

# LANCASTER COUNTY MIDDLE SCHOOL ENVIROTHON

## 2020 Field and Meadow Pollinators

### Study Materials

#### Alfalfa Butterfly

**Description:** Quite variable, wing span 1 ½ - 2 ¾ " (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 boarder surrounding light spots. Underside hindwing spot silver with 2 concentric dark rings, a spot above it.



MALE



FEMALE

**Diet:** Adults drink 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, and road edges.

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

**Conservation Concerns:** None known.

**Bug Bites:**

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

**Description:** Robust and very hairy, moderate to large bees, .4 - .9" (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.



MALE

FEMALE

**Diet:** Bumble bees visit a succession of flowers from a wide variety of plants throughout the foraging season, from early flowering willow trees 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 Cycles:** 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 1990s American bumble bees were taken to Europe for breeding for the United States greenhouse tomato industry. They appear to have contracted a disease that they carried back when they were re-imported. The disease spread to wild populations in the United States.

### 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 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.
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## Carpenter Bee

**Description:** Robust, often with a hairy thorax but only sparse hairs on the abdomen. Moderate to large, ½ - ¾ "(13-30 mm) long.

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



MALE



FEMALE

**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 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 areas adjacent with flowers.

**Life Cycles:** Eggs are probably the largest of all insect eggs. Egg can be more than half an inch 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 creates 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.
  - They are frequently confused with bumble bees.
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## Firefly

**Description:** Called lightning beetles because they are not flies or true bugs. Their body is about a 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. No difference between male and female.



MALE

FEMALE

**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 Cycles:** 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 scientists name 2 factors: development and light pollution. You can help by turning off outside lights at night, avoid using pesticides, and when mowing leave lawn grass at least 3 ½ inches high.

### Bug Bites:

- Fireflies have organs dedicated to light under their abdomens.
  - Fireflies take in oxygen into special cells and 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.
  - The firefly is the state insect of Pennsylvania.
  - The insect has an unappetizing taste to potential predators.
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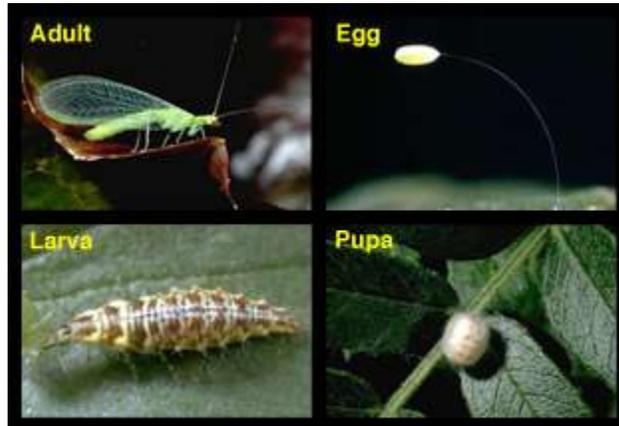
## Green Lacewing

**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. No difference between male and female.



MALE



FEMALE

**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 Cycles:** Green Lacewings lay eggs on white stalks, hanging from the bottom of leaves. Larvae 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.

**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 for adults), they will lay eggs.
  - Green Lacewings can sense the sounds of bats. They land immediately to avoid predation.
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## Hummingbird Clearwing Moth

**Description:** Adult appearance is variable. Can be distinguished by two characteristics: lack of any banding on the lateral side of the thorax and always has yellowish or pale colored legs. Wing span close to 2 – 3 inches. No difference between male and female.

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



MALE



FEMALE

**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 Cycles:** 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 through July.

**Conservation Concerns:** Not required.

### 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.
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## Mason Bee

**Description:** Robust, small to moderate-sized bees, 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.



MALE



FEMALE

**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 Cycles:** 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 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:** Not required.

### 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.
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## Monarch Butterfly

**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.



MALE



FEMALE

**Diet:** The 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. 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 Trans volcanic Range. Most of the roosts are located about 60 miles west of Mexico City.

**Life Cycles:** The four stages of the Monarch butterfly life cycle are the egg, the larvae, the pupa, 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.
- There is a concern that pesticide use has effective Monarch populations.

**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.
  - 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 mildewed 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. The chrysalis phase is 10 days long. 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 2-6 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 cycles as the first generation did, dying 2-6 weeks after it becomes a beautiful Monarch butterfly.
  - The fourth generation of Monarch butterflies is a little bit different than the first 3 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 one part. The fourth generation does not die after 2-6 weeks. Instead, this generation migrates to warmer climates like Mexico and California and will live for 6-8 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.
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## Cabbage White Butterfly

**Description:** The wingspan of this butterfly is 1-2 inches.

**Color:** White wings with black tips. Females have two black spots on white wings for a total of 4 spots, while males have just one spot on each wing for a total of 2 spots on their wings. Beneath their main wings their lower wings have shades of yellow, green, and gray.



MALE



FEMALE

**Diet:** This type of butterfly feeds on the leaves of cabbage and other vegetables like broccoli and cauliflower. Outside of a garden in a field or meadow they may also feed on nectar from mustards, dandelion, red clover, asters, and mints.

**Habitat:** The cabbage white butterfly is found throughout the United States and is common in any open space including weedy spots, gardens, roadsides, cities, and suburban backyards.

**Life Cycles:** Eggs of this butterfly are laid on plants not in clumps but insolated. The caterpillar is the next phase in the life cycle. It will rest underneath leaves for protection. As it develops into an adult, it will turn into a butterfly that will be an active flyer. Adults are diurnal and are most active during the day.

**Conservation Concerns:** Not required.

### Bug Bites:

- Birds are the major predators to the cabbage white butterfly.
  - Before the female butterfly lays eggs on a plant, she will drum or rapidly move her forelegs against the leaf to check the surface of the leaf to see that is suitable for the egg to develop.
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## Honey Bee

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**Description:** Honey bees are found throughout the United States. The stocky striped body of a honey bee is made up of many hairs that pollen adheres to. Male honey bees are larger than females known as drone bees. Female honey bees are known as worker bees.

**Color:** Honey bees are both mustard yellow and brown.



MALE



FEMALE

**Diet:** The honey bee is often called a super pollinator transferring nectar from 1,000 of types of plants including the majority of fruits and vegetables grown for human consumption. Honey bees harvest nectar and pollen from flowering plants.

**Habitat:** Honey bees are not native to the United States but were introduced by European settlers in the mid 1600's. Beekeepers imported several additional types of different European types of bees from 1859-1992. Honey bees live in large groups called colonies. Open fields and grasslands with a variety of wildflowers provide the best habitat.

**Life Cycles:** The process from egg to adult worker bee takes about 18 days. During the laying season in late spring the Queen bee can lay over 1,500 eggs per day. The worker bees direct her to the prepared honey comb and she lays a single egg in each hexagon shaped cell. The size of the cell determines the type of egg she lays. Smaller cells will produce a female worker bee. Larger cells will produce a male drone bee. It is the worker bees and not the queen that determine the ration of workers to drones in a hive. In 3 days the eggs hatch and larva emerge. In the beginning, nurse bees feed the larva royal jelly to help them grow quickly. Next the nurse bees switch to honey. On the fifth day the worker bees seal the cell with a wax cap. The larva then surrounds itself with a cocoon inside the cell, similar to a butterfly. Here wings, legs, eyes, etc. develop to become an adult. This process takes 12 days. On the 18<sup>th</sup> day, the baby bee is fully developed and chews through the wax cap. Now it's a full member of the hive.

**Conservation Concerns:** There is great concern that the honey bee population in the United States is decreasing rapidly. Reasons for this decline include changes in climate patterns, agriculture pesticides, bacterial diseases, and viruses. With so many factors affecting honey bees, it means there isn't one easy answer to solve the problem.

### Bug Bites:

- 80% of what we eat in the United States is pollinated by honey bees including fruits, vegetables, and seeds.
  - Honey bees share information about where the best food source is by performing a waggle dance. They move in a figure 8 and waggle their body back and forth.
  - Honey bees are the only insect that produces food eaten by humans.
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## Silver-spotted Skipper

**Description:** Wing pattern features a large white spot on the underside. Silver spotted Skipper is the most widespread and most recognizable skippers.

**Color:** Wings are brown-black. Front wings have gold spots, back wings have white spots. Metallic silver band outlines each wing.



No difference in appearance for male or female.

**Diet:** The adult Silver spotted Skipper almost never visits yellow flowers but favors blue, red, pink, purple, and white flowers. Favorite flowers include milkweed, red clover, buttonbush, and thistles.

**Habitat:** Dry to moist fields, wet meadows, and edge of woods.

**Life Cycles:** The adult Silver spotted Skipper can fly with startling speed as well as plunge down to a flower or stop abruptly. Sometimes they dash away like a swift arrow.

**Conservation Concerns:** Not required.

### Bug Bites:

- Silver spotted Skipper may sometimes be heard in the field. They rapidly beat their wings that produce a whirring sound.
  - Young caterpillars live in a shelter created by a folded flap of leaf cut from the edge of the leaf and tied down with silk threads. They leave their shelter at night or on cloudy days to feed on nearby leaves.
  - They have large eyes that appear to bulge out from their head with short antennae with square ends.
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## Isabella Tiger Moth

**Description:** Most widely known for the caterpillar phase called the Woolly Bear. Woolly bear caterpillars turn into Isabella tiger moth.

**Color:** Yellow to orange coloration, black legs, and small black spots on wings and thorax.

No difference in appearance for male or female.



Woolly bear caterpillar



No difference in colors between adult male and female.

**Diet:** The woolly bear caterpillars and adult moth are known as generalist feeders feeding on leaves and herbs like dandelion, plantain, and nettle throughout the summer and fall.

**Habitat:** The Isabella tiger moth can be found where grasses are abundant. Their habitat range includes the United States and Canada.

**Life Cycles:** The woolly bear caterpillar has 13 segments with brown and black hair. The caterpillar overwinters from fall to spring by literally freezing solid. First its heart stops beating, then its gut freezes, then its blood, followed by the rest of the body. In the spring it thaws.

**Conservation Concerns:** Not required.

### Bug Bites:

- The adult Isabella tiger moth usually rests with its wings held like a flat roof over its head or held flat at its sides.
- Woolly bear caterpillars will roll into a ball if disturbed.
- Woolly bear festivals are held throughout the United States celebrating the folklore that the varying widths of the caterpillar's bands of color predict the harshness of the next winter.

## Great Spangled Fritillary

**Description:** Smaller than a Monarch, it is the most common fritillary in North America.

**Color:** Front wings are bright orange with rows of black spots with black dashes that surround a brown body. Females are larger than males with deeper colors.



**Female**



**Male**

**Diet:** Nectar from summer garden plants like purple coneflower, milkweed, joe pye weed, mountain laurel, and butterfly bush

**Habitat:** Open sunny fields or pastures with wetland spots.

**Life Cycles:** Females lay eggs in late summer. Caterpillars that hatch don't feed and overwinter until the next spring. Adults emerge and take flight in June through September.

**Conservation Concerns:** Not required.

### **Bug Bites:**

- Found throughout North America.
  - Have similar features to a Monarch.
  - Enjoy nectar from wetland plants in fields and pastures.
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## Sphinx Moth

**Description:** Also known as a hawk moth. Wingspan is almost 4 inches across. Sometimes mistaken for a hummingbird in flight. Some sphinx moths have a proboscis mouth part that measure a foot in length and is able to take pollen for a variety of flowers. Their thorax, abdomen, and wings are covered in scales. Abdomen tapers to a sharp point hence they are sometimes called hornworm or horn moth.

**Color:** Color patterns vary with shades of brown, gray, green, black, and purple.



**Diet:** Adults feed on nectar. The caterpillar is recognized by gardens as the green hornworm and can chew through tomato plant leaves.

**Habitat:** Sphinx moths search fields for flowers of any type. They range in commonly warm climates.

**Life Cycle:** Most species are able to produce several generations a year. From larva, the hornworm appears, then pupa to adult.

**Conservation Concerns:** Not required.

### **Bug Bites:**

- Most moths only fly at night, while the sphinx moth can be diurnal.
- Prior to flying the moth will shiver its muscles to warm them up. Their body temperature can surpass 104 degrees.
- Sphinx moths are known for their ability to hover over flowers like the hummingbird. They can also swing their body side to side over a flower. Believed this behavior evolved to protect them from predators that might lie in wait inside a flower.