

# The Outside Story

## Summer Lights: It's Firefly Season!

By Laurie D. Morrissey

*Here come real stars to fill the upper skies, / And here on earth come emulating flies, / That though they never equal stars in size, / (And they were never really stars at heart) / Achieve at times a very star-like start...*

—Robert Frost, “Fireflies in the Garden”

It happens on a warm June evening: in the darkening field near my house, I notice a brief flicker of light. Then another. And another. It's the opening act of firefly season – a nightly light show, courtesy of a family of ½-inch-long insects. As fleeting as it is spectacular, firefly season lasts only a few weeks, during which the newly emerged adults mate and lay eggs.



The sight of fireflies (also known as lightning bugs) invokes memories of childhood summers, when I chased the flashes with my brother, occasionally catching a few in a jar for closer inspection. These luminescent insects are easy to like. They brighten our summer evenings – and they don't bite, sting, crawl up our legs, or nibble our lettuce.

Despite their common name, fireflies are not flies. They're winged beetles in the *Lampyrida* family. There are roughly 2,000 firefly species worldwide, and about 170 in North America, including some 20 species that live in northern New England. Another surprise is that not all fireflies flash through the night; some species are active in the daytime and only glow in their larval stage, out of our sight.

Sara Lewis, a Tufts University evolutionary ecologist and self-professed firefly junkie, says fireflies are a beautiful example of the creative improvisation of evolution. “Beneath their gentle façade, fireflies' lives are surprisingly dramatic,” Lewis writes. “They're full of spurned advances, expensive nuptial gifts, chemical weapons, elaborate subterfuge, and death by exsanguination!” (That's a fancy word for blood loss; some females prey on males of a different genus, ingesting their blood to steal some of their defensive steroids.)

Lewis has published hundreds of research papers about fireflies and is the author of “Silent Sparks: The Wondrous World of Fireflies.” Her TED talk, “The Loves and Lives of Fireflies,” has more than a million views.

Fireflies spend their larval stage, which can last from one to three years, underground feasting on earthworms, snails, and soft-bodied insects. They then pupate – also underground – for about two weeks, and emerge in

early summer as adult beetles. An adult firefly lives only a few weeks, during which it carries out what Lewis calls a “courtship conversation” of precisely controlled flashes.

A firefly has two pairs of wings: one for flying, and another shell-like set to protect its flight wings and soft body. Its head is covered by a flattened shield. It keeps its chemistry set – the source of the seemingly magical production of light – on the underside of its abdomen.

When a firefly flashes, it transforms chemical energy into light. This bioluminescence likely evolved to signal toxicity to potential predators. Over millions of years, these lights have developed into a communication tool powered by a chemical reaction between luciferase (an enzyme) and luciferins (molecules that produce light). Each firefly species has its own flash pattern.

When a female waiting in the grass sees an appealing flash from a male, she aims her lantern in that direction and responds with her own flashes. During mating, the pair spends all night together, Lewis explains, and the male delivers sperm as well as a nutrient-filled package – called a “nuptial gift” – that is essential to provisioning the eggs. Lewis and her colleagues think that longer flashes are associated with larger nuptial gifts, and thus superior nutrition for eggs. Females select their mates accordingly. Two to three weeks after mating, the female lays her fertilized eggs in moist soil. In late summer, larvae emerge and will overwinter in the soil

It’s hard to say exactly how many firefly species live in the Northeast. The University of New Hampshire’s insect collection contains 18, and Vermont has 13 confirmed species. Determining ranges for specific species can be difficult, partly because these change in response to human pressures such as alterations of the landscape. Relatively few scientists study fireflies, and there is only a short period when field work can occur.

Sadly, firefly watching is becoming increasingly rare. Populations are declining due to habitat loss, light pollution, and the use of chemical pesticides. To increase the chances of spotting these flashing insects, biologists recommend turning off outdoor lights, leaving unmown areas, and avoiding pesticides and chemical fertilizers.

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