens forage for pollen and nectar on early spring flowering trees and shrubs and early blooming herbaceous wild flowers. The queen raises her daughters through several larva stages, a pupa stage and upon completion of this stage they metamorphose to worker bees, in a month to a month and a half. These workers are generally very small as the queen was only able to provide them with limited food. With the first batch of mature daughters the queen forages less and less and instead stays in the nest and rears more daughters. The mature daughters become the foraging force.

Throughout the summer more mature daughters emerge and so the colony grows in numbers and the workers also become larger as their food limitation becomes less. By mid-summer, the queen not only lays eggs destined to become daughters, but also lays eggs that will become males or drones. The late summer males and females that emerge leave the nest and mate. The males die and the large females which are destined to become next years queens feed heavily in preparation for hibernation in overwintering sites. The old queen does not usually live past the late summer or fall.

– Frank Drummond, University of Maine: August 2019 Bee Health, E-Xtension

## **Other Pollinators**

The vast majority of moths are nocturnal, and some are very important pollinators of night-blooming flowers, particularly in desert regions of the southwestern United States and Mexico.

Flies and beetles are two important groups of native pollinators. Some flies resemble bees because they mimic bee coloration and patterns, allowing them to evade predation. Bees and flies both have transparent, membranous wings, but can be distinguished from one another because flies have two wings, while bees have four. Some pollinating beetles are quite small and difficult to see, resembling black specks on flowers, while others are large and colorful.



Hummingbirds feed on nectar from wildflower blossoms and flowers of many species of shrubs and vines. Hummingbirds pollinate as they drink nectar from flowers. Hummingbirds will try to feed at any flower with nectar, no matter what its shape, color, size, or position. Insects, such as mosquitoes, gnats, fruit flies, and small bees form a large part of hummingbirds' diets. They also eat tree sap, spiders, caterpillars, aphids, insect eggs, and willow catkins. Hummingbirds derive water from the nectar and insects consumed, and so do not require a source of water for drinking. However, they will bathe in water, if it is available.

### **Bee-ware**

The decline of the honey bee is serious. It is estimated that the number of colonies has diminished by almost 50% in the United States. The decline of bees is due to a combination of disease, pesticides, invasive species, and climate change. The population decline of honey bees started in this country in the mid 1980's when two new parasitic mites were introduced. Most of our bees have pretty good resistance now to one of these, the tracheal mite, but there are still some bees killed by them. The Varroa mite continues to kill our bees. However, a recent phenomenon referred to as "colony collapse disorder" has been reported to kill many hives in 2006 and 2007. The set of symptoms includes rapid dwindling of the population, resulting in just a handful of bees, a queen and no dead bees around the hive. Much brood and honey may be present. It remains to be seen if this problem will persist. Similar phenomenon have been observed in the past and referred to as "disappearing disease" but no one has determined the cause.

– Greg Hunt, Purdue University: August 2019 Bee Health, E-Xtension

### **Nectar corridors**

The migration of pollinators, including monarch butterflies and some bat and hummingbird species, is a significant phenomenon. Certain species migrate over paths that stretch thousands of miles while pursuing blooming plants — north to south in fall, south to north in spring. To ensure the survival of migratory pollinators, three types of habitat needs must be considered. These are summer breeding and foraging areas, secure overwintering sites, and between the two, nectar corridors and rest stops. Nectar corridors are patches of nectar-rich plant habitat, which act as step-ping-stones for the pollinators on their long migratory journeys. Due to development and land use changes, many nectar corridors are no longer intact. Migrating pollinators must attempt to survive their journey through scattered habitats that contain little food. The lack of fuel (nectar) along migratory routes is much to blame for dramatically decreasing populations of migratory pollinators.

### **Plants Too?**

Native plants are adapted to the local climate, soils, and the native pollinators with which they co-evolved. Native plants should comprise at least 75 percent of a habitat area. Invasive species should not be planted because they will degrade pollinator and other wildlife habitat by interfering with the natural structure and composition of the ecosystem.

### **References and Resources**

The Life Cycle of a Honey Bee: [www.Wikipedia.org](http://www.Wikipedia.org)

The Life Cycle of a Monarch Butterfly: [www.monarchbutterflyusa.com](http://www.monarchbutterflyusa.com)

The Life Cycle of a Painted Lady Butterfly: [www.earthsbirthday.org/butterflies](http://www.earthsbirthday.org/butterflies)

Entomology Curriculum National 4-H website; [www.4-h.org/](http://www.4-h.org/)

The Butterfly Site: [www.thebutterflysite.com](http://www.thebutterflysite.com)

**North Dakota Game and Fish:**

[https://gf.nd.gov/wildlife/pollinators#:~:text=In%20North%20Dakota%2C%20the%20principal,bee%20species%20\(probably%20hundreds\).](https://gf.nd.gov/wildlife/pollinators#:~:text=In%20North%20Dakota%2C%20the%20principal,bee%20species%20(probably%20hundreds).)

Natural Resource Conservation Service, Wildlife Habitat Council: 2005 Fish and Wildlife Habitat Management Leaflet, Number 34

**E-Xtension**

<https://bee-health.extension.org/what-is-the-life-cycle-of-the-bumble-bee/>

<https://bee-health.extension.org/honey-bee-biology/>

**NDSU Extension**

<https://www.ag.ndsu.edu/publications/lawns-gardens-trees/bee-utiful-landscapes-building-a-pollinator-garden>



[www.ag.ndsu.edu/extension](http://www.ag.ndsu.edu/extension)

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## Let's Build a Butterfly House.

Butterfly houses are easy and fun to build. However, there is no proof that butterflies use them. They are displayed for ornamental purposes. But, a challenge might be to build one that some pollinator may use.



Butterfly houses can be painted brightly to enhance the colors of the flowers in the garden. To best serve wildlife, natural materials are preferred and the wood would not be treated when constructing a shelter or feeder.

I repurposed some materials that I had on hand so the measurements I used are not a standard pattern of measurements but it still looks fine.



### **Materials Needed:**

- 1 -8 by 24 inches board or piece of plywood for face (size can vary)
- 1 -5 ½ by 22 inches board (back)
- 2 -3 ½ by 20 inches boards (sides)
- 2- 1 by 5 or 6 inches boards 8 inches long (roof)
- 1 – 1 by 3 ½ inches board five inches long (bottom)
- 1 – 2 by 2 inches board one foot long (stand mount)
- Air Brad Nail Gun with 1 ½ brads or 1 ½ inch outdoor deck screws (6 screws if air nail gun is used.)
- 2 – 2 inch common nails
- A 3/8 inch wood spade bit
- A 5/8 inch wood spade bit
- Strips of small wood to place inside or pieces of small branches
- Safety Glasses



### **Construction:**

1. The front of the butterfly house is the most work. First, the peak of the butterfly house is drawn out so it can be cut. If you have a saw that will cut 45-degree angles, mark the midpoint of the board on the top and place in saw bed to make the cut. For use of a jigsaw, mark the midpoint of the board. A 45-degree square is placed on the half mark to allow one to draw the 45 degree roof. The straight edge of the square is used as reference to draw the correct angle.
2. Once the peak of the roof is drawn on the face, the same can be done to the back of butterfly house. The peak of the roof is cut.



3. The top edge of the sides can have a 45-degree cut made to match the roof slope to fit tight. This is not necessary but may be an additional step desired for a fair project.



4. Next, the roof boards are cut for the peak. Each roof board peak is cut at a 45 degree angle so the roof boards fit tightly together at the top

5. The slots in the front of the house can be measured out. There is no preferred design and that is totally up to the builder. For this build, the two bottom slots are marked  $1\frac{1}{2}$  inches from each side and 4 inches from the bottom. (bottom is the top in the photo) The length of the slot on this build is 4 inches. The end of the first slots is marked  $1\frac{1}{2}$  inches from the side and 8 inches from the bottom.



6. For the center slot, a mark is placed on the center of the width of the board and  $8\frac{1}{2}$  inches from the bottom. The top of the slot is measured at width midpoint and  $12\frac{1}{2}$  inches from the bottom.

7. The bottoms of the top slots are marked  $1\frac{1}{2}$  inches from each side and  $12\frac{1}{2}$  inches from the bottom. The top of the top of the slots in this build are 17 inches from the bottom.



8. The slots can be cut with a router or using a drill and jigsaw. For jigsaw, a  $3/8$  wood spade or other drill bit is used to drill a hole on the marks of the slots. A pencil and straight edge is used to draw a line to guide the cut from the outer edges of the bottom hole to the outer edges of the top hole of each slot.

9. Any rough spots can be sanded or a rasp can be used in the slots. After completing the slots, the house is ready to put together. The exterior wood can be painted or stained at this point or after assembly.

10. The sides are fastened to the front with the air nail gun or screws. One side must have the pole mount 2 by 2 inches piece wood fastened to it before it is put together. The 2 by 2 inches board must have a  $5/8$  inch hole drilled 8 inches lengthwise into the bottom end for a  $1/2$  inch piece of conduit. The mount is fastened from inside the house with  $1\frac{1}{2}$  screws above the hole drilled lengthwise inside the mount on either side of the house or if you prefer, the back. However, if it is fastened to the back the design of this build uses the back as a clean out door.



11. Once the mount is fastened, the side can be put on the house. The sides are fastened to the back of the face, not along-side. With the sides fastened to the face, the roof and bottom are fastened.



12. The back fit is checked for any trimming. It should fit inside the walls and under roof. The length can be trimmed, not the V of the roof. Next, predrill two screw holes on the side wall near the bottom to fasten the back door. The two screws are put into the bottom side walls loosely so the back will hinge out. Then, a  $1\frac{1}{2}$  inch deep hole for a common nail is drilled near the top of the each sidewall of the house into the back door. A common nail will be used on each side of the door to hold it shut. The nail should fit loosely and leave  $1/2$  inch exposed.

13. The last step is to put a screw into the top of the back door to use as a knob to open the door and add something for butterflies to sit on. The 1 ½ inch screw is screwed into the door near the peak leaving approximately a half inch protruding to use in opening the door. For a butterfly perch, I staple some waste wood to the back door and place some long weathered dead branches into the house.

14. All that is left is to paint the house or push a piece of 6 feet long ½ conduct into the flower bed and set it up. The house should be on a short pole as wind storms will tip them.



### **Mason Bee House**

Mason bee houses are simple to build. The house consists of chambers drill 6 inches into a piece of wood. Generally, the interesting thing about the bee house is the bees will lay eggs in the chamber in fall to hatch the next spring. The person placing the bee house will need to put the house in a dark tub over winter. The tub should have a hole cut into it so they can escape when they hatch. The bees can take up to two years to hatch. In the spring after the hatch, the house is burned or cleaned to reuse.



Only natural materials can be used as moisture and disease are the first concern of the nesting bees. Predation by woodpeckers and flickers are a concern with the bee house. They have long beak and tongue to reach deep into holes. A wire mesh will need to be placed over the entrance to the mason bee house to prevent the birds from getting the bee larvae.

### **Materials Needed:**

- A 4 by 4 inches block of wood seven inches long (not treated)
- 2 pieces of 1 by 6 inches 10 inches long for roof. (45 degree cut peak) or
- 1 – board 1 by 6 inches and 1 – 1 by 4 inches (without cutting) 10 inches long.
- 1 – 2 by 2 inches 10 inches long for mounting stand
- A 5/16 inch spade bit for drilling nest chambers
- A 3/8 inch spade bit to drill hole in mounting 2 by 2 inches board
- One foot square of wire mesh for bird guard
- A drill press (preferably)
- A cordless drill with driver bit
- 6 – 1 ½ inch screws (The roof can be air gun nailed with brads)

### **Construction:**

1. The piece of 4 by 4 inches of wood seven inches long is cut to six inches long. Next, assuming the piece of wood has a square end to sit on while drilling, the piece is set up on a drill press to prepare drilling the nesting chambers. It must allow one to drill perfectly vertical. The holes should be at least ¼ inch apart. However, there is no set numbers of holes to drill.
2. The nesting chambers are drilled lengthwise through the wood and must be drilled straight. The bit will sometimes want to follow the wood grain out.
3. If the house is going to be burned, the backdoor option can be skipped. The block would remain 7 inches long for the no door option. For the clean out door, an inch is cut off the back of the house to be used as a cover. Two screw holes can be predrilled through the piece in a location so they do not interfere with a nesting chamber. The cover is put on and fastened with the screws.



4. The roof of the house and bird guard are fastened to the house. The roof boards are put into place and the back screws (or air gun brads) are secured. Before the front screws (or air gun brads) are secured, the wire mesh bird guard must be cut and put in place. Woodpeckers have long bills and tongues so a guard must be placed across the entrance that is at least an inch away from the entrance.



The mesh should be at least ¼ inch and stiff. The guard should be fitted to have top two edges under the roof and one edge long enough to staple a supported 3<sup>rd</sup> edge to the house. Once the guard is fitted to the house, the lip is tucked under the roof, formed and fastened. The guard needs to have about an inch of space from the screen to the entrance and the wire stiff to prevent the birds from compressing it.

5. Paper straws (not plastic) are placed into the nesting chambers and trimmed. These are to better be able to clean them. They should fit the holes and not be much smaller.
6. Mounting the house can be a challenge depending on the shape of the house. The house needs to be standing firm and not hanging. This build has the house rotated and required a 2 by 2 inches piece of wood to attach. The end is drilled with a 3/8 inch spade bit 6 inches deep with the mounted end cut at 45 degrees. The mounting holes are pre-drilled and care is taken to miss the nesting chambers. If the house does not have the clean out door, the mount can be fastened on the back or in the last inch of the house. The house is placed on a 3/8 rod or round step in fence post in the landscape when finished.
7. Once you have nesting bees, they will go dormant sometime during late October. After the first hard freeze, it should be safe to put the house in the tub. You may check the nests in June of the next year to examine them for hatching and clean out.



The house can be any length or size and mounting is made easier on a larger piece of wood. This is just what I had for repurposing and to give you an idea of what you need if you want to do a project.

