



Pollinator Power

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Table of Contents

Pollinator Power	3
Bats	4
Bees	5 - 6
Beetles	7
Butterflies	8
Flies	9
Hummingbirds	10
Moths	11
Wasps	12
Pollinator Habitats	13 – 14
Providing for Pollinators	15 - 16
Pollinators in Peril	17
Pollinator Programs	18 – 19
Color the Pollinators	20
Websites and Apps for Pollinator Information	21
Sources for Seeds for Pollinators	22
Houses for Pollinators	23

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Pollinator Power



Insect and Animal Pollinators – ants, bats, bees, beetles, butterflies, flies, hummingbirds, moths, and wasps - have the power to fill our world with flowers and to make or break our food supply.



The pollinators visit flowers mainly in search of food in the form of nectar. Seeking shelter and searching for nest-building materials and potential mates may also be noted as reasons for visiting the flowers.

Some pollinators, such as bees, visit the flowers specifically to collect pollen and in the process transport pollen to other flowers. Butterflies, birds, beetles, moths, bats, and other pollinators move pollen strictly by coincidence in their quest for nectar.

Pollen sticks to the bodies of the pollinators as they are feeding or drinking the nectar in the flower blooms and is transferred to other flowers, resulting in pollination of those flowers. Visits from bees and other pollinators result in larger, more flavorful fruits and higher crop yields.

Good pollinators like to travel – moving pollen around as they go. Good pollinators are hairy – the more hair, scales or feathers a pollinator has the more pollen sticks to its body and is transferred to other flowers. Good pollinators have specialized mouths – tailor-made for collecting pollen.

80% to 90% of all the flowering plants on Planet Earth are pollinated by these insects and animals. Some authorities assert that over 75% of the world's staple food crops depend on the actions of these pollinators for successful production. Others make the claim that one out of every three bites of the food we consume is the result of the efforts of the pollinators. Interestingly, not only does the human species depend on the pollinators for the production of our food supply, but other animal species are just as dependent on these pollinators for their food supply and for the physical well-being of their habitats.

Healthy ecosystems depend on pollinators. Over 1,400 food crops and 180,000 different types of plants are pollinated by insects and animals. These plants not only beautify our world, but also supply oxygen, stabilize our soil, assist in cleaning our air and water, and support wildlife.

The Power of Pollinators is highlighted in a 2014 United States Presidential Memorandum which states: “Over the past few decades, there has been a significant loss of pollinators, including honey bees, native bees, birds, bats, and butterflies, from the environment. **The problem is serious and requires immediate attention to ensure the sustainability of our food production systems, avoid additional economic impact on the agricultural sector, and protect the health of the environment.**”

It is a known fact that plants and pollinators cannot exist without one another. If one should disappear, the other is only one generation from disaster. As good stewards of the Earth, we must step up our efforts to conserve and protect the pollinators in our own little slice of the world and focus on educating and motivating others to assist in the effort.

Pollinator Power is a vital, essential component in the well-being of healthy ecosystems worldwide. Without pollinators, the human race and all of earth's terrestrial ecosystems as we know them would not survive.

Bats – Acrobatic Pollinators



BAT FACTS

- Bats are flying mammals.
- There are over 1000 different bat species.
- Bats are nocturnal (active at night).
- Bats can live over 20 years.
- Bats are the only mammals capable of flight!
- Bats find shelter in caves, crevices, tree cavities and buildings.
- Scientific Name: *Chiroptera*

DIET

- 70% of bats consume insects, making them a large part of natural pest control.
- There are also fruit eating bats and nectar eating bats.
- Some bats are carnivorous and prey on small mammals, birds, lizards, frogs and fish.
- The most famous blood-sucking bats are from South America.
- A single little brown bat can eat up to 1000 mosquitoes in one hour!

POLLINATION

- **Bats are very important pollinators in tropical and desert climates.**
- Bats use echolocation (the location of objects reflected by sound) to find flowers.
- Most flower-visiting bats are found in Africa, Southeast Asia, and the Pacific Islands.
- Bats tend to like flowers that give off strong scents or offer bright colors. These flowers also seem to have lots of nectar offered in them.
- Flowers that rely on bats for pollination produce a musty, rotten odor to attract them.
- Bat flowers are often white or light-colored in an attempt to stand out against foliage or the night sky. The flowers open up at night and are usually large in size and pale or white in color.
- Birds and bees take the day shift on pollination and the bats take the night shift.
- Over 300 species of fruit depend on bats for pollination. These fruits include mangos, bananas and guavas.
- Since many bats are migratory in nature, they can carry the pollination process great distances.
- 500 flower species from at least 67 plant families rely on bats for the majority of their pollination.
- One species of nectar-feeding bat has the longest tongue relative to its size of any mammal in the world! This bat is from South America and it is only the size of a mouse, but its tongue is 8.5 cm long – 150% of its body length! It's an *Anoura fistulata* and it is very rare. It keeps its long tongue in its chest in a cavity between its heart and sternum!

OTHER WAYS OUR BAT FRIENDS HELP US

- Bugs bugging you? The 20 million Mexican free-tail bats from Bracken Cave, Texas can eat 250 tons of insects in a night!
- The Vampire bat might help scientists. The saliva from the vampire bat is being studied to see if someday a new medicine can be found to help people with heart problems.

We can protect bats by telling others how helpful and useful they are. But remember, bats are wild animals and you should never touch them! You must leave them alone!

Bees – Champion Pollinators



There are about 25,000 known species of bees in the world – and there are probably more to be discovered.

Bumble Bees

Bumble bees are members of the genus *Bombus* which means buzzing or humming in Latin. In England they were also called humble bees. In the Northern Hemisphere there are over 250 species and some also occur in South America.

Bumble bees are the only bees that use “buzz pollination.” The bee grabs the flower and produces a high-pitched buzz by vibrating its wings very quickly. This shakes out the pollen. By giving off good vibrations, bumble bees change the world one plant at a time!

Tomatoes are pollinated by “buzz pollination.” Bumble bees also pollinate beans, peas, and raspberries among other plants. **In agriculture they are used to pollinate 25 crops in over 30 countries.** They also pollinate some wildflowers.

Bumble bees appear early in the spring and work until late fall. A bumble bee colony is started fresh each year by a queen that overwintered.

Bumble bees prefer warm, dry, cavities for their nests and will use spaces in brush piles, rock piles or even grassy areas left to grow taller. A queen may even choose an old bird’s nest or a vacant building.

Bumble bee nests are a collection of wax cells where the larvae develop. The pollen that bumble bees collect from flowering plants is used to feed the larvae. Bumble bees do not make honey.

Bumble bees do not swarm and are usually not aggressive. Only females can sting and they rarely do unless very threatened.

Bumble bees are larger and hairier than honey bees. With this extra insulation they can live in colder climates and can come out of winter hibernation earlier. Unlike honey bees, they are able to forage in cold, rainy and cloudy conditions.

Recently, scientists have noticed a decline in populations of bumble bees such as seen with honey bees. They suspect the reasons are loss of habitat, use of pesticides and the introduction of non-native pathogens. **Bees are important indicators for the health of the environment. When something is wrong with our bees, something is wrong in the environment!**

Gardeners can help bumble bees and other pollinators by leaving areas “wild,” planting nectar-rich plants for a long succession of bloom, and not using chemicals.

Greenhouse growers used to rely on manual pollination, a time consuming, labor intensive process. With the discovery of “buzz pollination” there is a huge growth of bumble bee pollination in greenhouses.

Research suggests that honey bees working together with bumble bees are better able to pollinate blueberry crops and ensure higher yields, while some solitary bees such as leafcutters and mason bees are first-class pollinators for other crops.

Of the 100 crop species that provide 90 per cent of the world’s food, over 70 are pollinated by bees.

Bees – Prolific Pollinators



Mason Bees – Honey Bees – Leaf Cutter Bees

Megachilidae are more commonly known as Mason Bees or Leaf Cutter Bees.

They are among the most efficient pollinators in the world.

150 Mason or Leaf Cutter bees can be equally as productive pollinators as 3,000 Honey Bees.

Mason Bees are hardier than honey bees and have a complete immunity to infestations of the different mites.

Mason and Leaf Cutter Bees must have mud to propagate and survive.

During a nectar flow, one honey bee hive may contain over 80,000 bees and the majority of them will be gathering nectar and pollen.

80% of all plants rely on insects and animals for pollination and 90% of that 80% is done by honey bees.

Honey bees communicate by dancing. They can tell the other bees the location of a blossom over 2 miles away or tell the queen the location of a new possible home during a swarm.

Honey bee hives are made up of one queen, a few drones, (males who only mate and eat) and tens of thousands of worker bees (females who do all the work).

Honey bee queens can live up to 3 to 4 years while the drones and workers usually live only 25 to 30 days - but can live up to 6 weeks. Mason and Leaf Cutter bees live only about a month not counting their time in the cocoon.

Honey bee queens mate only once at exactly 20 feet above the ground with a drone from another hive and can produce as many as 2,000 eggs a day during a nectar flow and over 1,000,000 during her lifetime!

Drones only have one job - mate with a queen from another hive and then die during this process. All drones are thrown out of the hive during the winter to preserve the honey and pollen for the workers to survive during the cold months - not a good retirement plan.

The Department of Agriculture is working on a super honey bee that will be extremely resistant to all mites. There are super bees already and the plan is to seek them out and propagate them.

Most bee keepers have known for quite some time that the COLONY COLLAPSE DISORDER of the honey bee has been a direct result of the introduction of the pesticide neonicotinoids. The honey bee can overcome the mites, viruses, and other pesticides, but the neonicotinoids work on the nervous system and that is why the bees can't find their way back to the hive.

There are about 60 different brand names that contain neonics, so be sure to check your pesticide labels. Bayer uses an unusually strong formula that came on the market the same year the colony collapse disorder exploded.

Honey bee hives multiply by swarming, a process where, when the hive is overcrowded, the queen leaves with half the workers and finds a new place to live. The old workers put royal jelly on a half dozen pupae to make new queens. When the first one hatches she kills all the others before they hatch. Only one queen is allowed per hive!

Beetles – Colorful Pollinators

There are over 30,000 species of Beetles in the United States and they spend a great deal of their lives on flowers.

Beetles contribute to the pollination of 88% of the quarter-million flowering plants worldwide. Because of their vast numbers, they are the largest overall set of pollinators.

Beetles are not as awe-inspiring as butterflies or hummingbirds to most of us, yet they play a major part in pollination.



Although beetles are the largest order of insects, they are not considered as important to pollination in temperate regions as they are in the tropics. However, it is estimated that there are 52 native plant species pollinated by beetles in North America alone.

Beetles drop pollen as they meander their way through plants but just are not as efficient as other pollinators we know. The mighty magnolia, peonies, and yellow pond lilies are a few examples of horticulture pollinated by beetles.

Beetles are one of the oldest forms of insects – as verified by fossil records. Some forms of beetles have remained unchanged since the beginning of their existence on Planet Earth.

Beetles have a hard exterior and are identified as having 2 pair of wings; the top pair protects the bottom pair which is responsible for flight. They all have 6 legs and 3 body parts: head, thorax, and abdomen.

Beetles rely on their sense of smell for feeding and finding a place to lay their eggs. Beetles are attracted to dull white and green flowers with scents ranging from almost no scent to large and highly scented fruity flavored flowers or flowers with a foul smell.

There are no crops in the U.S. known to be pollinated by beetles except for the native pawpaw.

Beetles thrive and play a major role in the habitat in which they live. With the exception of the freezing polar regions, they live worldwide on most land and freshwater areas.

Beetles are omnivorous, mainly consuming debris from plants and animals. They rely on their sense of smell for feeding and finding a place to lay eggs.

The U.S. Forest Service states that research has shown that beetles see colors, but sight is limited to a few colors and red is not one of them. Some beetles see ultraviolet light but do not use it as a source to obtain food like bees or butterflies.

Since their habitat range is so vast and their food source plentiful, the average life span of a beetle is 3 years as opposed to a butterfly's life span of 2 weeks.

Some beetles eat parts of plants and therefore do damage. Japanese beetles devastate flowering trees and plants; Cucumber beetles do a lot of damage to some crops on farms and in gardens.

Through the process of Carpet Beetle Integrated Pest Management (IPM) the benefits and risks for the farmer to control the number of these beetles are assessed so the outcome will be less damage to plants and crops.

Beetles are not an endangered species, but before you are tempted to step on the next one you see, think of their beauty and their amazing ability to pollinate.

Butterflies – Graceful Pollinators



Butterflies are found on every continent but Antarctica.

There are over 20,000 species of butterflies (*Lepidoptera*) in the world.

725 species of native butterflies exist in North America.

Butterflies range in size from a tiny 1/8 inch to almost 12 inches.

Butterflies taste with their feet.

Butterflies can only fly if their body temperature is between 82 and 102 degrees. If body temperature is higher, they need to cool down before they can fly.

The smallest butterfly is the Pigmy Blue and the largest butterfly is the Queen Alexandra Birdwing, with a wingspan of 12 inches.

Adult butterflies rely almost solely on nectar for food.

Native butterflies prefer brightly colored blooms of red, purple, yellow, and orange, but will frequent other colors if the plants are in a cluster - an example would be five or seven of the same plant in one area. Wildflowers are a valuable source of nectar for pollinators.

Most butterflies are limited to only one plant species or to a few closely related plant species that successfully serve as host plants for the caterpillars. Eggs must be laid on or near the host plant in order for the caterpillar to survive. Caterpillars feed on the leaves, stems, flowers, or fruits of their host plants.

Butterflies require both nectar and host plants for their survival and for the survival of future generations of butterflies. A comprehensive list of host and nectar plants for butterflies can be found at www.gardenswithwings.com

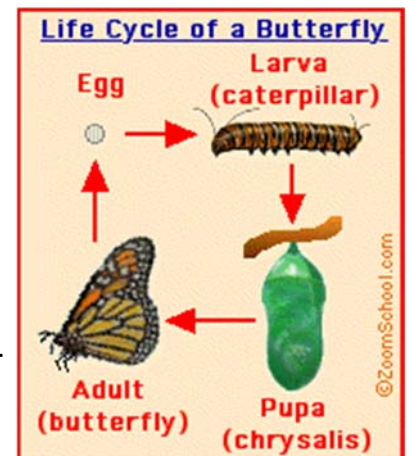
In their role as a pollinator butterflies transfer pollen grains from the male part of the flower to the female part of the flower, thus assisting the flower to produce seed for the next year. Pollination is necessary for a plant to produce seed, fruit or vegetables.

Life Cycle of a Butterfly

Butterflies and moths undergo complete metamorphosis in which they go through four different life stages.

- **Egg** - A butterfly starts its life as an egg, often laid on a leaf.
- **Larva** - The larva (caterpillar) hatches from an egg and eats leaves or flowers almost constantly. The caterpillar molts (loses its old skin) many times as it grows. The caterpillar will increase up to several thousand times in size before pupating.
- **Pupa** - It turns into a pupa (chrysalis); this is a resting stage.
- **Adult** - A beautiful, flying adult emerges. This adult will continue the cycle.

Source: EnchantedLearning.com



Just when the caterpillar thought the world was over, it became a butterfly.

Flies – Overlooked Pollinators



Flies are often overlooked as pollinators, but they deserve our attention for their role in the pollination process.

According to fossil evidence from at least 150 million years ago, long before bees appeared on earth, plants were being pollinated by flies and their relatives, such as gnats and mosquitos.

Many species of plants still rely totally or in part on flies for pollination. Depending on location, plant shapes, and weather conditions, flies may be the main or only pollinator or share pollination duties with bees and other pollinators. Some flies may look similar to bees. The most obvious difference is the number of wings. Flies have only one pair of wings, while bees and wasps have two pairs of wings.

Plants use two general types of fly pollination: myophily, where flies visit flowers to feed on pollen and nectar, and sapromyophily, where flies are attracted by putrid odors that mimic their favored food, including rotting meat, decaying plants and feces.

Common characteristics of flowers that are pollinated by flies include pale and dull colors, putrid odors, no nectar guides, pollen production and flowers shaped to funnel or trap flies.

Unlike bees which must provide food for the hive, adult flies feed only themselves. Their low energy needs allow them to remain active at lower temperatures than bees and other well-known pollinators. This means flies are particularly important pollinators in arctic and mountainous areas. In more temperate areas, flies are often the only active pollinators on cold, windy and cloudy days.

Flies are abundant almost everywhere on earth. The diversity of the over 160,000 species of flies contributes to their effectiveness as pollinators. Some species have developed to feed on and pollinate a single plant species, while other flies visit a wide variety of plants.

Among the pollinating flies, hover flies are the reigning champions. The roughly 6,000 species known worldwide are also called flower flies because of their connection with flowers. Hover flies are the workhorses of the orchard, where they help pollinate a variety of fruit crops: apples, pears, cherries, plums, mangos, apricots, peaches, strawberries, raspberries, blackberries, and many herbs and vegetables.

Flies are also important pollinators of many tropical plants, such as certain orchids and chocolate. The cocoa tree, (*Theobroma cacao*), the source of chocolate, is pollinated entirely by a tiny fly relative called a midge.

Other pollinator flies include some carrion and dung flies (which pollinate pawpaws), tachinid flies, bee flies, small-headed flies, March flies and even blow flies.

Most people know how important bees are as pollinators, but far fewer people realize that flies are the second most important pollinators. Although flies often are not as efficient pollinators as bees - as bees struggle to overcome the effects of climate change, colony collapse and neonicotinoid poisoning, flies are likely to become even more important as pollinators.

Hummingbirds – Enthusiastic Pollinators

Hummingbirds are small, colorful birds with iridescent feathers.

Their name originates from the fact that they flap their wings so fast (about 80 times a second) that they make a humming noise.

Hummingbirds can fly in all directions - right, left, up, down, backward, even upside down.

They have a specialized long tapered bill that is used to acquire the nectar from long tubular flowers.



Flowers are the main source of food for hummingbirds. Hummingbirds drink nectar, a sweet liquid inside certain flowers. They are attracted to scarlet, orange, red, white, or bright pink tubular-shaped flowers with no distinct scents. An alternative food source other than native plants is the use of sugar-water in feeders.

Hummingbirds are attracted to flowering plants, but they need more than just nectar. For protein, they eat tiny insects, such as mosquitoes, gnats, fruit flies and small bees, as well as spiders, aphids, caterpillars and tree sap, thus providing an important natural pest control for our gardens.

Hummingbirds are found only in the Western Hemisphere and are located from southeastern Alaska to southern Chile. There are more than 300 species, 17 of which summer in North America and winter in the tropics. Most of the 300 species of hummers live in Central and South America.

About 26 species of hummingbirds visit the United States during part of the year and 17 breed in the U. S. Most hummingbirds that breed in North America overwinter in Mexico.

Hummingbirds take epic flights that follow the coasts, the spine of the Rockies, or even across the Gulf of Mexico, in an 18 to 22 hour, non-stop flight to their winter habitats, reversing the migration route in the spring. Their flights north correspond to the flowering times of native plants at their destinations.

Hummingbirds are important and enthusiastic pollinators as they move from plant to plant incidentally carrying pollen as they are sipping nectar from the flowers. They pollinate the native wildflowers in parks, along roadsides and in home gardens.

Scientists are finding disturbing changes to blooming times of flowers as well as the arrival times of hummingbirds. The potential mismatch of nectar sources and the arrival of the hummingbirds could prove disastrous to the hummers. The lack of food along migratory routes is much to blame for the dramatically decreasing populations of migratory pollinators including not only hummingbirds, but monarch butterflies and some bat species.

To attract hummingbirds to your garden:

- Plant brightly-colored flowers with a tube shape and different blooming times (early, mid and late summer).
- Include flowering native plants.
- Provide clean, hummingbird feeders free of honey, food coloring, fruit juices and artificial sweeteners.
- Provide trees, shrubs and/or vines for perching, shelter, shade and nesting cover.
- Avoid chemicals in your yard as much as possible.

It should be noted that hummingbirds will try to feed on any flower with nectar, no matter its shape, color, size or position.

Moths – Nocturnal Pollinators



There are more than 100,000 species of moths. They are grouped into various families, according to common physical features:

- Owlet and Underwing Moths
- Tiger Moths
- Measuring Moths
- Tussock Moths
- Hawk Moths
- Giant Silkworm Moths
- Royal Moths

Most moths are nocturnal and have wings covered with dull-colored scales that are covered with a fuzzy thick coat to help keep them warm at night when the weather is cold.

Moths are important in pollination of certain flowers. Some flowers that only bloom at night are highly dependent on night-flying moths for pollination.

Most flowers pollinated by moths are pale-colored or white, have long tube-like petals, and produce a strong, sweet scent.

Moths are distinguished from butterflies by their antennae. Butterfly antennae are simple with a swelling at the end. Moth antennae may be simple to featherlike, but never have a swelling at the end.

In addition, butterfly bodies are not very hairy, while moth bodies are hairy and more stout.

In order to camouflage themselves, certain moths look like the bark on a tree, or leaves of a tree. Some moths have markings on their underwings that resemble the eyes of a large animal.

Similar to the butterfly, the life cycle of a moth involves 4 stages of development: egg, larva, pupa, and adult.

Most moths live in the rain forests, where there are thousands of different food plants available.

The Luna moth is one of the largest and most beautiful moths in North America. Its name comes from the Latin word for the moon. An adult Luna moth does not have a mouth, and has a life span of only one week, surviving on food stored in its body in its caterpillar stage.

Luna caterpillars feed on the following host plants: birch, alder, persimmon, sweetgum, hickory, walnut, sumac, and moonflower.

Hummingbird moths can hover and even fly backward as they zip from flower to flower. Unlike most moths, they are active during the day.

A moth can zoom through the air at speeds up to 30 miles an hour!

Some Hawkmoths have tongues longer than their bodies. The Hawkmoth caterpillar – the tobacco and tomato hornworm is a voracious eater, well-known to gardeners for its destructiveness.

Other than pollination, the best-known benefit of moths to human beings is probably the production of silk; however the caterpillar of the Silkworm moth in Costa Rica will sting, so you had better not touch it!

Wasps – Specialized Pollinators

Often overlooked as pollinators, Wasps deserve our attention for their involvement in the pollination process.



Some wasps visit flowers as pollinators, but they are not as effective as their bee cousins. Wasps lack the body hairs that bees have to trap pollen, so they are not as successful transferring pollen from flower to flower.

Wasps are usually unintentional pollinators for some plants and are only interested in flowers that produce nectar. Wasps, unlike bees, are not drawn to flowers by color and actually rely on only a few plants for nectar.

While the vast majority of wasps play no role in pollination, a few species can effectively transport pollen and are therefore, pollinators of several plant species.

There are several hard-working wasp pollinators. Pollen wasps gather nectar and pollen in a crop inside their bodies, rather than on body hairs like bees, and pollinate flowers of the penstemon and the water leaf family.

Pollen wasps are on every continent except Antarctica. They prefer hot, semi-arid or tropical climates such as the Caribbean and Southern Africa. Only 14 species of the pollen wasp call North America home.

The broad-leaved helleborine orchid relies on two species of wasps (common and European) for pollination services. The orchid releases a chemical that smells like a caterpillar infestation that lures the predatory wasps to their flowers for pollination.

The most notable wasp pollinators are the fig wasps which pollinate the tiny flowers inside the developing fig fruit. These fig wasps are the sole pollinators of fig trees and, in turn, fig wasps can breed nowhere else but inside figs. There are over 700 species of fig trees worldwide and each fig tree species has its own wasp species for pollination.

Cornell University published a study based on the manner that fig trees and fig wasps help each other. Fig wasps lay their eggs inside the fruit where the wasp larvae can safely develop. In return, the wasps pollinate the figs; however, if the wasp fails to pollinate the figs in the process of laying its eggs, the trees will drop those figs to the ground, killing the baby wasps inside.

It should be noted that most wasps are solitary nesting insects and contrary to popular belief, the majority of wasps in our landscapes don't sting humans!

Habitat Conservation and Protection for Pollinators



Habitat conservation for all pollinators is critical for continued pollinator survival and development of their habitat.

Monarch butterflies are in decline due to loss of habitat. Monarch caterpillars depend on milkweed plants for their food supply, but this habitat is disappearing due to urbanization.

Bats are subject to white-nose syndrome that is keeping their numbers in decline, and pesticides are wiping out large numbers of the bee population.

Our pollinator friends – bats, bees, beetles, butterflies, flies, hummingbirds, moths, and wasps – need assistance in the conservation and protection of their habitats.

Developing landscape plantings that provide habitat is a major way we can increase the number, longevity, and safety of pollinators. Plants provide food, specifically nectar, which is high in sugar and pollen for protein. Conserving this food source requires planting flowers in groups to increase the amount of food for pollinators. A timely planting season ensures nectar and pollen for many months during the growing season.

Plant diversity supports a variety of pollinators. The color, shape, plant height, and/or fragrance of plants attract different pollinators throughout the season. Specifically, herbs such as mint, garlic, oregano, basil, and many others are helpful to pollinators and even though they may not be native to the region, they provide habitat for larval formation for future generations of butterflies. Zinnias, sunflowers, and cosmos, are grown in many regions in the country to sustain butterflies and bees.

There is a comprehensive list of plants contained in a smartphone ‘App’ titled “Bee Smart” and on the Pollinator Partnership website (www.pollinator.org). These are free planting guides matching pollinators to helpful plants, trees and much more in most areas of the country. Based on your zip code, navigation is easy as you make your selections according to your ecoregion.

Pollinators require shelter from predators and for nesting and roosting as well as protection from the elements. We can help provide shelter by planting different sizes of trees, shrubs and plants to protect a variety of pollinators as many live at varying heights. Many species of bees nest underground and we can help them by not disturbing their entrances. Leaf litter and some decaying plants provide shelter - leave a little in your garden.

Clean water is essential for a healthy pollinator population of all species. Drinking and bathing assisted by water fountains, ponds, and small containers conserve their habitat. Larger rocks have depressions and hold small amounts of water convenient for pollinators.

Integrated Pest Management (IPM) is a practice addressing pest concerns. Minimizing pesticides protects our pollinators and helps insure their survival. **Liberal pesticide use kills the good along with the bad and will not totally eliminate the problem long term.** Be prepared to be responsible with good IPM management. Apply pesticides only for problematic species, keeping in mind it is best not to use pesticides at all.

Wetlands are an excellent source of conservation and protection for pollinators. They exist naturally in nature or can be constructed by man; they enhance the beauty wherever they are; and they function to control water, specifically flooding and recharging ground water. The habitat of a wetland contains purer water, flowers for pollination, and trees and shrubs for protection. **Building more wetlands and protecting the ones we have can be accomplished by all of us!**

More About Habitat Conservation and Protection for Pollinators

Habitat for millions of bees is underground - either in colonies or as solitary beings. Some also nest on twigs. If their needs are met for nectar and water, they are more efficient pollinators.

Trees, shrubs, and plants provide habitat for butterflies as they pollinate in gardens and edges of woods. Protection from wind and positioning a rock in the sun for resting will benefit the butterflies. Butterflies feed on wet mud for the moisture and minerals.

Moths are active mainly at night and are attracted to sweet smelling flowers that are white or pale in color. Most moths are protected by their ability to blend in to the landscape and are disguised.

Beetles are the largest group of pollinators, with over 30,000 species in the U.S. alone. Like moths, beetles are attracted to flowers by smell and many of them are found on flowers. Their habitat is all over the world except frozen arctic areas.

It is hard to imagine the fly as a pollinator, but similar to beetles, flies wander about and visit many species of plants. Fly habitat is worldwide including Antarctica. Moist habitats support greater populations. Flies prefer manure, garbage, and warm organic matter for breeding and are very prolific during their 30 day lifespan in the 2 mile area in which they dwell.

Hummingbirds are legendary pollinators using their long tongues to draw nectar from tube plants and carry pollen on their beaks and feathers. Habitat for the hummingbird is a warmer climate, but they are found in great numbers all over the Americas. Small nests can sometimes be spotted in bushes and shrubs with woody structure for protection. Hummingbirds migrate south for the winter, resting in trees and feeding on nectar producing plants as they go.

Bats pollinate in a select few regions, mainly in the habitat of the southwest desert and in the tropics. Cactus and agave are desert plants from which the bats extract pollen and nectar as they move from plant to plant. Over 300 species of fruits depend on bats for pollination – including mangos, bananas and guavas. Many bats thrive in wooded areas where they live and feed on flying insects and mosquitoes.

Many organizations are dedicated to conserving and protecting our pollinators. Several of these include the National Garden Clubs, Inc., the Xerces Society, Pollinator Partnership, Monarch Watch and the National Wildlife Federation.

By building Mason bee houses and bat houses and constructing small-scale wetlands at school sites, we can actively participate in the restoration of habitat for pollinators and other animals. Researching and planting the best nectar plants specific to the region will aid the pollinators in their relentless search for food.

The USDA Natural Resources Conservation Service (NRCS) lists 7 actions to establish and maintain a pollinator-friendly habitat on your property:

1. Use pollinator-friendly plants in your landscape.
2. Choose a mixture of plants for spring, summer, and fall, with different flower colors, shapes and scents.
3. Reduce or eliminate pesticide use.
4. Accept some plant damage on plants providing habitat for butterfly and moth larvae.
5. Provide clean water.
6. Leave dead tree trunks in your landscape for wood-nesting bees and beetles.
7. Support land conservation in your community to ensure that pollinators have appropriate habitat.

All of the pollinators play a key role in our world and, in most circumstances, it is up to us and our children to assist these pollinators in conserving and protecting their habitat – and ours as well.

Providing Plants for Pollinators

As an inaugural partner of the National Pollinators Garden Network, National Garden Clubs, Inc. advocates and encourages its members and others to plant gardens for pollinators. Pollinator gardens of all sizes are needed everywhere and needed NOW!

No space is too small. No site is too unimportant. From containers on apartment balconies, to back yards, to private gardens, to plantings in city abandoned lots, plantings on byways and rights of way, and landscapes around our schools, municipal buildings and town parking lots - pollinators need them all. **Our gardens will provide sanctuary and nourishment for our pollinators.**

In the case of the butterflies and moths, it is recommended that we plant gardens that contain both the native plants the caterpillars/larvae need to chew on¹ and the flowers they prefer as nectar sources. As their future is threatened, we should grow the plants our honeybees and native bees need to support their colonies and hives; and plant milkweeds to help our monarch butterflies on their journey south to Mexico and on their return trip north. **We should plant the specific food preference and host plants required by our local pollinators.**

The list of pollinators in your area may include butterflies, moths, bees, hummingbirds, wasps, flies, beetles and bats. **Before you begin to build your garden, become familiar with your local pollinators, and grow what they need for food and nectar.** An excellent “app” that identifies the pollinators in your area, listing their preferred host and nectar plants is the [BEESmart Pollinator Gardener](#). A list of sources for these preferred plants is available from the [Xerces Society](#).

Examine your proposed garden site to see which native host plants and nectar plants will grow successfully in your garden – as some plants prefer dry sandy sites, others wet soggy soils, some prefer to grow in the shade, and others grow in full sun. **Choose plants that will grow in your environment and plant for a succession of bloom to provide both host plant food and nectar flowers for the duration of your growing season.** Good sources for this information are the [Eco Guides](#) by the Pollinator Partnership which list the plants most suited to your ecological region.

Remember that as moths and bats tend to feed at night, they are attracted to plants with specific pale or white flowers, specific shapes, and in some cases a distinct scent. Hummingbirds prefer red and purple tubular flowers. A [chart from the USDA](#) details where to find the preferences of various pollinators for floral shapes and colors.

Many pollinators, when collecting pollen or nectar from flowers, generally visit only one plant variety and one color at a time, going from one of these to the next through the entire group before starting to feed on another group or variety. The pollinators choose plants that are best adapted to their tongue length, and their customary manner of feeding: large butterflies park and rotate around the blossom head, bees buzz about, and hummingbirds sip, rest, and sip again. **To make it easier for the pollinator, it is best to plant a good number – 8 or more - of each variety rather than planting single specimens of many different varieties.**



Certain flower forms (specifically the Daisy/Aster types – members of the Compositae Family) have great appeal to many pollinators as they have the attributes of a big box store or supermarket – for one stop shopping - wherein each petal has nectar and pollen as do each of the florets in the central disk.



¹ According to Doug Tallamy in [Bringing Nature Home](#), most non-native plants are not a good food source for our pollinators.

Providing Habitat for Pollinators

Research is being done on how flowers communicate with their pollinators. Many of whom use ultraviolet light to assess the best approach to the nectar and pollen, and others use electric-static messaging to advertise their readiness. To make this process easier for both flower and pollinator, consider deadheading (removing the spent blossoms) your plants when they are past their peak.

If you wish to attract monarch butterflies, you must include some milkweed (*Asclepias* sp.) in your garden, as this is the only plant that the monarch caterpillar eats. Without milkweeds, we will not have monarchs. It is suggested that you include at least two types of milkweeds that are common/local to your area in your garden plantings, planting them 12 inches apart if using plugs (seedlings). As many of the milkweeds are tall, consider placing them in the back of your border. In addition to being the only successful food source for monarch caterpillars, many other pollinators enjoy the nectar from milkweeds. We encourage you to consider registering your garden as a [Monarch Way-Station](#). For more information about locally appropriate milkweed seeds and sources for them, please visit [the Xerces Society's Milkweed Finder](#).

Pollinators need shelter. Many pollinators depend on trees and shrubs for both food and shelter. If you allow some wilder, more unkempt corners around your garden, the pollinators can hide from predators in these weedy areas on the edges of your garden, and can find shelter there from inclement weather and wind. Several species of butterflies overwinter (either as adult butterflies, caterpillars, chrysalis, or eggs) in leaf litter, woodpiles, tree bark and in the unkempt areas in your yard. These “messy areas” are an important element in your garden’s design and may well encourage several varieties of our native bee pollinators to overwinter in these areas as well. The [Wildlife Gardeners site](#) lists the various butterflies that overwinter and their strategies for survival.

Pollinators need water. Many butterflies must “puddle,” gaining nutrients and salts from wet muddy areas. Others benefit from shallow rocky pools or a shallow dish where they can drink, rest and bask on the rocks.

Some pollinators feed on alternative sources. Some eat aphids, enjoy rotting fruit, or will feed on sweat, blood, urine and dung. A hanging dish of rotting fruit (like a bird feeder) will appeal to them and to various other important pollinators such as the wasps, bees and flies. The [Kids Butterfly.org site](#) contains information about why and how butterflies feed on these alternative sources.

Avoid pesticide, fungicide and herbicide use in your garden, on nearby lawn areas, and on your trees and shrubs. All pesticides are harmful to some degree to our insect pollinators and to the amphibians, small mammals and birds that eat pollinators. So-called systemic pesticides, soil treatments, and seeds coated with Neonicotinoids are problematic as the chemicals taken in by the plants at any stage of development may be expressed in pollen and nectar and may kill pollinators or disrupt their life cycle. **If you must use a pesticide, fungicide or herbicide, use as little as possible, choose one that has as short a lifetime/kill time as possible, and apply it at a time of day when it is least likely to affect your pollinators.** Remember - although butterflies, bees, and hummingbirds feed in the daytime, moths and bats feed at night.

Consider your pollinator garden as an isolated habitat. By creating an oasis for your pollinators, you are adding a link in the geographic map of resources, adding an important element of pollinator habitat that is currently missing in your neighborhood.

Life began in a garden.

Note: All links to websites cannot be accessed directly by touching Ctrl + Click from a printed copy of these pages but may be accessed from the pages in the original publication on the NGC website.



Pollinators in Peril



Pollinators worldwide are in decline.

There are various factors contributing to this decline – with the end result placing the pollinators in peril.

Honey Bees and Wild Bees: Habitat loss, invasive species, parasites, and pesticides are largely to blame.

Bats: Loss of habitat and disease (white nose syndrome).

Butterflies and Moths: Loss and decline of habitat, and loss of food source (milkweed for Monarchs).

Hummingbirds: Loss and decline in habitat, global warming, and misuse of pesticides.

Pollinators in Peril

- Over 100,000 invertebrates—including butterflies, moths, wasps, flies, and beetles—and over 1,000 mammals, birds, reptiles and amphibians, act as pollinators. (NWF)
- Homes, businesses, and roads are replacing the native fields, wetlands, and forests that are home to many pollinators. In addition, many of the wildflowers that pollinators feed on are rapidly disappearing. The destruction and fragmentation of pollinator habitats have led to significant declines in many populations.
- Pollinators such as bats, butterflies, and hummingbirds may migrate many miles during a year. These travelers need nectar producing flowers in some places throughout their journeys.
- Wildflowers and natural habitats are being replaced by agricultural and urban development with less food and habitat available to pollinators – both for native pollinators and for migrating pollinators.
- Air pollution from automobiles and power plants inhibits the ability of pollinators to find flowers by fragrance/scent. Ozone, hydroxyl, and nitrate radicals bond quickly with volatile scent molecules of flowers, shortening the distance the scent travels. Pollinators must travel increasingly longer distances to find flowers providing nectar and, in turn, the flowers receive inadequate pollination to reproduce and diversify.
- Excessive use and improper application of many pesticides impact pollinators and their habitats. Some insecticides directly kill pollinators, particularly pollinating insects. Herbicides reduce forage plant diversity by killing wildflowers.
- Non-native pollinators, such as honeybees, can out-compete native pollinators for local nectar resources, placing the native bees at a greater risk of decline.
- At least 185 species of pollinators are considered threatened or extinct by the World Conservation Union (IUCN), and at least 2 bat and 13 bird species listed as endangered in the United States are pollinators.

Sources: Fish and Wildlife Management (FWS) United States Department of Agriculture (USDA) National Wildlife Federation (NWF) University of Virginia

BEE A Wildlife Action Hero! Commit to Garden for Wildlife

What vision do you have when you hear the words “wildlife habitat”?
Do you wonder why that’s even part of our gardening organization?

“Wildlife” traditionally referred to non-domesticated animal species, but according to Wikipedia has come to include “all plants, fungi and other organisms which grow or live wild in an area without being introduced by humans”.

- **WE WORRY** about some of our past gardening practices and what serious impacts they have had on our land and waterways, **AND** our wildlife – especially our pollinators!
- **WE KNOW** that chemicals that we have used in our gardens alter how children develop and lead to life-long effects, cause our pets to be at twice the risk of developing malignant cancer, reduce the hatching success and cause birth defects in our birds, and harm our earthworms and our beneficial insects and pollinators.
- **WE KNOW** that runoff from rain and watering further contaminates our groundwater and watersheds.
- **We KNOW** that native habitats are decreasing at an alarming rate.

We not only have the obligation to ourselves to have a beautiful yard and garden that our friends and neighbors **LOVE** to visit – one of which we are proud with specimens that win those coveted blue ribbons – but we also have an obligation to our “wildlife” to protect their environment and increase their habitat so that they can thrive and prosper, as well!



We are asking YOU to “Bee a Wildlife Action Hero!”

We are asking ALL garden club members, youth, friends, and junior gardeners to **Commit to Garden for Wildlife** and show the way – not only in your own backyards, but in public places, schools, parks, nursing homes, roadsides, government offices, businesses! You will attract the pollinators, butterflies, amphibians, and other beautiful wildlife to these gardens so you, your families and others can enjoy them **AND** provide a safe haven where they can live and reproduce.

To Garden for Wildlife, you only need to practice sustainable gardening, and provide food, water, cover, and a place for our wildlife and pollinators to raise their young or complete their metamorphosis.

- **Sustainable Gardening** – growing without the use of harsh pesticides, herbicides, fungicides, and inorganic fertilizers, and selecting plants that have not been treated with pesticides or grown from pesticide treated seeds
- **Food** – in feeders and/or by planting and retaining native plants
- **Water** – can be as small as a birdbath or puddling tray for pollinators
- **Cover** – any kind of protected area for safety, as simple as a pile of brush
- **Place to Raise Their Young** – nesting boxes and/or planting native plants and host plants

**You will be amazed at the new life in your garden,
friends and neighbors will notice the difference - giving you the chance to share your knowledge,
and the Buzz will Bee:**

“Congratulations! YOU have Become a Wildlife Action Hero!”

In recognition of NGC’s commitment to habitat and our youth, and our widespread conservation efforts, National Wildlife Federation - well known for their dedication to protecting wildlife and habitat and inspiring the future generation of conservationists - has partnered with National Garden Clubs, Inc. to work together to create garden habitat for pollinators and other wildlife and to inspire our members and our youth to get outdoors and **connect with nature!** Certifications are available for Backyard Wildlife Habitats™, as well as Community Wildlife Habitats™, helping to create new corridors for wildlife to thrive.

The Million Pollinator Garden Challenge



WE NEED YOUR HELP!

**WE ARE THOSE POLLINATORS
YOU'RE HEARING SO MUCH ABOUT!**

AND WE'RE IN TROUBLE!

**OUR NUMBERS ARE RAPIDLY DECLINING
AND OUR FUTURE IS THREATENED!**

WHY? We don't know for sure. There may 'bee' many reasons, but experts agree that the overall loss in the amount and distribution of habitat and food plants, as well as the widespread use of pesticides, herbicides and fungicides, are critical contributors.

HOW BAD IS IT? In addition to being vitally important to natural ecosystems across our country, pollinators are responsible for at least 1 out of every 3 bites of food we take each day. Our pollinators are at a critical point in their survival, and that means that the food supply on which we humans rely for our well-being is also threatened.

WHAT IS 'BEE'ING DONE? The **MILLION POLLINATOR GARDEN CHALLENGE** has been launched by The National Pollinator Garden Network to support our U.S. President's Executive Strategy to "Promote the Health of Honey Bees and Other Pollinators." The Network is an unprecedented collaboration of national, regional, conservation and gardening groups, of which National Garden Clubs, Inc. is an Inaugural Garden Partner. Over the next two years, the Network will bring together the science and garden capabilities of industry with the outreach of nongovernmental organizations to empower a million private citizens and organizations to plant pollinator gardens nationwide. Information is 'bee'ing made available through www.millionpollinatorgardens.org on native plants, pollinator science, food and habitat, planting ideas for habitat creation, recommended plants and seeds by region, seed sources (many free), and a multitude of other science-based research.

WHAT CAN WE DO? We **KNOW** that increasing the number of pollinator-friendly gardens and landscapes will help revive the health of pollinators all across the country.

WE NEED TO PLANT the appropriate flowering plants and trees to provide more nectar, pollen sources, and host plants in our own gardens – just a container or window planter will help – and in our public garden projects, youth garden projects, schools, nursing homes, botanical gardens, parks, business areas, governmental offices, places of worship, roadsides – **ANYWHERE WE CAN**

WE NEED TO DISCONTINUE the use of pesticides, herbicides, and fungicides

WE NEED TO SHARE this valuable information with those around us

WE NEED TO REGISTER these gardens on the pollinator.org SHARE (Simply Having Areas Reserved for the Environment) map so they can be counted toward the **MILLION POLLINATOR GARDEN CHALLENGE!**

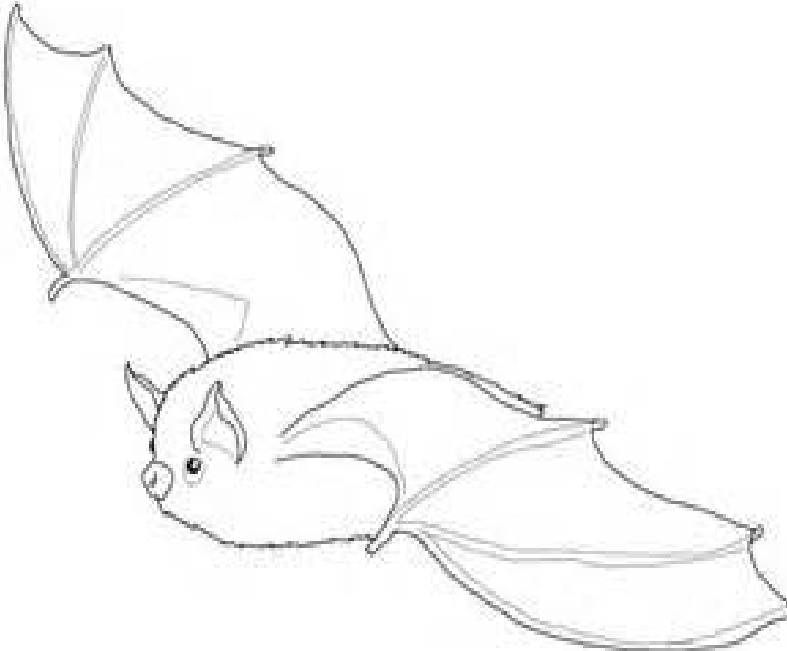
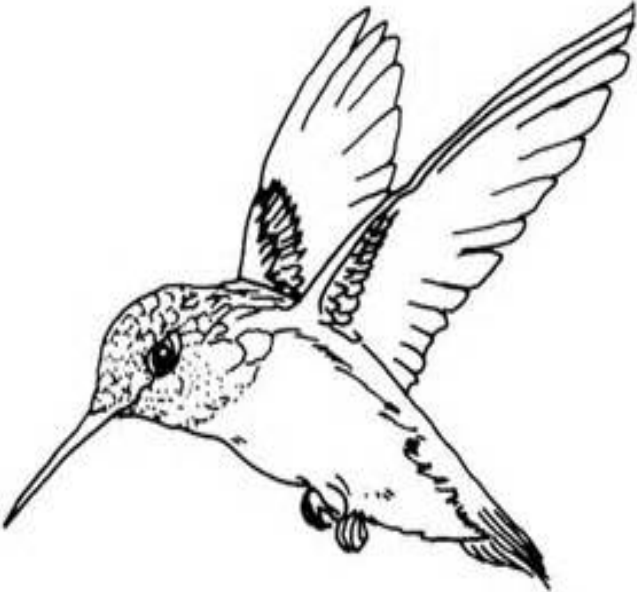
"A million pollinator gardens will 'bee' a million beacons of hope for the future."

~ Bruce D. Rodan, U.S. Assistant Director for Environmental Health

ARE YOU UP TO THE CHALLENGE?

Color the Pollinators

Name that pollinator.



Websites for Pollinator Information

Bats4Kids	www.bats4kids.org
Buzz About Bees	www.buzzaboutbees.net
Gardens With Wings	www.gardenswithwings.com
Kids Zone	www.kidzone.ws/animals/bats
Learn About Nature	www.learnaboutnature.com
Monarch Joint Venture	www.monarchjointventure.org
Monarch Watch	www.monarchwatch.org
North American Butterfly Association	www.nababutterfly.com
National Garden Clubs, Inc.	www.gardenclub.org
National Pollinator Garden Network	www.millionpollinatorgardens.org
Natural Resources Conservation Service	www.nrcs.usda.gov <i>Topics > Plants & Animals > Pollinators</i>
National Wildlife Federation	www.nwf.org
Nature Serve	www.natureserve.org
Pollinator Partnership	www.pollinator.org
USDA Forest Service	www.fs.fed.us/wildflowers/pollinators/monarchbutterfly/
US Fish and Wildlife Service	www.fws.gov/pollinators
Wildlife Gardeners	www.wildlifegardeners.org
Wild Ones	www.wildones.org
Xerces Society	www.xerces.org

Android, iPhone, iPad, and iPod APP for Pollinator Information

BEESmart™ Pollinator Gardener	www.pollinator.org
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Recommended Seed Sources for Pollinator Gardens

Recommended Seed Sources for Native Plants for Pollinators

Applewood Seed Company	www.applewoodseed.com
Ernst Seed	www.ernstseed.com
Native American Seed	www.seedsource.com
Pinelands Nursery	www.pinelandsnursery.com
Plants for Pollinators	www.plantsforpollinators.com
Plants of the Southwest	www.plantsofthesouthwest.com
Prairie Moon Nursery	www.prairiemoon.com
Wildseed Farms	www.wildseedfarms.com
Xerces Society	www.xerces.org/pollinator-seed

Recommended Seed Sources That Include Native Plants in Their Wildflower Mixes for Pollinators

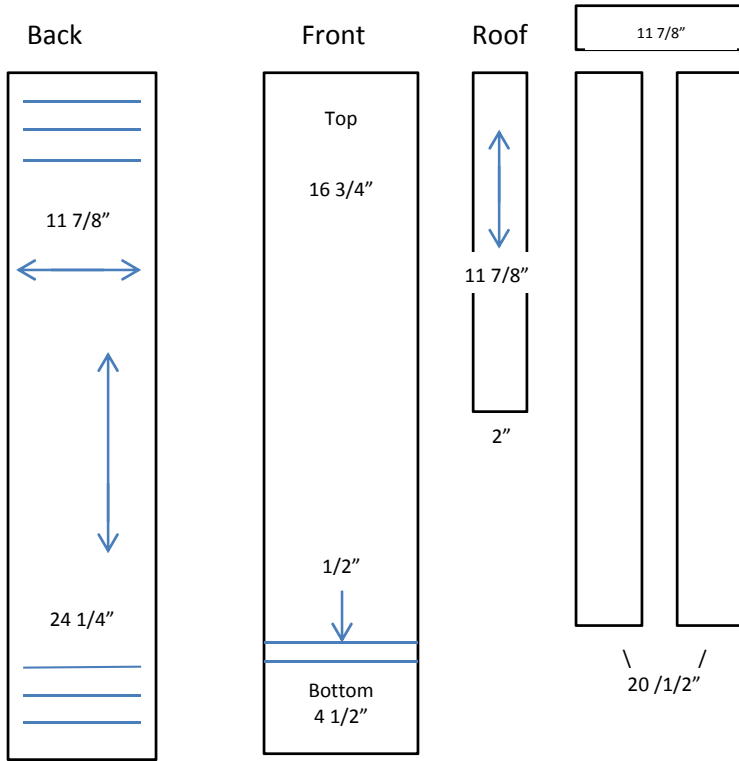
American Meadows	www.americanmeadows.com
Select Seeds	www.selectseeds.com
Sheffield's Seed Company	www.sheffields.com
Stokes Seeds	www.stokeseeds.com

Heritage Seed Sources

Heirloom Seeds	www.heirloomseeds.com
Sheffield's Seed Company	www.sheffields.com
Stokes Seeds	www.stokeseeds.com

Houses for Pollinators

Bat House



Bat House Plans

(Use 3/4 inch plywood – takes 1/8 of a sheet)

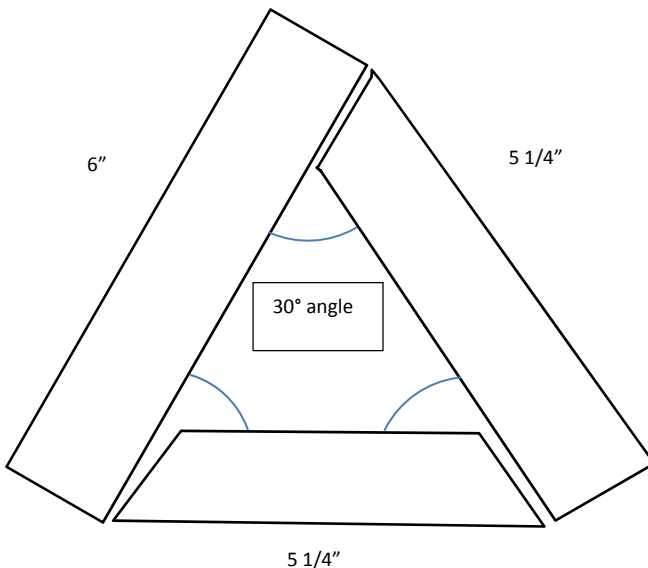
- Cut the Back 11 7/8" W x 24 1/4" L
- Cut slits 1/2" top to bottom for steps
- Cut the Front (top) 11 7/8" W x 16 3/4" L
- Cut the Front (bottom) 11 7/8" W x 4 1/2" L
- Cut the Roof 11 7/8" W x 2" L
- Cut furring strips 3/4" x 3/4"
- Cut top furring strip 11 7/8" L
- Cut sides (2) furring strips 10 1/2" L

PREDRILL HOLES TO AVOID SPLITTING

Use 1 1/4" screws

- Screw top furring strip to Back at the top
- Screw sides (2) furring strips to Back to left and right side below top
- Screw Front (top) to furring strips on top and sides
- Screw front (bottom) 1/2" below top for air flow
- Attach Roof with screws

Mason Bee House



Mason Bee House Plans

(Use 1/2" cedar fence board 72" long)

- Fence board is 6" wide so one side will be 6"
- Cut right side to 5 1/4" width, then cut top at 30 degrees
- Cut bottom to 5 1/4" width the cut top and bottom at 30 degrees
- Connect all sides with 1" brad nails
- Insert Crown Bee nester tubes (optional)