

Backyard Fireflies

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Do you want to learn more about the flashing insects in your backyard? Fireflies, or lightning bugs, are insects that can create their own light. By lighting up segments on their belly known as a lantern, male and female fireflies communicate to find one another in the night. But fireflies and other insects need our help. Just like us, they need food, shelter, and a healthy habitat to grow and raise a family.

BACKGROUND

Fireflies belong to a group of insects known as beetles. They get their name from their ability to glow. Fireflies have segments on their bellies that light up, known as the **lantern**. Different species of fireflies can glow yellow, orange, green, and even blue! Fireflies use their lanterns to communicate. Each species of firefly has its own unique blinking pattern, like a secret language. Fireflies respond to the blinking pattern of their same species.

The ability for an organism to glow and produce light is known as **bioluminescence**. Fireflies create a chemical reaction in their body by mixing oxygen from the air with a chemical known as **luciferin**. When these two mix, an enzyme known as **luciferase** starts a reaction that creates a glow. Even though a firefly lights up, its lantern does not get hot like a light bulb does. This chemical reaction produces little to no heat. It is safe and efficient. Even firefly eggs and larvae faintly glow.

Not all fireflies have a lantern. Some fireflies are day flyers and do not have a light organ.



Words in **bold** are highlighted in the glossary at the end of this Idea Starter

PLAN YOUR PROJECT

Use this idea starter AND publication 4-H 365 *Self-Determined Project Guide* as the starting place for your 4-H self-determined project. The *Self-Determined Project Guide* is available from your county OSU Extension office or on the Web at ohio4h.org/selfdetermined. You may choose to do a little or a lot depending on your level of interest. Be sure to register your project with your county OSU Extension office.

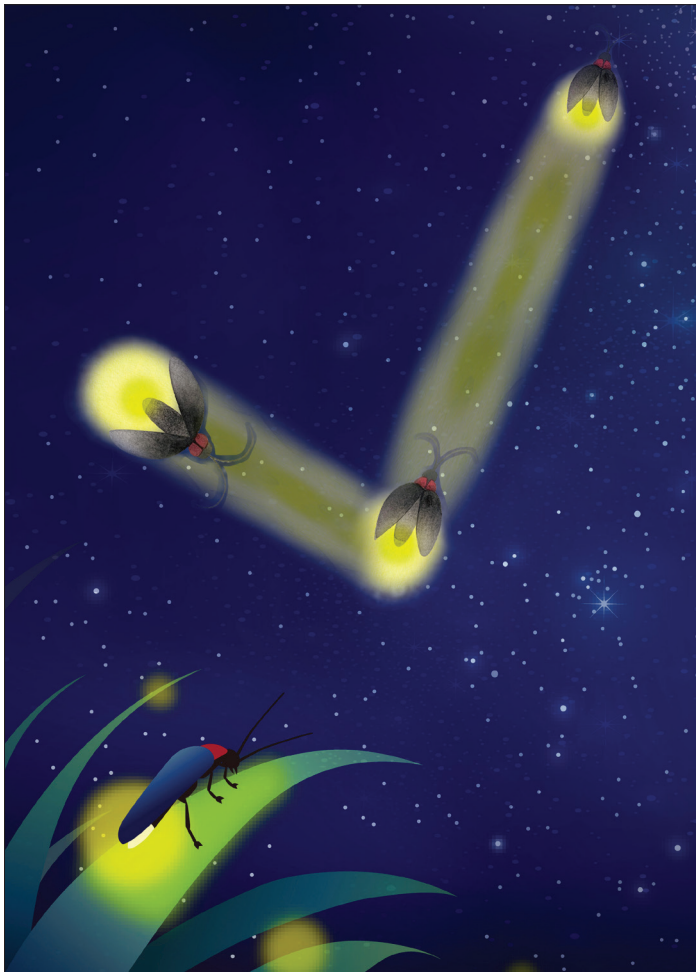


Backyard Fireflies

There are about 24 species of fireflies living in Ohio. The most common firefly in Ohio backyards is the Big Dipper, whose scientific name is *Photinus pyralis* (pronounced: Foe-TIE-nus pie-RAL-us). This large firefly has a shield on its back called a **pronotum** that protects its head.

Dipper's pronotum has a black dot on it, surrounded by a ring of red or pink. This is one way we can identify it. These fireflies have adapted to many habitats including urban areas and backyards, as well as forests and fields.

On warm summer days, Big Dippers begin blinking in the early evening just before sunset. The Big Dipper has a yellow-green light, and its blinking pattern makes a "J" shape in the air. While a Big Dipper male is flying, he lights up his lanterns, dips down in the air, and then flies straight up to create a "J" or "checkmark" of light in the air. The blink ends and he scans the ground for signs of a female firefly, who will blink her response.



Firefly Lifecycle

Similar to a butterfly, beetles undergo **complete metamorphosis**. Their life cycle begins as an egg laid in moist, humid leaf litter and humus, organic mulch, or undisturbed grassy areas. When eggs hatch, tiny **larvae** emerge. Firefly larvae are predatory, feeding on small insects, earthworms, snails and slugs found on the ground and leaf litter where the eggs were first laid. The larvae spend one to two years eating and growing before they are ready to transform. When the time comes, they develop into pupae. Much like a butterfly's chrysalis, the pupa stage allows the larvae to transform into winged, flying adults. Adult fireflies emerge in the summer, ready to find a mate and lay eggs, continuing the cycle.



Helping Fireflies

Fireflies experience pressures that can make it difficult for them to successfully grow, mate, reproduce, and thrive. Habitat loss and human activity may negatively impact their lives. When humans remove leaves and compost piles from their yards, it removes the safe spaces where eggs and larvae develop, eat, and grow. Applying chemicals to lawns to kill weeds or insects can harm fireflies and reduce the number of fireflies in our yards.

Humans can help fireflies by creating a welcoming environment. Fireflies need shelter for eggs and larvae. Leaving leaf mulch provides a moist dark habitat for larvae to hunt. By planting native garden plants, humans can create spaces for firefly food, such as slugs and earthworms, in the soil. Mowing the lawn at a higher height can also help keep soil moist and habitable for fireflies to land and lay eggs. Turning off lights at night or using low-intensity lights can help encourage firefly blinking. Without light pollution

from lamps and porch lights, male and female fireflies can communicate back and forth. The darker it is, the better the light show! And most importantly, talking with adults about reducing the use of pesticides around the home reduces the risk of accidentally killing fireflies. Using some or all of these tips can help increase the firefly population in your neighborhood.

AREAS OF INTEREST AND THINGS TO DO

Every self-determined 4-H project can be broken down into areas of interest. These are the specific things members want to address during their project adventures. Using 4-H 365 *Self-Determined Project Guide*, identify at least three areas of interest with at least three activities per area to explore. Take your ideas from the list below or make up your own.

Learn About Fireflies

- Research and identify two species of fireflies not mentioned in this idea starter. Write a brief summary of the characteristics of the fireflies you researched.
- Make an interactive poster which shows the anatomy of a firefly. Create a label for each part of the firefly's anatomy. Include a description of its function. Ask your family members or your club or group members to match the labels to their correct locations on your poster.
- Create a short presentation about firefly predators. Share your presentation with your club or group.
- Learn about the blinking patterns and blinking colors of different species of fireflies. Make a display that shows the blinking colors and blinking patterns of three different species.
- Build your own firefly circuit. Instructions are on the worksheet at the end of this idea starter. Share this activity with your club or group.

Firefly Habitats

- Research native plants that attract fireflies. Create a poster with pictures and information about three native plants that attract fireflies. Share your poster with your club or group.
- With parental/guardian permission, plant one or two native plants to attract fireflies to your yard.

Observe the plants to see if fireflies are attracted to the plant(s).

- Make a firefly-friendly yard sign. Display it in your yard.
- Create a presentation about why people should reduce the use of chemicals in their yards. Share the presentation with your club or group.

Firefly Observation

- With your adult project helper, search the internet for examples of how to construct a bug net using items you find around your home. Watch [youtube.com/watch?v=M0h_K3lty0Y](https://www.youtube.com/watch?v=M0h_K3lty0Y) or go.osu.edu/net if you need ideas. Make your own bug net from household items and share your net with your club or group.
- Use an old container with a lid, such as an empty peanut butter or mayonnaise jar, to catch fireflies. Observe them with a magnifying glass. Draw pictures of the fireflies you capture and research their species names. Share your findings with your project helper. Remember to release the fireflies once you have finished recording your observations. If you use a glass jar, be careful not to drop it on a hard surface.
- After carefully observing a firefly, build your own out of recycled materials. Use a small flashlight or a glow stick to simulate the firefly's lantern. Watch this video for basic instructions: [youtube.com/watch?v=1faqQmip2X4](https://www.youtube.com/watch?v=1faqQmip2X4)
- Arrange with a Cloverbud volunteer to lead an activity during a Cloverbud meeting about observing fireflies and their flash patterns. Incorporate literacy into your lesson by reading aloud "Fireflies Light the Night," "Fly, Firefly!" or another age-appropriate book about fireflies with your Cloverbuds.

Be a Citizen Scientist!

- Go outside at dusk and record how many firefly flashes you see over a set period of time. For example, watch your yard for 15 or 30 minutes. How many flashes do you see? Do this for several days in the summer and compare your results. Do the number of flashes change on hot nights or cold nights? Do the number of flashes change if it rains? What observations can you make about the firefly numbers in your yard? Write a brief summary of your observations and share your summary with your project helper.

- Encourage members of your club or group to collect firefly data in their own backyards. Ask them to record the date, time, location, and weather conditions, along with the number of flashes they observe. Collect their data and prepare a presentation showing the results. Give the presentation at your club or group meeting.
- With a parent or guardian’s permission, participate in a citizen science project to help map and monitor fireflies nationally by observing fireflies in your backyard and reporting your data to the Firefly Atlas Project at fireflyatlas.org. Take

pictures of the fireflies you see and upload them. Include the day and time of your observations.

- Search the term “firefly blitz” at inaturalist.org. With your parent or guardian’s permission, set up an account on the site so you can report what you observe. Take a picture of the fireflies you see and upload them to the site. Include the date and time of each observation.
- sum to a conservation group for educating the public about facts and superstitions.

GLOSSARY

bioluminescence. The emission of light by living organisms, such as fireflies and deep-sea fishes.

complete metamorphosis. Insect development with four life stages—egg, larva, pupa, and adult.

lantern. The section(s) of a firefly’s abdomen that glow.

larvae. The immature form insects that undergo metamorphosis.

luciferin. An organic substance that produces light when exposed to oxygen.

luciferase. The enzyme that causes luciferin to react with oxygen to produce a glow.

pronotum. A shield-like structure directly behind the head of an insect.

RELATED RESOURCES

BugGuide. “Identification, Images, & Information. Family Lampyridae—Fireflies.” bugguide.net/node/view/85

Community Roots. “Native Plants: Do You Wish You Had More Fireflies?” communityrootsohio.org/post/native-plants-do-you-wish-you-had-more-fireflies

Firefly Conservation & Research. firefly.org

North Carolina State University. “How Fireflies Glow—and What Signals They’re Sending.” news. ncsu.edu/2019/07/23/how-fireflies-glow-and-what-signals-theyre-sending

U.S. Fish & Wildlife Service. “Save the Fireflies.” fws.gov/story/save-fireflies

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FIREFLY WORKSHEET

Materials

- conductive tape for circuits, such as Maker's Tape or copper tape
- 3mm blinking LED diode light with 2 leads. Remember, firefly lanterns may glow in yellow, green, orange, or even blue.
- CR2032 coin battery
- crayons, colored pencils, or markers
- scissors
- clear tape (optional)
- firefly template, Figure 1 and 2—for best results, copy the template on cardstock or heavy paper

What to do

1. To capture the natural shades of a real firefly, color the firefly image using red, brown, black, and yellow.
2. Cut along the dotted line and punch a hole through the black hole at the top of the template. Your firefly can then be hung as an ornament.
3. The LED light has two "legs" called LEADS. One is shorter than the other. The long leg is the positive lead. The short leg is the negative lead. Electricity flows from the negative side to the positive side once you create the electrical circuit.
4. Check the polarity of your battery. The battery is marked with positive (+) and negative (-) sides, but you can also test this by touching the light



leads to the battery. The short leg should touch the negative side of the battery. The long leg should touch the positive side. If this is done correctly, the light will blink.

5. Place the firefly template on a flat surface with the firefly image facing up. Make a small hole and push the LED leads through the bottom of the firefly. The bulb represents the firefly's lantern. The two leads should be sticking out on the back side of the template.



6. Cut a strip of conductive tape 1½ inches long. Tape the shorter lead (negative) to the back side of the template, ensuring the tape extends into area where the battery will be placed. Place the battery on top of the tape. Refer to Figure 2 for battery placement.
7. Next, cut another strip of conductive tape long enough to cover the longer lead (positive) and connect it to the battery's positive side. Tape the positive lead down to the paper ensuring the tape contacts the positive (+) side of the battery. This should complete the circuit, and the light should be lit.
8. Use additional clear tape as needed to secure the edges of the battery onto the paper.
9. Hang your blinking firefly as an ornament.

FIREFLY TEMPLATE

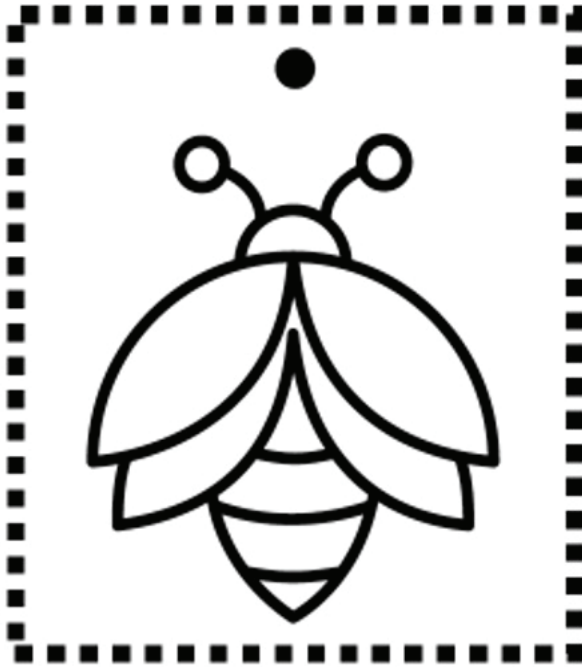


Figure 1 Front

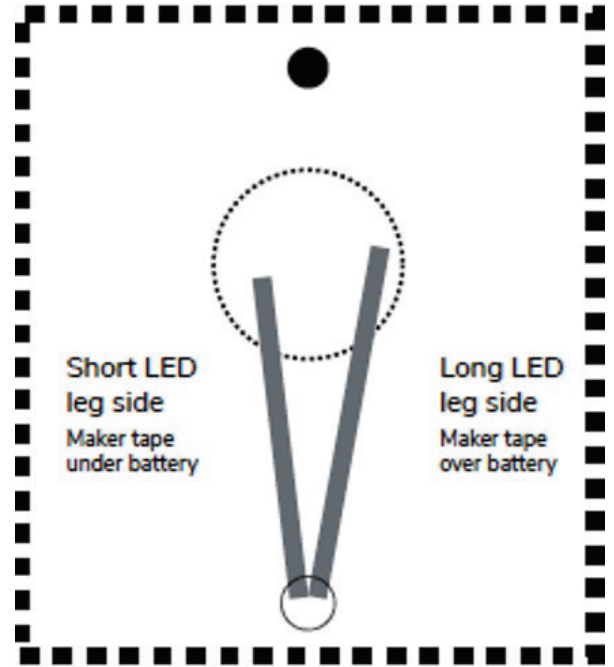


Figure 2 Back