

2012 Field and Meadow Pollinators Study Materials

<p>Hummingbird Clearwing Moth Monarch Butterfly Ruby Throated Hummingbird Bumble Bee Mason Bee Carpenter Bee Tachinid Fly Bee Fly Firefly Green Lacewing Scolid Wasp Alfalfa Butterfly</p>
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Bees Versus Wasps

Simple rules to separate bees from wasps:

- Wasps tend to have more extensive and more obvious coloration and patterns.
- Wasps are less hairy than bees (and the hairs they do have are a single filament instead of the branched hairs of bees).
- Wasps never carry pollen. They drink nectar for energy and provision their nests with prey animals.

Bees Versus Flies

Simple rules to separate bees from flies:

- Flies have only two wings; bees and wasps have four.
- Flies are generally less hairy than bees.
- Flies typically have large eyes near the front of their heads that often meet on the top; those of bees are off to the side.
- Flies' antennae are shorter; they are stubby with a single, protruding bristle.
- Flies don't carry pollen loads.

Helpful Definitions:

Parasitoids kill their hosts. An example of a parasitoid is an insect that kills its host (usually another insect) in order to complete its lifecycle.

Parasites don't kill their hosts (tapeworms, lice, fleas).



Name: Bumble Bee (*Bombus impatiens*)

Description: Robust and very hairy, moderate to large bees, 0.4 – 0.9 inches (10 - 23 mm) long.

Color: Yellow, black, white, brown, or orange bands by which different species can be identified, although there can be variation in color pattern within a species.

Diet: They visit a succession of flowers from a wide variety of plants throughout the foraging season, from early-flowering willows to late-summer blooms such as goldenrod. Bumble Bees are important pollinators of crops as diverse as tomatoes, watermelons, and blueberries.

Habitat: Very general, including intensively farmed areas, suburbs, and highly urban areas. Bumble Bees nest socially in annual colonies. The nest consists of an irregular cluster of ball-like, wax brood cells in a small cavity such as an abandoned rodent burrow or under a grass tussock. The cells are unique among bees because they may contain multiple offspring and are enlarged as the larvae develop.

Life Cycle: At the end of summer most bumble bees die, leaving only a few mated queens to hibernate. In the spring the queens emerge each founding a new colony as a solitary bee. The queen rears her initial brood. When those workers are ready to take over foraging, she remains in the nest to lay eggs.

Conservation Concerns: There has been a steep decline in several bumble bee species due to disease. In the 1990's American bumble bees were taken to Europe for breeding for the United State greenhouse tomato industry. They appear to have contracted a disease that they carried back when they were reimported. The disease spread to wild populations.

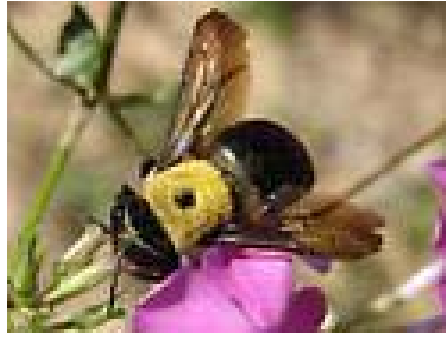
Bug Bites

-Females carry pollen moistened with nectar in stiff hair baskets on their hind legs.

-Few bees are large enough to be confused with bumble bees. Large carpenter bees are not as hairy or as brightly colored.

-Bumble bees are among the first to bees to emerge in the spring and the last to disappear in the fall.

-Bumble bees can buzz pollinate. Some flowers such as tomatoes need to be vibrated to release the pollen. They do this by grabbing onto the flower and vibrating their flight muscles without flapping their wings. There is an audible buzz, hence the name.



Name: Carpenter Bee (Large) (*Xylocopa virginica*)

Description: Robust, often with a hairy thorax but only sparse hairs on the abdomen. Moderate to large, $\frac{1}{2}$ - $\frac{3}{4}$ inch (13 - 30 mm) long.

Color: Black but may have a metallic sheen of blue or green with blackish wings. Yellow pile on the thorax.

Diet: Large body size limits it to visiting large or open-faced flowers. The flower needs to be strong enough to support the weight of the bee. Its strong jaws will be used to bite into the sides of flowers (blueberry) to rob nectar without pollinating. It pollinates passionflower quite effectively--pollen is deposited on thorax. In addition to passion fruit and blueberries it pollinates other crops including blackberry and pepper.

Habitat: Forests and adjacent areas with flowers.

Life Cycle: Eggs are probably the largest of all insect eggs. It can be more than half an inch (13mm) long, which is more than half the length of the female's body. Each female lays only a small number of eggs in her lifetime (usually 8 or fewer) and, compared to other bees, invests greater maternal care and more time in raising them. They only live one year.

Conservation Concerns: None known.

Bug Bites

-Most species make solitary nests and are not social.

-They are among the few bees that can excavate their own nests in wood, using powerful jaws to chew soft wood and plant stems. They are well-known for chewing nest cavities in the structural timber of buildings. A good coat of paint will deter them.

- Egg laying and tunnel provisioning occurs in the spring. Males hover around the tunnel entrance while the female provisions the nest and lays eggs. Many people are intimidated by their size, however, they are gentle creatures.

-Males are territorial and may buzz around humans.

-Frequently confused with bumble bees.



Name: Mason Bee (*Osmia spp.*)

Description: Robust, small to moderate-sized bees, 0.2 – 0.8 inches (5 – 20 mm) long. Round, broad heads, and their round, wide abdomens usually lack conspicuous markings or hair bands.

Color: Most are metallic, and many are brilliant metallic green, blue, or even purple.

Diet: Forage for nectar and pollen on a wide variety of flowers. They commonly visit flowering shrubs and small trees in the rose family, especially fruit trees in orchards. They are important pollinators of fruit crops such as apple, cherry, and plum.

Habitat: These solitary bees usually nest in beetle tunnels in dead wood or the hollow centers of plant stems, but some nest in crevices between stones or in abandoned wasp or bee nests. Females will readily occupy artificial nest sites such as drilled wood blocks or bundles of reed stems. They do not excavate their own nests.

Life Cycle: The bees emerge from their cocoons in the spring, with males the first to come out. They remain near the nests waiting for the females. When the females emerge, the first thing they do is mate. The males die and the females begin making their nests. Females visit flowers to gather pollen and nectar. It will take many trips to complete a pollen/nectar provision mass. Once a provision mass is complete, the bee backs into the hole and lays an egg on top of the mass. Then she creates a partition of "mud", which doubles as the back of the next cell. The process continues until she has filled the cavity. Female-destined eggs are laid in the back of the nest, and male eggs towards the front. Once a bee has finished with a nest, she plugs the entrance to the tube. By the summer, the larva has consumed all of its provisions and begins spinning a cocoon around itself and enters the pupal stage. The adult matures either in the fall or winter, hibernating inside its cocoon. These bees are well-adapted to cold winters.

Conservation Concerns: Two non-local species are listed as vulnerable.

Bug Bites

- They don't carry pollen on their legs. They carry dry pollen in a patch of hairs on the underside of the abdomen.
- Often mistaken for flies.
- Mason bees are prized for their efficient pollination of orchard crops in spring.
- Will nest in existing cavities above ground including garden hoses or faucets. Mason bees collect wet soil or mud to divide the nesting tunnel into brood cells.
- There are no worker bees for this species.
- Both native and introduced species have been successfully managed by providing nesting boxes or tubes that can be stored in a sheltered location over the winter.



Name: Tachinid Fly (*Xanthoepalpus*)

Description: Medium to large sized, 0.75 (18mm), majority are 5 – 10 mm, long and hairy. More rounded than house flies and have conspicuous, bristly hairs over their abdomen. Some resemble house flies, others have a beelike or wasplike appearance. Adults have only 1 pair of wings.

Color: Extremely varied in appearance. Some adult flies may be brilliantly colored or brilliantly metallic and multicolored. Despite the huge range in size, shape and color within the family, the majority are grayish black and rather drab. Wings are usually clear but are darkened or patterned in some species, or even bicolored. Many species have four black longitudinal stripes on the thorax

Diet: They visit flowers to drink nectar which makes them effective pollinators. Many species typically feed on pollen, therefore, they can be important pollinators of plants at higher elevations such as mountains where there are few bees. Larvae are parasitoids of other insects.

Habitat: Practically anywhere. Can be abundant on sunny hilltops looking for mates.

Life Cycle:

Eggs are white in color. They are found in the skin of the host insect or in leaves near the host and are hatched when the host ingests them. The larvae or maggots are worm-like and lack appendages like all other fly larvae. They are greenish-white in color. They have three larval instars and then leave the hosts to pupate in the soil. Before pupation, some mature maggots produce hard cocoons. The newly hatched larvae enter into its host and feed on the content before pupating into the soil.

Conservation Concerns: Reducing the use of insecticides and providing sources of food like dills, parsley, clover and other herbs are the most efficient ways to conserve Tachinid Flies in agricultural ecosystems.

Bug Bites

-Tachinid flies are a prime example of the many beneficial, but mostly unseen, creatures that make it possible for us to enjoy naturally healthy gardens without the use of pesticides. They are important in controlling destructive insects, particularly caterpillars and beetle larvae. They are small and inconspicuous, but do a mighty big job for us. For this reason several species have been used in the [biological control](#) of pests.

-A species of tachinid was introduced to the United States from Europe to control the [gypsy moth](#).

-Tachinid larvae are internal parasitoids of other insects, often caterpillars.

-Tachinids are true flies.

-The scientific information is rather general concerning tachinids. Only a few of the 1,300 North American species have common names, and only about 20 percent can be identified with a hand lens and field guide.



Name: Bee Fly (*Bombylius major*)

Description: Stout and hairy like bumble bees, striped with black, white, or shades of brown, body length 0.55 to 0.71 inches (14 to 18 mm). Some species have a prominent bristle like proboscis to reach the nectar, others hover while feeding. Legs are long and hairy and dangle in flight, eyes almost touching above, especially in males. Most have banded or spotted wings that stick out sideways when the insect is at rest.

Color: Often brightly colored.

Diet: Drink nectar from flowers, reinforcing the resemblance to bees. Adults also feed on [nectar](#). larvae are mostly parasitoids of other insects including butterflies, ground-nesting solitary bees and wasps. Others prey on grasshopper eggs

Habitat: Found in wide variety of habitats including gardens and the edges of woodlands. Its major requirement is the presence of the host species. Females hover over their host's nest, often in dry areas

Life Cycle: Not well known, however, the first instar of the larva is active and penetrates the host's nest, then turns into a sedentary parasitoid; pupa is equipped with spines or spikes to drill out of the nest.

Conservation Concerns: Loss of host habitats has a direct impact on the survival of this species.

Bug Bites

-Mimic bees to allow them to get close to the bees burrow. When close, the female will flick the eggs into or near the nests of the host insects such as ground bees and wasp nests.

-When cold, the bee-flies perch vertically, pointing upwards, and they can remain in this position for a week or even longer. Adults will whirr their wings to warm up the flight muscles before take off. Many individuals fly along the ground to absorb heat, whilst others fly further up trees to maximize direct sunlight.



Name: Hummingbird Clearwing Moth

Description: Adult appearance is variable. Can be distinguished by two characteristics: 1) lack of any banding on the lateral side of the thorax; 2) always has yellowish or pale colored legs. Wing span $1 \frac{9}{16}$ – $2 \frac{3}{16}$ inches (4 – 5.5 cm)

Color: Thorax is olive to golden-olive in color dorsally, yellow ventrally; abdomen is dark burgundy (sometimes almost black), with light olive to dark golden patches dorsally. Wings mostly clear with reddish brown terminal borders and dark scaling along veins.

Diet: Adults nectar from a wide variety of flowers including Japanese honeysuckle, beebalm, red clover, lilac, phlox, snowberry, cranberry, blueberry, vetch, and thistles. Caterpillar hosts include honeysuckle, snowberry hawthorns, cherries and plums.

Habitat: Open and second-growth habitats, fields, forest edges, meadows and cultivated gardens.

Life Cycle: As caterpillars, they wrap themselves in cocoons made of leaf litter and spend the winter on the ground. They emerge as beautiful clearwing hummingbird moths that can be seen flying from May typically through until July.

Conservation Concerns: None known.

Bug Bites

- Adults are frequently mistaken for hummingbirds or bees because of their fast-moving wings and coloration.
- Adults fly during the day and hover at flowers to sip nectar.
- Caterpillars pupate in cocoons spun at the soil surface.
- Moths and butterflies do not actively gather pollen, however, while foraging for nectar, pollen grains become stuck to the body or tongue and are accidentally spread.



Name: Ruby Throated Hummingbird

Description: Small hummingbird with a slender, slightly downcurved bill and fairly short wings that don't reach all the way to the tail when the bird is sitting. Average length 3.5 inches (8.9 cm)

Color: bright emerald or golden-green on the back and crown, with gray-white underparts. Males have a brilliant iridescent red throat that looks dark when it's not in good light.

Diet: Tube-shaped flowers, may also see them plucking tiny insects from the air or from spider webs. May feed on tree sap if nectar is scarce. They defend these food sources against others.

Habitat: Open woodlands, forest edges, meadows, grasslands, and in parks, gardens, and backyards.

Life Cycle: After mating, female selects a nest site, usually near the tip of a down sloping branch, with openness below, and a leaf canopy above. The nest is sometimes near or above water, and built by female alone. It is a tiny cup of wadded plant down, and bounded with spider web or pine resin. It is covered with lichens, making it very well hidden. Female lays 1 to 3 eggs. Incubation lasts about 10 to 14 days by female. This species produces up to three clutches per year. Old nests may be occupied for several seasons, but are repaired annually.

Conservation Concerns: Domestic cats are predators for adults.

Bird Bites

-Fly straight and fast but can stop instantly, hover, and adjust their position up, down, or backwards.

-Ruby-throated hummingbirds are [solitary](#).

-Aggressively defending feeding locations becomes most pronounced in late summer to early fall as they fatten up for migration.

-Due to their small size, they are vulnerable to insect-eating birds and animals.



Name: Scollid Wasp (*Scolia dubia*)

Description: Head, thorax , and first two abdominal segments are black, while the remainder of the abdomen is red with two bright yellow spots on the third abdominal segment, 0.8 - 1 inch (2 - 2.5 cm). Larva is a legless, white grub with a brown head.

Color: Black and red with yellow spots on abdomen.

Diet: Adults feed on nectar and pollen, may also feed on juices from beetle prey. Larvae are parasitoids of green June beetles and Japanese beetles.

Habitat: Fly low across soil and dig into the ground.

Life Cycle: Males and females have a courtship dance, flying close to the ground in a figure-8 or S pattern. Females burrow into ground in search of grubs, especially those of the Green June Beetle, and the Japanese Beetle. She stings the grub and often burrows farther down, then constructs a cell and lays an egg on the host. Larva pupates and overwinters in a cocoon within the body of the host. One generation per year in North, more in South.

Conservation Concerns: Scollid wasps are considered beneficial because they help control grubs in the soil. Because they are important natural agents no control measures seem needed. However, their presence means that grubs are present.

Bug Bites

- Also known as the blue-winged wasp
- Most abundant in August
- Males of some species sleep in clusters with their bodies tightly curled around a plant stem.
- They will not sting unless greatly aggravated or captured in the hands.



Name: Alfalfa Butterfly (*Colias eurytheme*)

Description: Quite variable, wing span 1 3/8 - 2 3/4 inches (3.5 - 7 cm).

Color: Upperside of male yellow with orange overlay, yellow veins, wide black boarder, and dark black cell spot. Female yellow or white with irregular black border surrounding light spots. Underside hindwing spot silver with 2 concentric dark rings, and a spot above it.

Diet: Adults nectar from many kinds of flowers including dandelion, milkweeds, goldenrods, and asters. Caterpillar hosts are plants in the pea family including alfalfa, white clover, and white sweet clover.

Habitat: A wide variety of open sites, especially clover and alfalfa fields, mowed fields, vacant lots, meadows, road edges.

Life Cycle: Females lay eggs singly on top of host plant leaves. Most feeding takes place at night. Young caterpillars chew holes in the tops of leaves, then later feed from the leaf tip. Older caterpillars eat half of the leaf before moving to the other half. Chrysalids overwinter.

Conservation Concerns: Not required.

Bug Bites

- One of the most widespread and common butterflies in North America.
- Caterpillars can be very destructive in alfalfa fields.



Name: Green Lacewing (*Chrysoperia rufilabris*)

Description: Bodies are pale green or pale yellow. Eyes are golden. Long slender antennae and long delicately veined wings. ½ inch – ¾ inch

Color: Light green color allows Lacewing to become camouflage among green leaves and stems.

Diet: Adult Green Lacewings eat pollen and nectar from flowers. They also eat honeydew, a liquid made by aphids and scale insects. Lacewings sometimes release a bad-smelling fluid when attacked by predators. Some predators of lacewings include birds, bats, and larger insects. When adults visit flowers for nectar, they may accidentally help pollinate a plant, which helps it to make seeds and spread.

Habitat: Adults only move around or fly at night. They are not social. They live in fields, gardens, and forest edges.

Life Cycle: Green Lacewings lay eggs on white stalks, hanging from the bottom of leaves. Larvae (baby lacewings) hatch in a few days. Lacewing larvae, sometimes called "aphid lions" eat many small insects as they grow. Besides aphids, they eat other small insects, including caterpillars, butterfly eggs, small beetles, scale insects, leafhoppers, small flies, and other small insects and eggs. They also eat mites, and they sometimes eat each other.

Larvae have large hooked jaws, which they grab their prey with before sucking out the juices. Lacewing larvae are yellowish-gray or brown, and a little bit less than 1/2 inch long.

After two or three weeks of eating, the larvae will make a cocoon (pupa stage) on the bottom of a leaf. In about five days, the adult lacewing leaves its cocoon. Adult Green Lacewings live for up to six weeks. A female may lay 200 eggs in her lifetime.

Conservation Concerns: Not required.

Bug Bites

- Green Lacewings are extremely helpful to people. They eat huge amounts of pests, including aphids and mites. Some companies even sell lacewing eggs to farmers and gardeners. They cause no harm to people. To attract them to your yard, plant lots of nectar-producing flowers. The adults will come, and if you have pests (food), they will lay eggs.

Green Lacewings can sense the sounds of bats. They land immediately to avoid predation.



Name: Firefly (*Lampyridae*)

Description: Called lightning beetles because they are not flies or true bugs. Their body is about ½ inch long with a black head.

Color: The firefly's most notable feature is on the bottom of the abdomen that includes a tail light segment in green and yellow.

Diet: Firefly larvae developing underground eat worms and slugs. Adults feed on nectar and pollen.

Habitat: Generally found in fields and at the edges of forests. Fireflies are nocturnal and spend daytime hours resting under leaves.

Life Cycle: Females deposit eggs in the soil, which is where larvae develop into adulthood. An adult firefly lives for about 2 months.

Conservation Concerns: - Firefly populations are dwindling throughout the country and world.

- Causes are not clear. Most researchers blame 2 main factors: development and light pollution.

- How can you help? Turn off outside lights at night. Avoid the use of pesticides. Don't over mow lawns. Leave lawns at 3 ½ inches in height.

Bug Bites

- Fireflies have organs dedicated to light under their abdomens.

- They take in oxygen and inside special cells, combine it with a substance called luciferin to produce light with almost no heat.

- Firefly light flashes in intermittent patterns that are unique to each one. Each blinking pattern is a signal that helps fireflies attract potential mates. Scientists are not sure how the insects regulate the light process to turn the light on and off.

- The firefly is the state insect of Pennsylvania.

- The insect has an unappetizing taste to potential predators.



Name: Monarch Butterfly (*Danaus plexippus*)

Description: The Monarch butterfly is one of the most readily recognized and beloved insects in North America. The Monarch is known for an interesting migration pattern involving multi-generations of butterflies.

Color: The butterfly is easily recognized by bold orange and black color patterns.

Diet: The larvae (caterpillars) of monarch butterflies eat ONLY milkweed, this is why the monarch butterfly is dubbed the 'milkweed butterfly'. The larvae stage is the only stage of the monarch butterfly that feeds on milkweed; there is something in milkweed that allows the caterpillar to grow and keep all of the vitamins needed to transform into a beautiful butterfly. In turn, the adult butterflies consume all sorts of different things including nectar, water and even liquids from some of the fruits we consume.

Many people do not know exactly how the monarch butterfly food is consumed. Well, a small little pipe, like a straw, which is coiled under its head most of the time is what an adult monarch butterfly uses to suck up all of the nectar from plants. The straw is called a 'proboscis'. This is the reason that all monarch butterflies generally stick to an all-liquid diet; it is very hard to suck up any solids with a straw like that for your mouth.

Habitat: Prior to migration, Monarchs are found in fields, gardens, and flower beds. Monarchs are unique in that they actually migrate south to a given overwintering site every year, much as many species of birds do. Unlike birds, the Monarchs who go south do not succeed in returning to where they were born. Rather, their children or grandchildren do - - - without any elders to show them the way. The innate ability of these small creatures to navigate across the continent has inspired and puzzled researchers for decades.

All of the Monarchs east of the Rocky Mountains are believed to overwinter on forested mountain tops in central Mexico within the Transvolcanic Range. Most of the roosts are located about 60 miles west of Mexico City.

Life Cycle: The four stages of the monarch butterfly life cycle are the egg, the larvae (caterpillar), the pupa (chrysalis), and the adult butterfly. Monarchs will only lay their eggs on milkweeds. Milkweeds contain a potent heart poison, which helps to protect them from browsing animals and leaf-eating insects such as grasshoppers. Monarchs are able to store this poison within their own bodies, making themselves poisonous in turn. They are very brightly colored, both as a caterpillar and as an adult, to advertise that they are not good to eat. Whenever an insect is brightly colored, rather than camouflaged to match its background, it usually means they have a secret weapon.

The chrysalis, or pupal skin, of the Monarch is strikingly beautiful. It is vivid jade green with little golden bumps, particularly in the horizontal line visible about 1/3 of the way down from the top of the pupa. In the final day or two before emergence, the chrysalis becomes transparent, allowing one to see the orange and black wings beneath.

Conservation Concerns: -

- People plant milkweed in their gardens to attract monarch butterflies.
- Concerns continue for the Monarch's migration destination in Mexico where forests are jeopardized by over cutting. Many residents in the area cut down trees for fuel that Monarchs would winter upon.

Bug Bites

- Milkweed is the only food the caterpillar will eat.
- Toxins from the milkweed plant make the caterpillar and adult butterfly poisonous to birds and other predators.
- A year of Monarchs

In February and March, the final generation of hibernating monarch butterflies comes out of hibernation to find a mate. They then migrate north and east in order to find a place to lay their eggs. This starts stage one and generation one of the new year for the monarch butterfly.

In March and April the eggs are laid on milkweed plants. They hatch into baby caterpillars, also called the larvae. It takes about four days for the eggs to hatch. Then the baby caterpillar doesn't do much more than eat the milkweed in order to grow. After about two weeks, the caterpillar will be fully-grown and find a place to attach itself so that it can start the process of metamorphosis. It will attach itself to a stem or a leaf using silk and transform into a chrysalis. Although, from the outside, the 10 days of the chrysalis phase seems to be a time when nothing is happening, it is really a time of rapid change. Within the chrysalis the old body parts of the caterpillar are undergoing a remarkable transformation, called metamorphosis, to become the beautiful parts that make up the butterfly that will emerge. The monarch butterfly will emerge from the pupa and fly away, feeding on flowers and just enjoying the short life it has left, which is only about two to six weeks. This first generation monarch butterfly will then die after laying eggs for generation number two.

The second generation of monarch butterflies is born in May and June, and then the third generation will be born in July and August. These monarch butterflies will go through exactly the same four stage life cycle as the first generation did, dying two to six weeks after it becomes a beautiful monarch butterfly.

The fourth generation of monarch butterflies is a little bit different than the first three generations. The fourth generation is born in September and October and goes through exactly the same process as the first, second and third generations except for one part. The fourth generation of monarch butterflies does not die after two to six weeks. Instead, this generation of monarch butterflies migrates to warmer climates like Mexico and California and will live for six to eight months until it is time to start the whole process over again.

It is amazing how the four generations of monarch butterflies works out so that the monarch population can continue to live on throughout the years, but not become overpopulated. Mother Nature sure has some cool ways of doing things, doesn't she?